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Foreword

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Almost 5 years ago we started to organise the International Science and Technology conferences in Turkish Republic of Northern Cyprus with about 200 papers submitted all around the World. In present conference, more than 400 papers were accepted from various countries Algeria to Poland. Some selected papers presented in the conference will be published in The Online Journal of Science and Technology.

Our goal is to rewiev and accept all kinds of scientific research paper. We are approaching to 5th ISTEC 2014 conference held in Doha, Qatar between 18-20 December 2014. We are welcome all attendees coming and joining the conference.

I will thank to the participants all around the World for supports by sending their valuable scientific works to present in the conference.

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***1Selim KAYA, 2Barış BORU , 3Eren Safa TURHAN, 4Gökhan ATALI**

Sakarya Üniversitesi Teknoloji Fakültesi Mekatronik Mühendisliği Bölümü, Sakarya

Özet İnsan hayatını kolaylaştıran ve işlerini daha az iş gücü kullanarak daha kısa sürelerde yapılmasını sağlayan teknolojiler arasında robotik önemli bir yere sahiptir. Robot kollarının özellikle endüstride çok geniş bir kullanıma sahip olması nedeniyle robotik çalışmalarının önemli bir kısmı robot kolları üzerine yoğunlaşmıştır. Bu çalışmada, bir robot kolunun hareket alanı içerisinde yer alan objeleri otomatik tanıyarak konumlarını tespit etmesi ve ilgili konumlarda objeleri yakalayabilmesi amaçlanmıştır. Kullanılan altı serbestlik derecesine sahip robot kolunun kontrolü gerçek zamanlı olarak bilgisayar ile gerçekleştirilmiştir. Robot kolu üzerine yerleştirilen kamera ile robot çalışma alanı izlenmektedir. Labview programında görüntü işleme ile analiz yapılmakta, daha önceden tanımlanan objeler tespit edildiği takdirde konumları belirlenmektedir. Konum verileri için altı eksenli robot kolunun ters kinematik denklemi ile servo motorların cisme ulaşması için alması gereken açılar hesaplanmaktadır. Tüm bu hesaplama işlemleri Labview grafiksel programlama ortamında hazırlanan yazılım ile bilgisayarda gerçek zamanlı olarak gerçekleştirilmektedir. Ayrıca robot kolunun manuel olarak motor açıları ile kontrol edilmesi mümkündür. Robot kontrolü için hazırlanan yazılıma internet üzerinden erişilebilmektedir.

Bilgisayara bağlı arabirim ile gerekli elektriksel kontrol işaretleri mikrodenetleyici tarafından üretilerek robot kolunun konumlandırılması sağlanmaktadır. Çalışmada kullanılan robot kolu üzerinde Robotis firmasına ait Dynamixel servo motorlar kullanılmıştır. Bilgisayar arabirimi olarak Usb2Dynamixel tercih edilmiştir. Bu birimler yüksek performansları ve düşük maliyetleri ile ön plana çıkmaktadır. Düşük maliyetli ve kolay uygulanabilir bir yapı olarak ortaya çıkan bu çalışma ürünü endüstride, mühendislik alanında eğitim ve araştırma çalışmalarında kullanılma potansiyeli yüksektir.

Anahtar Kelimeler: Robot kolu, Labview, Görüntü İşleme, Bilgisayar ile kontrol

Giriş

Günümüzde hızla gelişen teknoloji insan hayatını kolaylaştırmakta mesafe ve zaman sınırlarını azaltmaktadır. Bu gelişmeler arasında internet ve robotik teknolojilerindeki gelişmeler önemli yer tutmaktadır. Robotik teknolojisi sayesinde insanların yaptığı birçok iş alanında robotları kullanarak daha az iş gücü ile daha kısa sürelerde maliyeti düşük ve performansı yüksek faydalar elde edilmesi mümkündür. Robot teknolojilerinin faydalarını arttırmak ve daha geniş kullanım alanları sunmak amacıyla internet üzerinden erişim, görüntü işleme gibi teknikler robot uygulamalarına dahil edilmektedir. Görüntü işleme kullanılarak objeler ve konumları tespit edilebilmekte, bu konumlara göre istenilen işlemlerin robot uygulamaları tarafından gerçekleştirilmesi ile robotik uygulamalarının insanlara daha yararlı hale gelmeleri sağlanmaktadır. İnternet teknolojisi sayesinde uzak mesafeler arasında bilgi transferi ve kontrol sağlanmakta böylece insan hayatındaki birçok iş kolaylaşmaktadır. Bu çalışmada robotik, görüntü işleme ve internet teknolojilerinin bu faydaları bir arada kullanılarak endüstri, sağlık, savunma, ulaşım, tıp ve eğitim gibi birçok alanda insanlığın yararına sunulması amaçlanmaktadır.

Mevcut literatürde, internet kullanılarak robot kolu kontrolü üzerine birçok çalışmanın yapıldığı görülmektedir. Yılmaz N. ve arkadaşları (Yılmaz, 2005, Yılmaz, 2004) "Web Tabanlı Mobil Robot Sistemi Tasarımı" isimli çalışmaların da mikrodenetleyici olarak biri efendi (master) diğeri köle (slave) olmak üzere iki adet PIC16F877 mikrodenetleyicisi kullanmışlardır.Yaptıkları çalışmada, bilgisayara bağlı efendi mikrodenetleyici internetten aldığı verileri RF (Radyo frekans) ile robot üzerinde bulunan köle mikrodenetleyiciye göndererek robotun kontrolünü gerçekleştirmişlerdir. Ünlü B.'nin (Ünlü, 2007)
" İnternet Üzerinden Mobil Bir Robotun Kontrolü" isimli tez çalışmasında kontrol kartı olarak PIC16F877A ve Doğru Akım (DA) Motorların sürülebilmesi için L298 entegresi kullanılmıştır. İbrahim Ş., Mehmet Y.'nin (İbrahim,2011) yazdığı "Wireless Controlled Mobile Exploration Robot" isimli başka bir çalışmada yine mikrodenetleyici olarak PIC16F877A görülmektedir.Yılmaz N. ve arkadaşları [2,3] "Web Tabanlı Mobil Robot Sistemi Tasarımı" isimli çalışmaların da kontrol işlemleri için PHP ve JavaScript programlama dilleri kullanılarak web ara yüzünü oluşturmuştur. PHP veri tabanı fonksiyonları için kullanılırken, JavaScript kodları ile zamanlama ve tazeleme (fresh-up) fonksiyonları için kullanılmıştır. Ünlü B.'nin (Ünlü,2007) " İnternet Üzerinden Mobil Bir Robotun Kontrolü" isimli tez çalışmasında internet üzerinden sunucu ve istemci arasında bağlantı kurulmasını sağlayan kontrol programı, Borland Developer Studio 2005 programında nesne yönelimli bir dil olan C++ yazılımı kullanılarak geliştirilmiştir. Metin U. ve arkadaşlarının (Metin,) "Yerli İmkânlar ile Geliştirilen DA Servo Sürücü ve 5 Eksenli Robot Kol Uygulaması" çalışmasında isminden de anlaşılacağı gibi 5 eksenli bir robot kolu uygulaması yapılmıştır.
Uzer, M.S. ve Arkadaşlarının (Uzer,2010) "Görme Tabanlı Mobil Robot ile Farklı Renklerde Nesnelerin Gerçek Zamanlı Takibi" isimli çalışmalarında tasarlanan obje takibinde objenin arka plandan ayrıştırılması için nesnenin geometrik yapısı ve beraberinde nesnenin renginin kullanıldığı bir yöntem Matlab programı ile gerçekleştirilmiştir.

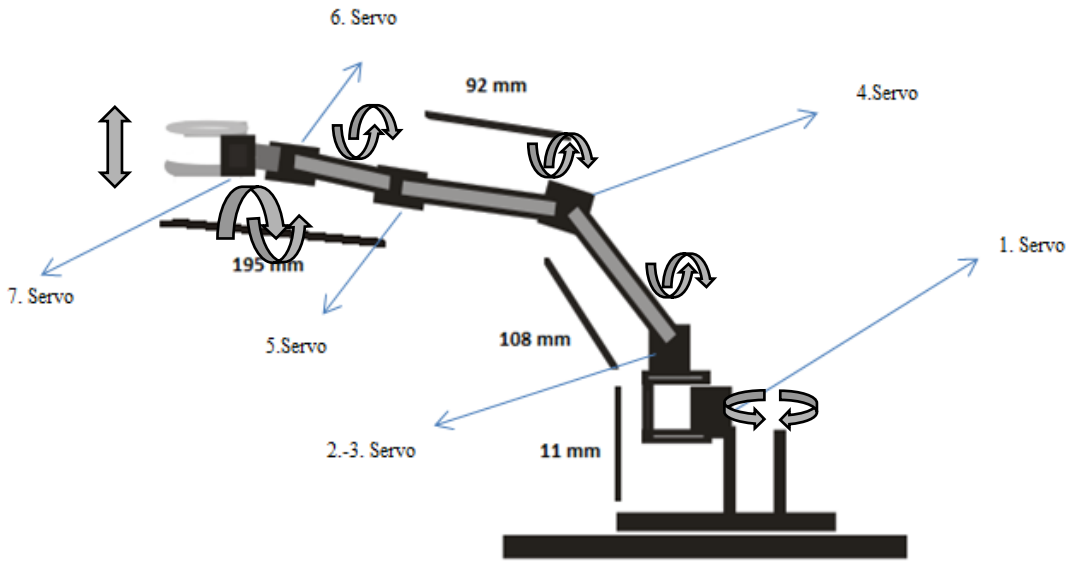
Bu çalışmada Robotis firmasına ait Dynamixel servo motorları ve Dynamixel servo motorları ile uyumlu çalışan Usb2Dynamixel arabirim kullanılmıştır. Bu çalışmasının öncesinde yapılan " Web Üzerinden Labview Kullanarak Altı Eksenli Robot Kolu Kontrolü" isimli çalışmada RC tipiservo motorlar ve Arduino mikrodenetleyici kullanılmıştır. (Kaya,2014) RC servo motorların hassasiyetlerinin düşük olması nedeniyle robot kolu istenilen kararlılıkta çalıştırılamamaktadır. Bu çalışmada kullanılan Dynamixel servo motorların hassasiyetleri 0.29 derecedir. Dynamixel servo motorların konum kontrolleri dijital olarak yapılmakta ve en önemlisi konum bilgilerini dijital olarak geri besleme yaparak göndermektedir. Arabirim olarak seçilenUsb2Dynamixel bilgisayardan gönderilen verileri RS-485 iletişim ile servo motorlara göndererek konum kontrolünü geri beslemeli olarak yapmaktadır.

Robot kolu kontrolü için bu çalışmada grafiksel programlama dili olan Labview kullanarak kontrol algoritması yazılmıştır. Labview, grafiksel programlama kabiliyetleri yanında birçok donanımla entegre ve gerçek zamanlı olarak çalışabilmesi ile öne çıkmaktadır. Ayrıca internet üzerinden gerçek zamanlı olarak altı eksenli robot kolunun kontrolün sağlanması ve izlenmesi için ekstra herhangi bir web sayfası yazmaya gerek duyulmaksızın Labview programı ile oluşturulan ön panel web sayfası haline dönüştürülmesi mümkündür.

Bu çalışmada tasarlanan altı eksenli robot kolu ile mevcut literatürde bulunan çalışmaların büyük çoğunluğunun aksine hareket alanının ve esnekliğin artması sağlanarak daha iyi bir performans elde edilmiştir.
Objenin konumun belirlenmesi için Labview programı kullanılır. Kameradan alınan görüntü Labview programı ile siyah-beyaz haline getirilir ve bu görüntüler üzerinde çalışmalar gerçekleştirilir. Önceden tanıtılan objenin boyutları ile eşleştirme yaparak objenin tanınması sağlanır. Tanınan objenin, konumu da yine Labview programıyla tespit edilir. Görüntülerin siyah – beyaz olması hem görüntü işlemenin hem de haberleşmenin daha performanslı olması ve hızlı çalışması sağlanır.

Sistem elemanları

Tasarlanan robot kolu altı serbestlik derecesine sahip olup dört eklemlidir.1. serbestlik platform üzerinde robot kolunu döndürmektedir. Diğer 4 serbestlik eklemlerde olup uzuvları hareket ettirmektedir. Son serbestlik ise tutucu aç kapa işlemini yürütmektedir. Robot kolunun en büyük momente sahip 2. Serbestlik noktasına bu gücü sağlayabilmek için paralel çalışan iki adet servo motor yerleştirilmiştir. Diğer tüm serbestlik noktalarında 1 motor kullanılmış olup robot kolu 7 motordan oluşmaktadır. Robot koluna ait genel çizim Şekil 1'de verilmiştir. Şekil1'de robot kolu serbestlik noktaları ve eklem uzunlukları görülmektedir.

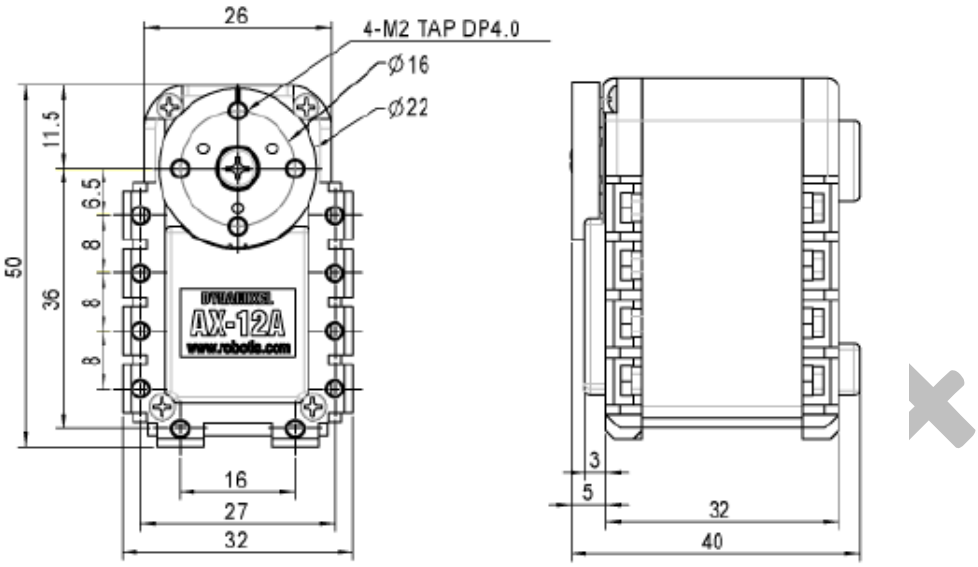


Şekil 1. Robot Kolu Serbestlik Noktaları ve Eklem Uzunlukları

Bu çalışmada kullanılan robot kolu Robotis firmasına ait 7 adet Dynamixel AX-12A servo motor kullanılarak oluşturulmuştur. AX-12A servo motorlar RS-485 haberleşme sistemi ile tamamıyla dijital olarak çalışmaktadır. Kontrol birimleri servo motorun içinde yer almakta olup çift yönlü olarak veri alışverişi yapmaktadır. Kontrol birimleri bir mikrodenetleyici çeşitli sensörler ve temassız enkoder içermektedir. Bu özellikleri ile Dynamixel servo motorlar robotik uygulamaları için ön plana çıkmaktadır. Dynamixel AX-12A servo motorların teknik özellikleri Tablo 1' de verilmiştir. Şekil 2'de AX-12A Servo Motorunun Ölçüleri verilmektedir.

Tablo1. Dynamixel AX-12AServo Motorların Teknik Özellikleri

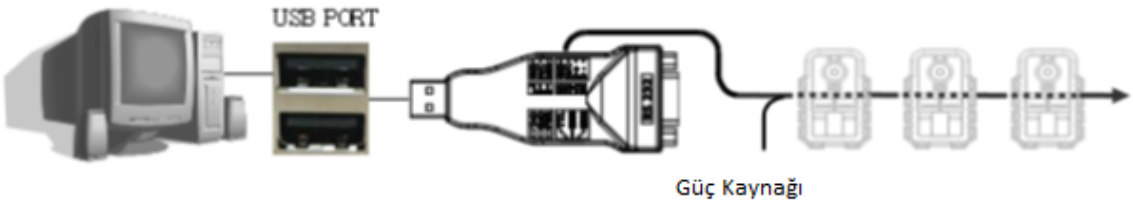
Tip	Ağırlık	Boyut	Hassasiyet	Tork	Dönme açısı	Çalışma gerilimi
AX-12A	54.6 gr	32mm X 50mm X 40mm	0.29 derece	1.5 N.m (12V, 1.5A)	0-300 derece	9-12 V



Şekil 2. Servo Motor Ölçüleri

Dynamixel AX serisi 10 bitlik bir temassız enkoder içermektedir. Dolayısıyla konum kontrolü 1024 adım ile gerçekleştirilmektedir. Motoru konumlandırmak için 0-1023 arası dijital bilgi gönderilmektedir. AX-12A servo motorları 300 derece/1024 adım=0.29 derece/adım hassasiyetindedir. RS-485 haberleşme protokolü kullanan AX serisi motorların en büyük avantajlarından biri ise 32 adet motorun tek hat ile kontrol edilebilmesidir. Bu amaçla her motora ait benzersiz bir ID numarası verilmektedir. Hatta bağlı olan tüm servolar içinden bilgi göndermek veya alınmak istenen servo motorun ID si ile işlem yapılmaktadır.

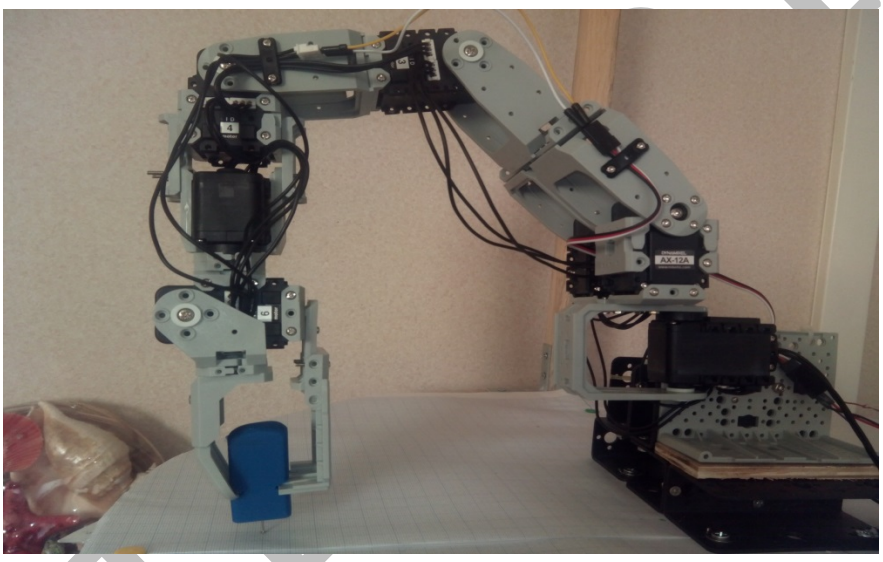
Usb2Dynamixel kontrol kartı isminden anlaşılabileceği gibi USB ile bilgisayara bağlanarak Servo motorlar ile bilgisayar arasındaki arabirimi oluşturur. Desteklediği farklı haberleşme standartları ile iletişim hattına bağlı olan servo motorlara bilgi gönderimi ve alımını sağlamaktadır. Şekil 3 ve Şekil 4'te Usb2Dynamixel bağlantı şeması ve resmi verilmiştir.



Şekil 3. Usb2Dynamixelin Bilgisayara Bağlantı Şeması

Şekil 4. Usb2Dynamixel

Tasarlanan robot kolunun mekanik aksamları ABS plastik kullanılarak oluşturulmuştur. Plastik seçilmesinin temel sebebi Robot kolunun ağırlığını azaltarak motorlara uygulanan moment kuvvetini düşürmektir. Robot kolunu taşıyan platform metal olarak yapılarak hareket alanının tamamını kapsayacak bir tabla üzerine yerleştirilmiştir. Çalışmada kullanılan altı eksenli robot kolunun resmi Şekil 5'de verilmiştir.



Şekil 5. Robot Kolu

Robot kolu kontrol yazılımı

Görüntü işleme

Görüntü işleme ile konumu hesaplanacak obje önceden usb bağlı kamera ile labview programına tanıtılır. Labview programına usb kamera bağlantısını yapabilmemiz için vision acquisition software driverını kurmamız gerekir. Kontrol yazılımının daha hızlı ve performanslı çalışması için gerçek zamanlı görüntü alınırken ve objeyi tanımlarken görüntüyü tek düzleme (Siyah-Beyaz) indiririz. Görüntüyü siyah beyaz almak için vision and motiondan sırasıyla vision utilities =>color utilities =>imaq extract single color plane seçilir. Görüntü işlemede asıl işin yapıldığı yer mathscript'e yazılan matlab kodlarıdır. Mathscript alanına yazılan kodlar matlab da yaptığı işlevin aynısını Labview programında gerçekleştirir.

Robotun ters kinematik denklemi

Robotlar kendilerinin ve çevrelerindeki nesnelerin bulunduğu 3 boyutlu uzayda hareket ederler. Robotun ve çevresindeki nesnelerin konumlarını ve birbirlerine göre yönelimlerini belirlemek için robotun ve çevresindeki nesnelerin merkezlerine birer koordinat sistemi yerleştirilir. Tanımlanacak bütün konum ve yönelimler evrensel çerçeveye veya evrensel çerçeve içindeki diğer kartezyen koordinat sistemlerine göre gerçekleştirilir. Robot sistemlerinin çalışma uzaylarında belirlenen noktalara gitmesini sağlamak için koordinat sistemleri ile ilişkilendirilirler. Çalışmamızda kullanan robotun Kinematik çözüm ve sembol matris eşitliği şekil 6'da görülmektedir. Bu matrislerin çözümlenmesi sonucunda robotun kendine özgü ters kinematik denklemleri oluşmaktadır.

$$A_1^{-1} = \begin{bmatrix} c_1 & s_1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ s_1 & -c_1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \quad A_1^{-1}T_0^6 = A_1^{-1}A_1\,A_2A_3A_4A_5$$

$$A_1^{-1}T_0^6 = \begin{bmatrix} c_1n_x + s_1n_y & c_1o_x + s_1o_y & c_1a_x + s_1a_y & c_1p_x + s_1p_y \\ n_y & o_y & a_y & p_z \\ s_1n_x - c_1n_y & s_1o_x - c_1o_y & s_1a_x - c_1a_y & s_1p_x - c_1p_y \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$A_2A_3A_4A_5 = \begin{bmatrix} c_5c_{234} & -s_5c_{234} & -s_{234} & a_4c_{234} + a_3c_{23} + a_2c_2 \\ c_5s_{234} & -s_5s_{234} & c_{234} & a_4s_{234} + a_3s_{23} + a_2s_2 \\ -s_5 & -c_5 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$\begin{bmatrix} c_1n_x + s_1n_y & c_1o_x + s_1o_y & c_1a_x + s_1a_y & c_1p_x + s_1p_y \\ n_y & o_y & a_y & p_z \\ s_1n_x - c_1n_y & s_1o_x - c_1o_y & s_1a_x - c_1a_y & s_1p_x - c_1p_y \\ 0 & 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} c_5c_{234} & -s_5c_{234} & -s_{234} & a_4c_{234} + a_3c_{23} + a_2c_2 \\ c_5s_{234} & -s_5s_{234} & c_{234} & a_4s_{234} + a_3s_{23} + a_2s_2 \\ -s_5 & -c_5 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

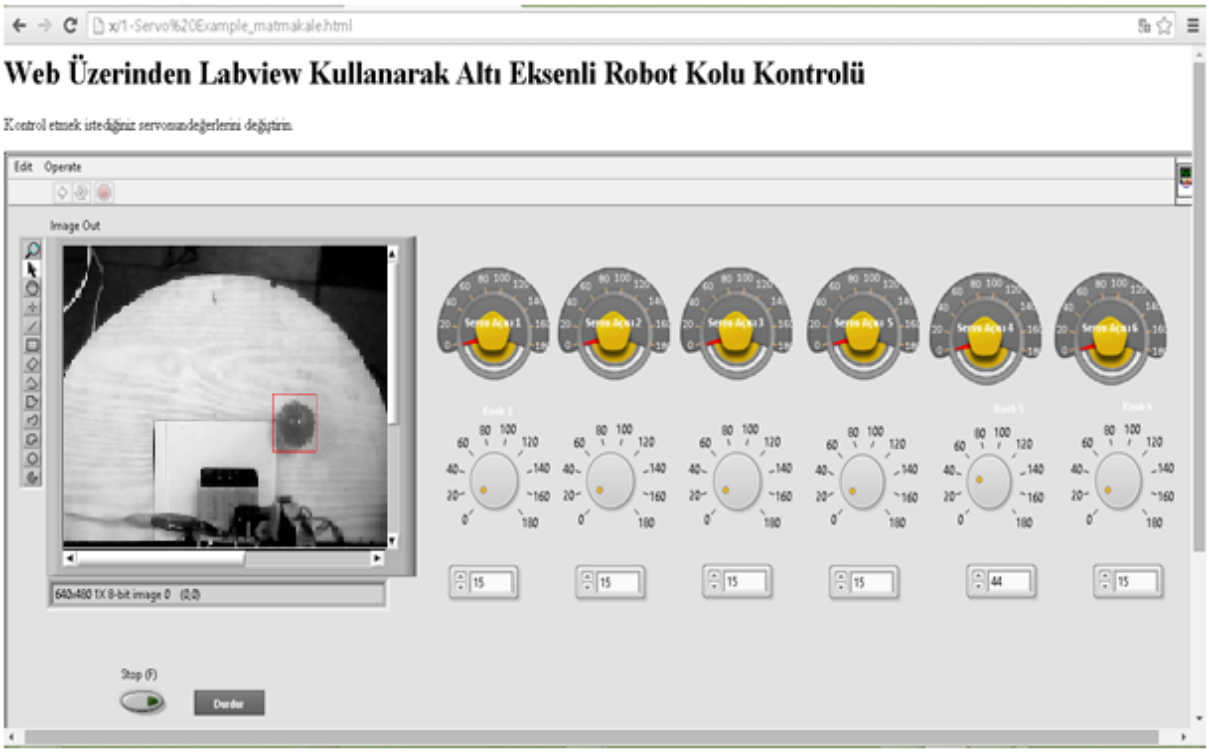
Şekil 6. Kinematik çözüm ve sembol matris eşitliği

Görüntü işlemeden gelen konum bilgilerinin kinematik denklemlerde işlenmesi sonucunda robot kolunun seçilen objeye ulaşması için her servo motorunun kaç derece dönmesi gerektiği hesaplanır.

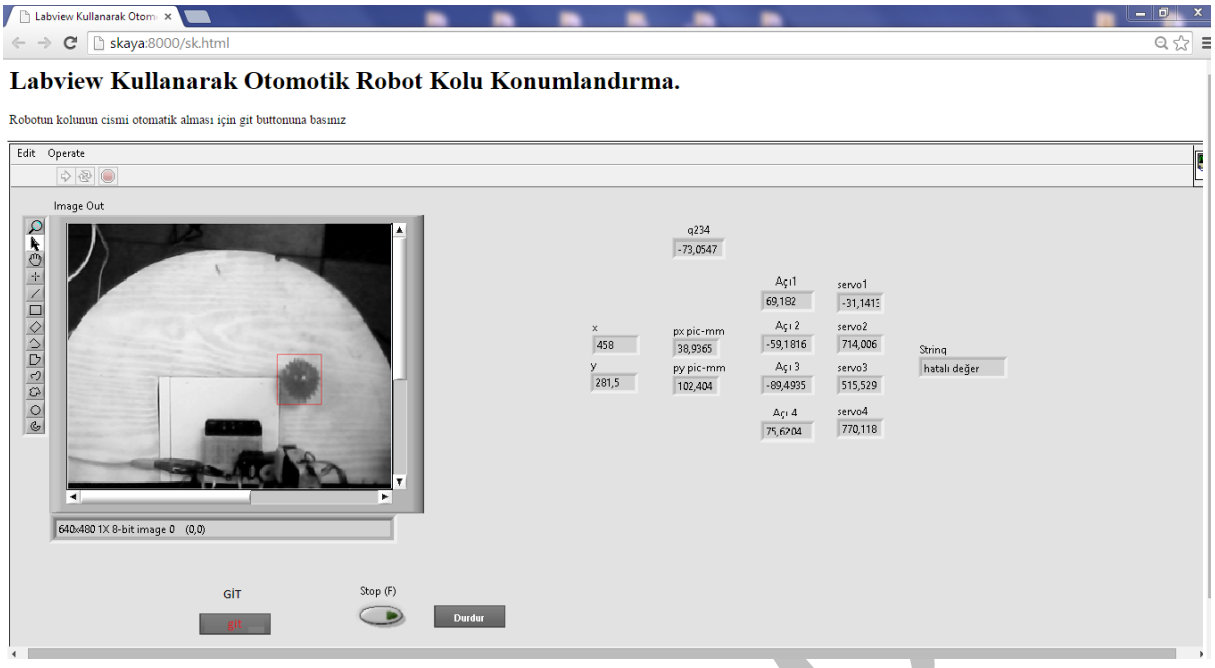
Labview Programının Servo Motorları ile Haberleşmesi

Labview programı ile Dynamixel servo motorların haberleştirilmesi için USB2Dynamixel arabirimi kullanılmıştır. Labview programında görüntü işleme ile algılanan obje konumu ters kinematik denklemler vasıtası ile ilgili motor açılarına dönüştürülmektedir. Bu elde edilen açı değerleri motorların sayısal konum bilgisine çevrilmektedir. Konum bilgileri her motor için USB2Dynamixel'e gönderilmesi için Dynamixel SDK Labview programına ilave edilmektedir. Bu SDK kütüphanesi içinde yer alan çeşitli fonksiyonlar ile motorlar kontrol edilebilmekte ve motorlardan bilgiler alınabilmektedir.

Labview programıyla gerekli kodlar yazıldıktan sonra Şekil 7 ve Şekil 8'de görülen web sayfaları aracılığı ile altı eksenli robot kolunun kontrolü sağlanabilmektedir. Web ara yüzünden veya kamera görüntüsünden görüntü işleme ile elde edilen gelen veriler Labview programında yazılan kodlar sayesinde yerel bilgisayarın USB portu ile Usb2Dynamixel kontrol kartından veriler iletilerek kontrol sağlanmaktadır.



Şekil 7. Robot kolunu manuel kontrol etmek için oluşturulan web ara yüzü.



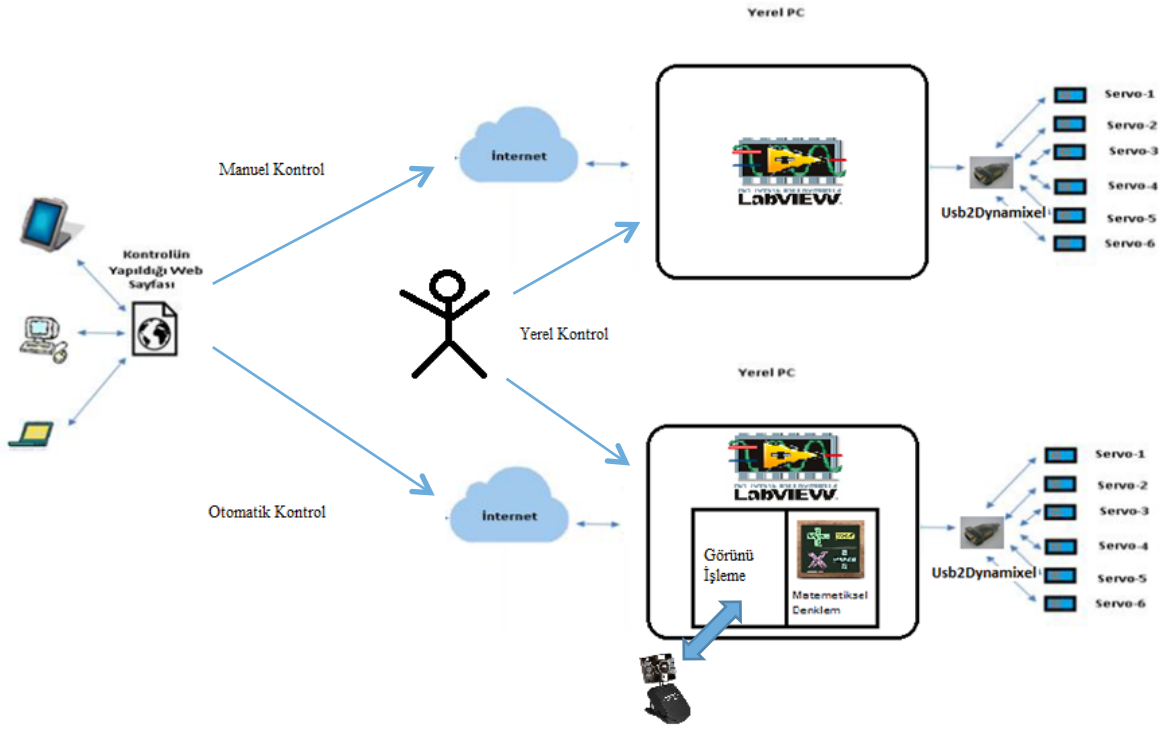
Şekil 8. Robot kolunu görüntü işleme kullanarak konumlandırmak için oluşturulan web ara yüzü.

Sistemin çalışması

Sistemin kontrolü için Labview programı gerekli olan hesaplamaları yapıp Usb2Dynamixel kontrol kartına gönderilecek şekilde tasarlanmıştır. Web ara yüzü sayesinde kullanıcı isterse manuel olarak istediği konumlara robot kolu yönlendirebilir veya daha önceden tanımlanan objenin konumuna otomatik olarak robot kolunu yönlendirerek objeyi herhangi bir alana taşıyabilmektedir.

Bu sistem yerel olarak kullanılabildiği gibi yerel bilgisayarın ip adresiyle uzaktan bağlanılarak yönetilmesi de mümkündür. Eğer istenirse sisteme bir domain ile ilişkilendirilerek bu domain üzerinden de kontrol sağlanabilmektedir. Uzaktaki kullanıcının web ara yüzünden robot kolunun manuel ya da otomatik kontrol seçimine göre iki farklı web ara yüzü ile karşılaşmaktadır. Uzaktaki kullanıcı manuel kontrol modunda, Şekil 7'deki web ara yüzünden servo motorunun açılarını güncellemesi ile oluşan değişiklikler Labview programında gerekli işlemlerden sonra USB portu ile Usb2Dynamixel kontrol kartına ulaşır. Motorlara bu veriler RS485 protokolü ile robot kolunun mekanik hareketini sağlayacak servo motorlara ulaştırılmaktadır. Bu değişiklikler yerel bilgisayara bağlı kamera ile görüntü alınarak tekrar Labview Programına iletilerek web sayfasında ve yerel bilgisayarda görüntünün oluşmasını sağlamaktadır.

Uzaktaki kullanıcı robot kolunu otomatik olarak yönlendirecekse Şekil 8'deki web ara yüzü ile karılaşır. Web sayfası açılır açılmaz robot başlangıç konumuna gelmektedir aynı zamanda kameradan alınan görüntüler web sayfasında gerçek zamanlı olarak görüntülenir. Görüntü işleme objeyi kırmızı bir kare içine alır ve konum bilgilerini robotun ters kinematik denklemine sokarak objeyi tutması için her bir servo motorunun kaç derce dönmesi gerektiğini hesaplar ve ekranda görüntüler. Kullanıcı web arayüzünden git butonunu seçmesi ile web sayfasında görüntülenen veriler motorlara ulaştırılarak robot kolu obje konumuna yönelir. Robot kolu objeyi mevcut konumundan alarak bizim belirlediğimiz koordinata kadar taşıdıktan sonra objeyi bırakmaktadır. Şekil 9'da sistemin çalışması blok diyagram olarak verilmiştir.



Şekil 9. Sistem Blok Diyagramı

Sonuçlar ve Öneriler

Bu çalışmada altı eksenli bir robot kolunun görüntü İşleme algoritmasının Labview görsel programlama dili ile entegre bir şekilde çalışması gerçekleştirilmiştir. Ayrıca internet teknolojisinin faydalarından da yararlanılmıştır. Önerilen "6 Serbestlik Derecesine Sahip Robot Kolunun Görüntü İşleme ve İnternet Üzerinden Kontrolü" literatürdeki diğer çalışmalardan en temel farkı daha önceden tanımlanan bir cismin otomatik olarak alınarak istenilen bir konuma taşınmasıdır. Ayrıca çalışmada kullanılan Labview programının esnek programlama yapısı ve grafiksel arayüzünün web yazılımları ile gerçek zamanlı olarak entegre bir biçimde çalışabilir olması çalışmada önemli diğer bir avantajdır. Çalışmaya kamera eklenmesiyle robot kolunun uzaktan yönetimi daha kolay hale gelmiştir.

Yapılan bu çalışıma da yapay zekâ algoritmaları kullanarak daha performanslı hale getirilebileceği öngörülmektedir. Çalışmada robot koluna Labview üzerinden yönetim sağlandığından platformdan bağımsız çalışmamaktadır. İleride yapılacak çalışmalar ile robot kolunun platformdan bağımsız hale getirilmesi faydalı olacaktır.

Teşekkür

Bu çalışma "2014-50-01-015" proje numarası ile Sakarya Üniversitesi Bilimsel Araştırma Projeleri Komisyonu tarafından desteklenmiştir.

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A brain tumor growth model with density

Fatma Bozkurt, Ahmet Sahin

Erciyes University, Department of Mathematics, Kayseri/TURKEY
Email:fbozkurt@erciyes.edu.tr

Abstract: Investigating the growth of tumor is an active research area and has lots of interests in biology, medicine and mathematics. In this work a fractional order logistic equation is considered such as D^Î± x(t)=x(t)[(r(1-Î²x(t)))+Î³x(t)] (A) that was previously constructed as a logistic equation with piecewise constant arguments to investigate the behavior of a brain tumor growth [1]. The parameter r and Î² denote positive real number, Î³ is a negative number and 0<Î±â‰¤1. Eq. (A) explain a brain tumor growth, where Î³ is embed to show the drug effect on the tumor. Eq.(A) is considered taking into account the tumor density. For this, we have constructed two models of a brain tumor growth; one is Eq.(A) and the other one explain an early brain tumor growth by incorporating Allee function at time t. In this study we show the stability, existence and the uniqueness of both models. Simulations give a detailed description of the behavior of solutions in (A) with and without Allee effect.

Keywords: Fractional order differential equation, stability, existence, uniqueness, Allee effect

A Comparative Study Based on Windows Size for Word Co-occurrence

Osman Yıldız[1], Abdullah Bal[2], Cengiz Teymur[3]

[1] Yildiz Technical University, Department of Informatics, Istanbul,Turkey. oyildiz@yildiz.edu.tr.

[2] Yildiz Technical University, Department of Electronics and Communications Engineering, Istanbul,Turkey.

[3] Yeni Medya Elektronik Yayıncılık LTD., Istanbul,Turkey. bal@yildiz.edu.tr.

Abstract: We have proposed a comparative study to evaluate the performance of text similarity based on window size for word co-occurrence. In general, co-occurrence matrices are constructed with certain length windows. The size of the window affects the performance of the text similarity accuracy. That's why, in this study, we have defined suitable size for word co-occurrence by analyzing the effect of the window size on the text similarity. The measure of semantic similarity is selected to evaluate the text similarity for two texts include news. The semantic similarity technique is based on co-occurrence matrix, the value of Term Frequency–Inverse Document Frequency (TF-IDF) of words, and cosine distance between the words. In the experiments, we have selected text couples belong to recent news and then, co-occurrence matrices have been constructed for each text by selecting various sizes of windows. For each size, the semantic similarity score and consumption time have been obtained and the most useful windows size is defined. According to the new windows size, semantic similarity technique is configured and the text similarity performance is finally evaluated.

Key words: text similarity, semantic similarity, character base, co-occurrence.

Introduction

Nowadays, with the development of internet infrastructure and the mobile technological progress a lot of people in the world, including people in Turkey, get their news from the internet. Sometimes, the news related to a particular event is reported in thousands of news websites in a similar content, while sometimes it is reported only in a few web pages. Text similarity methods are used to determine whether the reported news is the same or similar. There are many different methods for calculating the similarity rate of the two texts. One of such methods is a semantic similarity method (Huang, X., Zhang,V., & Chen, H. 2013). Classical text similarity algorithm uses vector space model and cosine strategy to measure the similarity between text, which ignores the relationship among terms (Song & Ma, 2010). In this study, the similarity between the two news reports published in the internet was calculated based on the semantic similarity method. One of the most important steps in this method is the formation of co-occurrence matrix. Since the word's co-occurrence context determines the word-sense, the context vectors, which are probabilistic distribution of co-occurrence context to the left and to the right of that word, are used to define the context (Chen, Youm 2002). Co-occurrence matrix expresses the semantic relationships in the text allowing us to determine the similarity between the two texts (Chen, Lu, 2011). Various studies have been conducted to evaluate the effects of the window size in texts of various lengths and written in different languages (Wandmacher, Ouchinnikova, & Alexandrov, 2008; Turney & Pantel, 2010; Hill, Kiela, & Korhonen, 2013; Walde, Mu'ller, & Roller, 2013; Kiela, & Clark, 2014). In this study, similarities in the news reports published in Turkish were determined by using the semantic similarity method and the created co-occurrence matrix was used to investigate the effects of the window size.

Materials and Method

In this study, the semantic similarity method was used to determine the similarity ratio of the two news reports. The first step of the method was to create the co-occurrence matrix. The number of unique words in the corpus was set as the fixed length and used to define a context vector, which calculates how many times certain words co-occurred with the current word in a defined window. Here, window size attained various values and affected the results. A small example for creating a co-occurrence matrix is shown below.
Corpus A B C A D A B E F D B A C D E

Windows Size (ws) is equal to 2. Unique words are A, B, C, D, E, F.

Ws=2	A	B	C	D	E	F
A	2	4	3	4	1	0
B	4	0	2	2	1	2
C	3	2	0	2	1	0
D	4	2	2	0	2	1
E	1	1	1	2	0	1
F	0	2	0	1	1	0

The establishment of the co-occurrence matrix is as follows. Locations of the unique words are determined, for example for "A" the location is1-4-6-12. Then, the window size (ws) is determined. If the ws = 2 the "A" word's co-occurrence with other words is monitored by the length of this window. For example, to determine the co-occurrence of "A" and "B" we need to investigate whether "B" is located 2 words before and after the location of "A", which is 1-4-6-12. Then, the co-occurrence value for "A" and "B" is written in the (A, B) position in the matrix. If the window size is increased, the matrix is created by evaluating the presence of "B" to the right and left of the same location within the new ws length value. The co-occurrence matrix created for Ws = 3 is shown below.

Ws=3	A	B	C	D	E	F
A	4	5	4	4	2	2
B	4	0	2	5	2	2
C	4	2	0	3	1	0
D	4	5	3	0	3	1
E	2	2	1	3	0	1
F	2	2	0	1	1	0

$$A = \begin{bmatrix} a_{11}\, a_{12} & \cdots & a_{1m} \\ \vdots & \ddots & \vdots \\ a_{m1}\, a_{m2} & \cdots & a_{mm} \end{bmatrix}$$

A describes the co-occurrence matrix, where a_{ij} $(1 \leq i, j \leq m)$ represents the co-occurrence frequency of term t_i and t_j in text 1, where t_i and t_j are ith and jth term of text1 as T_i.
All terms vote for the current term, if there exists a kind of co-occurrence relationship, the final weight from vote is defined as

$$\text{vote probability}_{ij} = \frac{a_{ij}}{\sum_{j=}^{m} a_{ij}}$$

Vote probability represents voting weight of term t_i and t_j. The term's weight is calculated by using TF-IDF and taking into consideration the relationship among terms, which is shown through voting weight. The improved approach of calculating term's weight for term t_i and t_j is defined as

$$W_{tj} = tf_{t_j} \times idf_{t_j} + \sum_{i=1}^{m} \text{vote probability}_{ij}$$

Furthermore, the semantic similarity between paragraphs is obtained by cosine strategy. Let $N = \max(m_i, m_j)$. The text vector, which has fewer terms, will be filled with zero. Then, the semantic similarity between text T_i and T_j is defined as

$$\text{Semantic Similarity}_{T_i \to T_j} = \frac{\sum_{s=1}^{N} W_{t1m_s} \times W_{t2m_s}}{\sqrt{\sum_{q=1}^{N} \left|W_{t1m_q}\right|^2} \times \sqrt{\sum_{q=1}^{N} \left|W_{t2m_q}\right|^2}}$$ (Huang et al, 2013)

Results

A pair of sample text used to test similarity is given below.

T_1 = "Yemen in Ebyen ilinde El Kaide ye yönelik hava operasyonunda 3'ü yönetici 55 örgüt üyesinin ölü ele geçirildiği bildirildi İçişleri Bakanlığı resmi internet sitesinde yer alan açıklamada dün ülkenin güneyindeki Ebyen ilinin El Mihved bölgesinde El Kaide ye ait eğitim kamplarına hava operasyonu düzenlendiği belirtildi El Kaide ye yönelikilk defa bu kadar geniş çaplı operasyon düzenlendiği aktarılan açıklamada örgüt yöneticilerinden Muhammed Salim Abdurrabu el Muşeybi Fevvaz Hüseyin el Mihrak ve Salih Said Mihrak'ın da aralarında bulunduğu 55 kişinin öldürüldüğü kaydedildi Açıklamada ayrıca saldırılarda hayatını kaybedenlerin kimlikleri ve uyruklarının belirlenmesi için çalışmaların devam ettiği bildirildi Yerel kaynaklar ise operasyonun ABD ye ait İHA lar ile yapıldığı bilgisini vermişti"

T_2 = "İçişleri Bakanlığı resmi internet sitesinde yer alan açıklamada dün ülkenin güneyindeki Ebyen ilinin El Mihved bölgesinde El Kaide ye ait eğitim kamplarına hava operasyonu düzenlendiği belirtildi El Kaide ye yönelik ilk defa bu kadar geniş çaplı operasyon düzenlendiği aktarılan açıklamada örgüt yöneticilerinden Muhammed Salim Abdurrabu el Muşeybi Fevvaz Hüseyin el Mihrak ve Salih Said Mihrak'ın da aralarında bulunduğu 55 kişinin öldürüldüğü kaydedildi Açıklamada ayrıca saldırılarda hayatını kaybedenlerin kimlikleri ve uyruklarının belirlenmesi için çalışmaların devam ettiği bildirildi Yerel kaynaklar ise operasyonun ABD ye ait İHA lar ile yapıldığı bilgisini vermişti"

The semantic similarity results for the above given news texts determined by using the window size values ws = [2,3,4,5,10,15,20,25,30] are shown in Table 1. Moreover, the graph created for texts' semantic similarity values according to changing ws value is shown in Figure 1

Table 1: The semantic similarity results of the two news reports according to ws value

Pairs of Text	Windows Size									
	1	2	3	4	5	10	15	20	25	Average
T1-T2	0,76	0,78	0,76	0,74	0,72	0,72	0,70	0,70	0,70	0,73
T3-T4	0,59	0,60	0,61	0,60	0,61	0,60	0,60	0,60	0,60	0,60
T5-T6	0,66	0,71	0,70	0,71	0,72	0,72	0,70	0,70	0,71	0,70
T7-T8	0,51	0,52	0,51	0,52	0,53	0,53	0,52	0,52	0,51	0,52
T9-T10	0,63	0,65	0,65	0,65	0,65	0,64	0,64	0,65	0,65	0,65

In Table 1, ws = 1 had the smallest values. Meanwhile, as can be seen in Figure 1 the ws values between 2 and 5 gave the best results. In the co-occurrence matrix created to find the semantic similarity between the texts, a change in ws reflected as 1-4% change in semantic similarity.

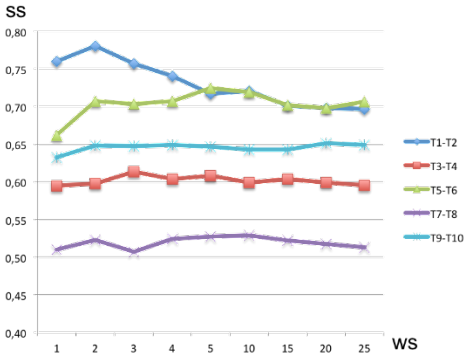

Figure 1: The graph of semantic similarity (ss) according to changing ws

The performance time based according to the varying ws in the above given news reports is shown Table 2. Moreover, Figure 2 depicts the texts' semantic similarity values and the performance time in seconds.

Table 2: The results of performance times based on ws values for given news reports

Pairs of Text	Windows Size									
	1	2	3	4	5	10	15	20	25	Average
T1-T2	0,98	0,92	1,20	1,48	1,73	3,08	4,30	5,37	6,33	2,82
T3-T4	4,02	5,65	7,46	9,20	10,96	19,76	28,25	36,28	44,88	18,50
T5-T6	2,02	2,65	3,46	4,29	5,06	9,07	12,81	16,41	19,84	8,40
T7-T8	4,75	6,63	8,73	10,84	13,12	23,08	33,12	42,61	52,01	21,65
T9-T10	7,55	10,33	13,80	17,11	20,18	36,53	52,22	57,77	63,11	30,96

The evaluation of the Table 2 revealed that increase in ws results in prolonged performance time. Moreover, increase in the number of words in the text has also prolonged the performance time. As can be seen in Figure 2, the performance time increased drastically after ws = 5. Based on these results, the optimal ws range in terms of performance time is between 1 and 5.

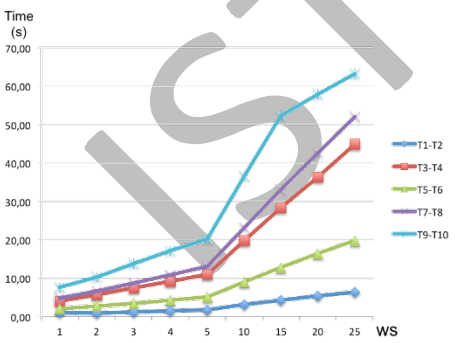

Figure 2: The graph of performance time according to varying ws.

The total number of words in the two news texts is shown in Table 3.

Table 3: The total number of words in two news texts

Pairs of Text	Total Word Number
T1-T2	184
T3-T4	542
T5-T6	355
T7-T8	561
T9-T10	743

Discussion

In a similar study, Hill et al. reported that smaller window size (ws) gives better results with concrete names. Meanwhile, the larger ws gave better results with abstract names. In a study conducted by Wald et al. with texts written in German large ws values lead to better results with German names and combined names. In the study of Wandmacher et al. also reported similar results. Kiel and Clark used ws 3,5,7,9 with full sentences and showed that change in the ws can affect the performance. They also reported that while small ws gave better results with large corpus, larger ws gave better results with small subspaced corpuses. In this study, the co-occurrence matrix was created with ws of 2,3,4,5,10,15,20,25 words on Turkish news text. This study has demonstrated that ws ≥ 5 gave significantly better results. When the ws was set to more than 5 the similarity values began to decline. In addition, the performance time was shorter for ws ≥ 5 compared to ws <5. Moreover, the performance time was determined to increase with every increase in ws value.

Conclusions

In this study, the semantic similarity method was used in determining the similarity of the news reports written in Turkish. The effects of the ws on the creation of the co-occurrence matrix, which is one of the most important steps of the semantic similarity method, were investigated. Significant results were obtained in this study with news texts of different word counts. The results obtained with smaller ws were better compared to results obtained with bigger ws. Moreover, small ws also resulted in faster performance times. Therefore, in the co-occurrence matrices ws impacts both the result and the performance time during the evaluation of the accuracy percentages of news texts written in Turkish.

Studies with larger group of texts can be performed in the future. Moreover, different language translations of the same news reports can be compared in terms of similarities and performances and studies on whether there are significant differences between those languages can also be conducted.

Acknowledgements

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A comparative study of Analytical Hierarchy Process and Ordinary Least Square methods for landslide susceptibility mapping using GIS technology

Sara Khodadad

Kongju National University, Gongju, South Korea
sara.kh80@kongju.ac.kr

Dong-Ho Jang

Kongju National University, Gongju, South Korea
gisrs@kongju.ac.kr

Abstract: This work presents Analytical Hierarchy Process (AHP) method available in Geographic Information System (GIS) to identify and classify the Penang Island according to the grade of present or potential danger of land failure happening. Landslide susceptibility zonation map has been generated by considering seven factors. Sensitivity analysis was performed in detail by varying the contributing factors weights and their effects on defined landslide susceptible locations.
In other part of the analysis, ordinary least square (OLS) technique has been used to estimate weights of point parameters then its result compared with AHP technique result. Finally, the landslide susceptibility maps resulted from AHP and OLS method has been compared to the landslide inventory map containing 355 real occurred landslides in order to verify the practicality of susceptibility maps. The outcome was that the 75% of occurred land failures fit into the very high and high susceptibility class of AHP map (using seven parameters), while this is 73.8% in the case of AHP with point parameters (using four parameters), and 65.8% for the OLS map. As conclusion, the AHP method yields reasonable results which make it reliable and credible approach in comparison with OLS, especially in the case of using large number of landslide contributing factors.

Key Words: GIS (Geographic Information System), Landslide, Susceptibility, AHP (Analytical Hierarchy Process), OLS (Ordinary Least Square), Sensitivity Analysis

Introduction

Landslide hazard resulted in loss of lives and extensive property damages, is the main problem of many countries. Since Penang Island in Malaysia country is the area which frequently experiences heavy rainfall and subsequently much landslide harm, it has been selected as suitable region to study landslide susceptibility (S. Lee & Pradhan, 2006). Tropical rainfall as triggering factor plus uncontrolled urbanization and deforestation play an effective role to aggravate slope destabilization in this island. In order to forecast and specify the region where future land failure is likely to happen, it is necessary to mapping the landslide prone areas (Althuwaynee, Pradhan, & Lee, 2012). Reliable and accurate landslide susceptibility map can be helpful for land planners, decision makers, and risk assessment.
Over the last few decades, Geographic Information System (GIS) has become a compulsory tool in landslide hazard and risk assessment, thus many landslide susceptibility maps have been produced using different GIS-based methods including the analytical hierarchy process (AHP), frequency ratio, bivariate, multivariate, Logistics regression, fuzzy logic, and artificial neural network (Matori, Basith, & Harahap, 2011). Although, all techniques have advantages, incomplete knowledge applied through qualitative methods makes the expert decisions inaccurate or wrong, and imprecise or inaccurate data have the similar impact in the case of using quantitative approaches (Vahidnia, Alesheikh, Alimohammadi, & Hosseinali, 2010). Therefore, the results from the different mixture of qualitative and

quantitative techniques, known as semi-quantitative approaches, which merge ranking and weighting, may be more credible (Ayalew & Yamagishi, 2005). The analytic hierarchy process (AHP) (Saaty, 1980), and analytic network process (ANP) (Saaty, 1999), weighted linear combination (WLC) (Ayalew, Yamagishi, & Ugawa, 2004), and fuzzy logic theory (Zadeh, 1965), are the examples of semi-quantitative techniques.
In this study the AHP and OLS methods have been chosen for making landslide susceptibility mapping. When AHP as popular and reliable method in landslide susceptibility mapping is integrated with GIS, it results in precise values for criteria. On the other hand, the ordinary least squares approach is considered as a basic prediction technique which is commonly used in various application fields. This method can be very quickly applied even to problems with hundreds of features and thousands of data points. However, linear models are not perfect since it is not reasonable to fit a simple line or planes to real world relationships. Although OLS has some weaknesses but it has been chosen for this research as a method to compare with AHP, because some distance factors have been discussed in this study are appropriate for OLS approach. Finally, it is noticeable that the quality and validity of landslide susceptibility zonation depend on the used methods and also the followed sampling strategies (Yilmaz, 2009). Thus, it is necessary to do comparative studies in order to find the best method for landslide susceptibility zonation (LSZ) mapping (Tien Bui, Pradhan, Lofman, Revhaug, & Dick, 2012).
In summery the results of this study suggest that the AHP method is the reliable method that can be used for landslide susceptibility mapping. And also, using more number of landslide contributing parameters increases the validation and reliability of susceptibility map.

Study Area

Penang Island is located in the west coast of Peninsular Malaysia. This Island with the area of 293 Sq.km is the fourth-largest in the Malaysia country and the most populated as well. It is located almost between the latitude of 5º15´N to 5º30´N and longitudes 100º10´E to 100º21´E. The altitude changes from 0 to 817 meters above sea level and slope degree varies from 0º to 61.598º. The climate is tropical and the mean value of annual rainfall varies from 2400 to 2700 mm. There are three main lithological formations in the study area; alluvium, granite and micro-granite (Pradhan & Youssef, 2009). The terrain is mainly represented by coastal plains, hills and mountains with much developed lowland areas.

Figure 1: Malaysia, Penang Island Map

Materials and Method

Since 1970ˮs, many researchers have applied GIS-based techniques to depict the spatial dispensation of landslide-prone areas. In general, all the models generated from all the methods rely on two assumptions: 1) future slope failures in a particular area will occur in the approximately same situation in which previous landslides have happened. 2) Casual factors that exist in GIS database can be utilized for evaluating the future landslides (Tangestani, 2009). Slope degree, distance to rivers, roads, and faults, lithology, land use/land cover, and precipitation are the causative factors considered in in this peoject based on availability, relevance, and scales.

Landslide causative factors
Slope

Since, the slope degree is straightly related to landslide, it is frequently applied in providing landslide susceptibility maps (Cevik & Topal, 2003; Dia, Lee, Li, & Xu, 2001; Lee, 2005; Yalcin, Reis, Aydinoglu, & Yomralioglu, 2011; Yalcin, 2008). Hence, the slope map of the study area was derived from digital elevation model (DEM) with a pixel size of 30 m by 30 m, and the terrain classified to five different zones according to the slope angle.

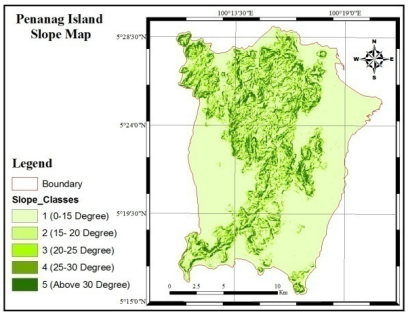


Figure 2: Penang Island Slope Map

Distance to Road

Constructing roads beside a slope results in some tensions, load decreasing on the slope heels, and landslide happening eventually (Ayalew & Yamagishi, 2005; Pachari, Gupta, Chander, 1998; Pourghasemi, Pradhan, & Gokceoglu, 2012). Therefore, the road proximity has been taken in account as a casual factor for landsliding. Road lines have been digitized from the hard copy of road network map that had been provided from Department of Survey and Mapping Malaysia (JUPEM), in the scale of 1:50,000. Then Euclidean Distance approach was applied to make different classes over the study area. The closest regions to the roads were classified to 5 zones based on the distance.

Distance to Rivers

Hydrological condition of the area or the saturation degree of the soil on slopes has been defined as a stability contributing parameter in landslide initiation in Penang Island. Water infiltration in soil, runoff, and groundwater flows were all happened under the hydrological circumstance (Thanh & De Smedt, 2011). Closeness of the slopes to river lines may affect its stability, because the proximity to rivers would activate the erosion process along the slope (Mancini, Ceppi, & Ritrovato, 2010). In this project five different zones have been buffered around river lines with 50 and 100 meters interval distance. The rivers map required for this part of the project had been provided from Department of Survey and Mapping Malaysia (JUPEM), in the scale of 1:50,000.

Lithology

Different lithological specifications of an area lead to different strength and penetrance of rocks. The soft copy of geological map in .pdf format and with the scale of 1:63,300, had been collected from Mineral and Geoscience Department of Malaysia. Then, it has been converted to IMAGINE Image format for further analysis in ArcGIS software. The lithology map was classified to three lithological units of Alluvium, Micro granite, and Granite.

Distance to Faults

The fractured rocks exist in faults form week zones that present favorable conditions for landslides. Landslides promotes in study area due to flow of water along fault planes and the erosion occurrence consequently. At first, the soft copy of geological map in .pdf format (scale 1:63,300) had been prepared from Mineral and Geoscience Department of Malaysia, and then converted to IMAGINE Image. The classified fault distance map has been extracted through Euclidean Distance method with 100 meter interval.

Land use/ Land cover

In this study the image of Penang Island has been downloaded from USGS website, clipped and prepared in ENVI 4.7 software and then classified to four classes of water bodies, clear land, vegetation, and urban area through Maximum Likelihood classification method. Finally converted to shapefile and exported to ArcGIS software.

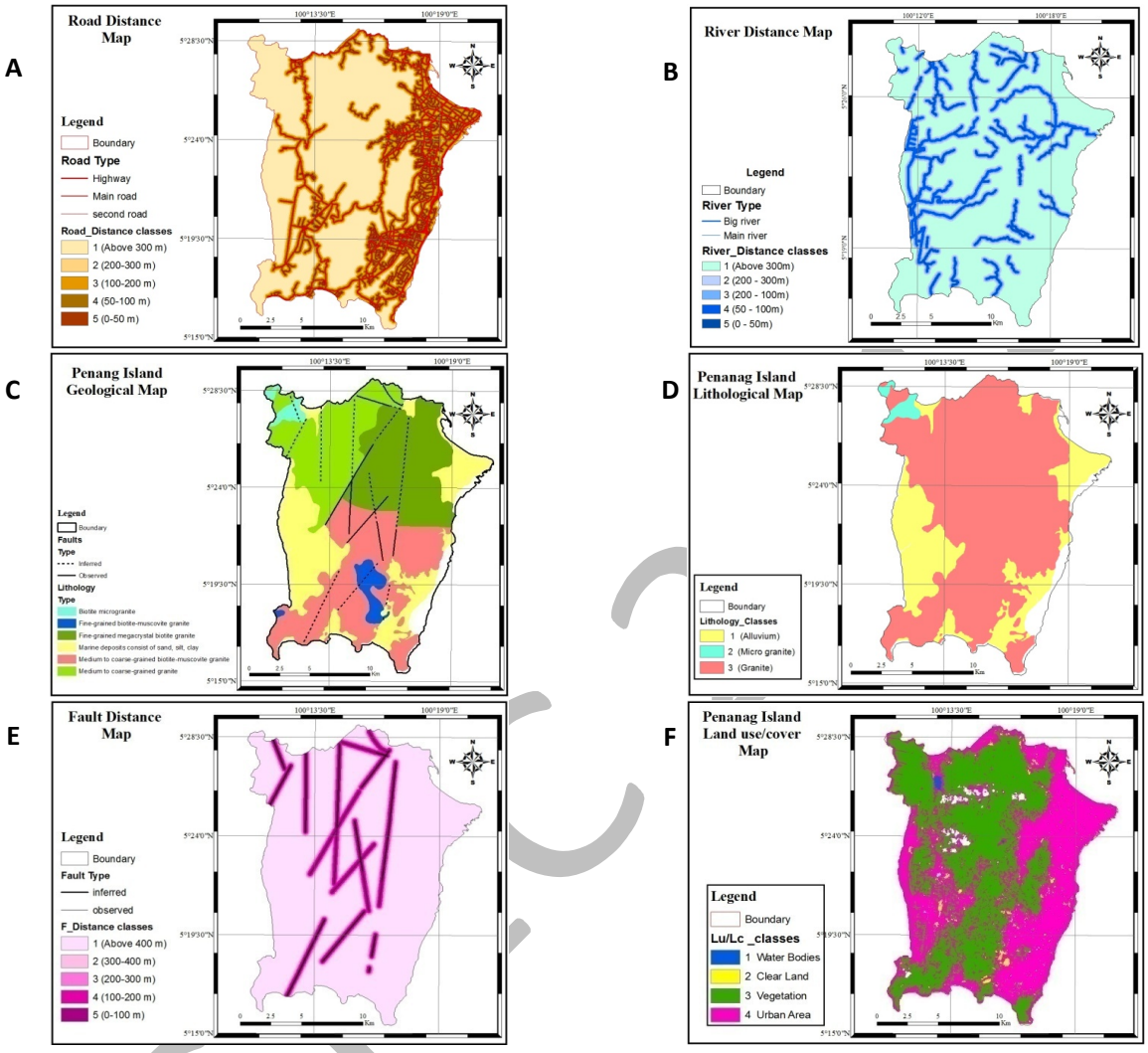


Figure 3: A) Road Distance Map, B) River Distance Map, C) Geological Map, D) Classified Lithological Map, E) Fault Distance Map, F) Land use/cover Map

Precipitation

Precipitation is initiation factor in landslide occurrence due to its major influence on runoff and pore water pressure. Total rainfall, short-term intensity, antecedent precipitation, and storm duration are the main rainfall measurements considered as effective factor in landslide initiation. Choosing from these factors for subsequent analyzing usually depends on rainfall records availability. In this study the average monthly rainfall data from three existing weather stations, was collected for the past ten years (2003 to 2012). The stations located in northwest, northeast, and southeast of Island have recorded the annual average rainfall of 2608 mm, 2677 mm, and 2381 mm respectively. An annual precipitation map of Penang Island was produced by Inverse Distance weighting (IDW) method over the three stations. This method is one of the spatial interpolation methods that are available in ArcGIS software spatial analyst tools.

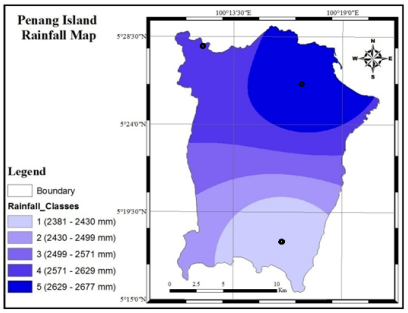


Figure 4: Rainfall Map of Penang Island

AHP analysis

AHP is widely applied in regional planning, resource allocation, routing modeling, suitability analysis, site selection, and landslide susceptibility analysis (Ayalew, Yamagishi, Marui, & Kanno, 2005). AHP uses pair-wise comparison to define weights or values for factors. Through pair-wise comparison each element compared to one another, and then the numerical weights are assigned to each factor due to their relative importance.
In this study the landslide causative parameters were put in sequence of importance. The relative importance of each parameter has been evaluated according to scientist researches especially for Penang Island (S. Lee & Pradhan, 2006; Oh & Pradhan, 2011; Pradhan, Lee, & Buchroithner, 2010). The following sequence indicates the priority of each parameter compare to others: Slope, Precipitation, Distance to roads, Distance to rivers, Land use/ Land cover, Lithology, Distance to faults. Then the preference matrix (Pair-wise comparison matrix) was created and AHP analysis was executed. Table 2 illustrates the weights calculated by AHP technique.

Sensitivity Analysis

Sensitivity analysis through simulation models helps researchers to specify the credibility of the result in cases where multi-criteria weights have been investigated (Abdullahi, Rodzi, & Pradhan, 2013; Chen, Yu, Shahbaz, & Xevi, 2009). It aims to identify the effects of changes in the inputs which are geographical data and the priorities on the outputs. If the changes do not result in significant effect on outputs, then the ranking is considered as robust and satisfactory. For this reason sensitivity analyses were performed to explore the response of the overall priority of landslide susceptible locations as alternatives to change in the relative synthesis value of each parameter. To perform sensitivity analysis three random points were chosen to act as alternatives.

Ordinary Least Square Technique

Ordinary least square method is used in order to investigate the relation of current landslides and defined criteria, such as high slope regions, areas with high road density, area with high river density and so on. By using this method the effect of various criteria on existing landslides were found, and the coefficients for each landslide occurrence parameter is shown in a table generated by OLS function (Table 2). These coefficients calculated by OLS, are based on the average distance between each happened landslides to parameters. For this reason, the point layers were created for landslide contributing factors. So, the land use/ land cover, lithology, and rainfall were eliminated, because point layers resulted from these factors were not reliable. Thus, the four independent factors used in OLS approach were slope, distance to road, river, and fault. The inventory map which had been produced by scientists through interpretation of aerial photographs, reports and field surveys, has been used for digitizing the location points of land failures occurred in Penang Island. Then the OLS measurements between existing landslides to road network density and rivers, high slope regions, and regions on faults were produced. Calculated coefficients of each parameter has been normalized and converted to Satty scale in order to apply in ArcGIS software (Table 2).

Table 1: Aggregate pair-wise comparison

	Slope	Rainfall	D-Road	D-River	LU/LC	Litho	D-Fault	**Weight**
Slope	1	2	3	3.5	4	5	5	**0.3419**
Rainfall	0.5	1	2	2.5	3	4	4	**0.2254**
D-Road	0.3333	0.5	1	1.5	2	2.5	3	**0.1368**
D-River	0.2857	0.4	0.6667	1	2	3	3	**0.1204**
LU/LC	0.25	0.3333	0.5	0.5	1	1	1.5	**0.0689**
Litho	0.2	0.25	0.4	0.3333	1	1	1	**0.0555**
D-Fault	0.2	0.25	0.3333	0.3333	0.6667	1	1	**0.051**
CR	0.0146							

Table 2: Ordinary Least Square calculation

Parameters	Coefficients	Normalized Coef	Saaty's Scale
Distance to Slope	-0.018677	1	9
Distance to Road	-0.01182	0.632864	6
Distance to River	0.006463	0.3460406	3
Distance to Fault	-0.000838	0.0447074	1

Validation

Validation of landslide susceptibility maps was an absolutely essential component in this study. Without a validation, the maps are useless and have no value. For this reason, landslide inventory map which shows the previous landslide locations, were used to validate the landslide susceptibility maps. In order to verify the output maps, they were first converted to vector format then overlaid with the landslide inventory map by means of GIS software. From attribute table, the number of previous landslides that fell into each class of susceptibility was calculated easily. This procedure was done for three susceptibility maps generated in this research.

Result and Discussion

In first part of the research, AHP method was applied using seven factors. Figure 5 shows the output map. Sensitivity analysis was performed by Expert choice software. Figure 6A illustrates the numerical original condition of parameters and alternatives in Dynamic graph of Expert Choice software. Point 1 is 42.1% susceptible, point 2 is 30.7% and point 3 is 27.2% susceptible, with slope, rainfall, distance to road, distance to river, land use/cover, lithology, and distance to fault criteria priorities of 34.2% , 22.5% , 13.7%, 12%, 6.9%, 5.6%, and 5.1% respectively. As shown in figure 6 B, C, D, E, F, G, and H, the priority of each criterion is increased up to 50%; while susceptibility and priority of alternatives (locations) does not change significantly.

In another part of the research, the weights calculated by OLS approach for four factors were used to make landslide susceptibility map (Figure 7A). In order to do practical comparison between AHP and OLS, a landslide susceptibility map has been made by AHP with the same factors used in OLS approach (Figure 7B). According to the validation result summarized in table 4, 75% of occurred land failures fit into the very high and high susceptibility class of AHP map (using seven parameters), while this is 73.8% in the case of AHP with point parameters, and 65.8% for the OLS map. The weakness of OLS technique is that, only point parameters can be evaluated, because the evaluation of criteria by this technique is based on average distance of point parameters (as independent variable) to existing landslides (as dependent variable). However, the aim of performing this technique was to make challenge for AHP weighting technique with other approaches.

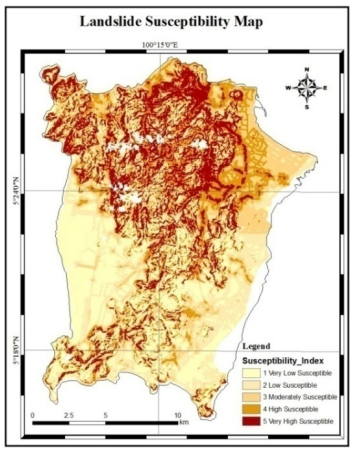
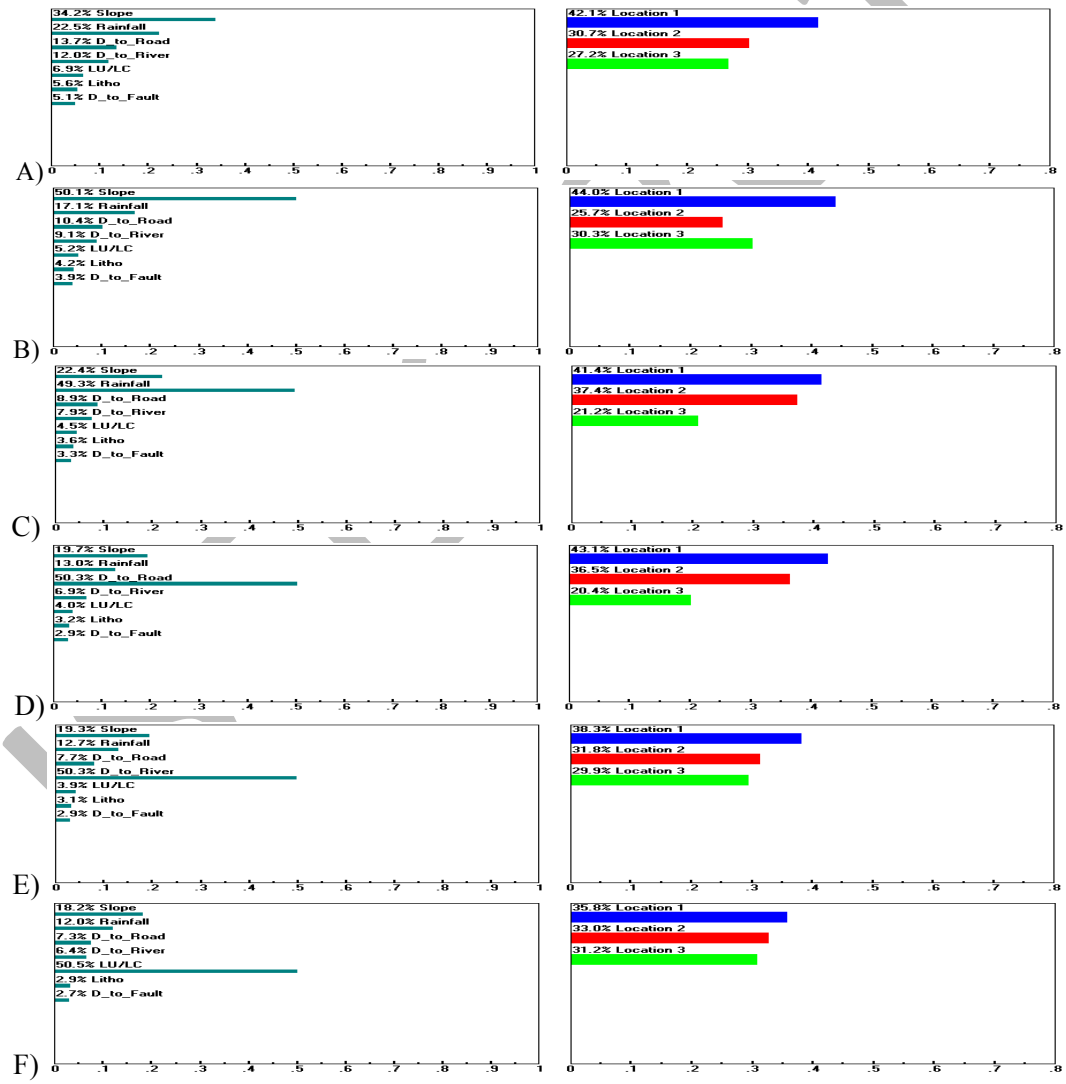


Figure 5: Landslide Susceptibility Map generated by AHP method



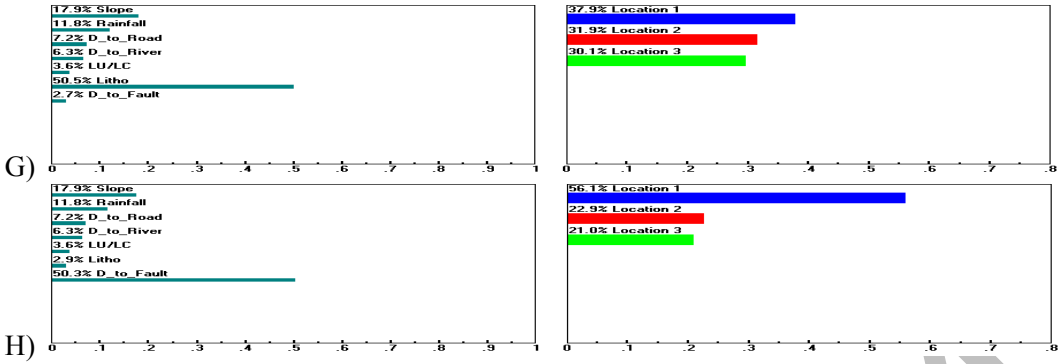


Figure 6: Numerical assessment of sensitivity analysis (Dynamic graph), A) Present condition

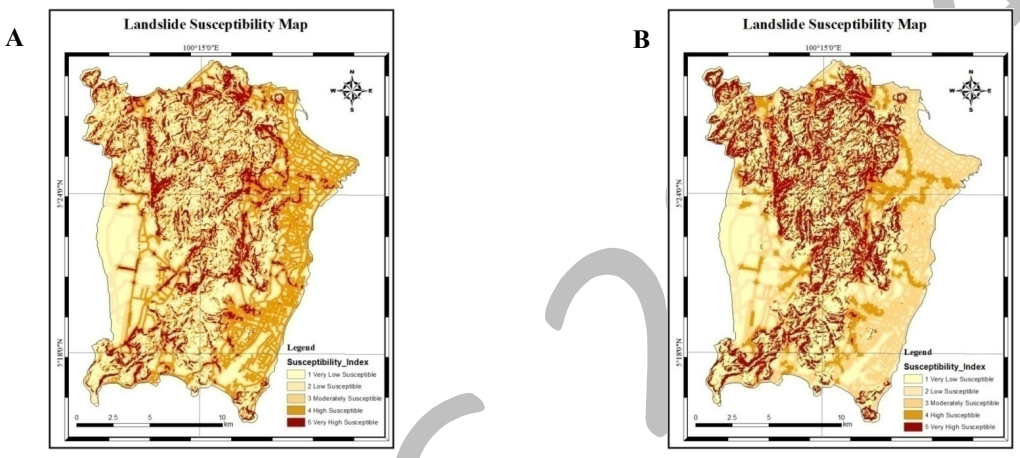


Figure 7: A) Landslide Susceptibility Map generated by OLS scales, B) Landslide Susceptibility Map resulted from AHP using four factors

Table 4: Comparison of different susceptibility map

	Past occurred landslides fall into Very High Susceptibility class		Past occurred landslides fall into High Susceptibility class		Past occurred landslides fall into Moderate Susceptibility class		Past occurred landslides fall into Low susceptibility class		Past occurred landslides fall into Very Low susceptible class	
	%	count	%	count	%	count	%	count	%	Count
AHP (seven parameters)	53.5%	187	21.5%	75	15.4%	54	6.8%	24	2.8%	10
AHP(point parameters)	52%	185	21.8%	77	6.9%	25	13.3%	47	6%	21
OLS	44.3%	157	21.5%	76	14.6%	52	13.6%	49	6%	21

Conclusion

As conclusion the AHP method is the reliable method that can be used for landslide susceptibility mapping. And also, using more number of parameters contributing in landslide happening, increase the validation and reliability of

susceptibility map. For comparing the results from OLS and AHP using same parameters (four parameters), AHP shows the better result in very high susceptible class (52%) , but from low susceptible to moderate class, the number of landslide decreases from 21.8% to 9.6% which shows the invalid result. Actually this problem may be solved by considering more number of factors in landslide susceptibility analysis, like what has been done in the first part of the study applying AHP Using seven factors.

Sensitivity analysis was done to evaluate the overall priority of the parameters or objectives. Results of sensitivity analysis for first part of research were acceptable and showed that by changing the degree of preferences for each objective or factor, no significant changes has been occurred on alternatives.

Acknowledgement

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A numerical study on the cooling performance optimization of a water purifier with an ice thermal storage

Kang Wook Lee, Jooseong Lee, Dong Soo Jang, Kang Sub Song, Yongchan Kim*†

Graduate School of Mechanical Engineering, Korea University, Seoul 136-713, Republic of Korea
sinki6@naver.com

*Department of Mechanical Engineering, Korea University, Seoul 136-713, Republic of Korea
yongckim@korea.ac.kr

Abstract: A simplified numerical model was developed to investigate the optimum cooling performance of a water purifier. The system consisted of a vapor-compression cycle for the water cooling, and an ice storage tank. The numerical model was validated by comparing the predictions with the measured data for the water purifier system. The cooling performance characteristics of the water purifier were analyzed with the variation of cooling coil length and bypass ratio in the extraction water. The simulation results showed that the extraction water temperature in the cooling coil and the coolant temperature in the thermal storage tank increased with extraction time because of the continuous heat absorption in the thermal storage tank. The optimum cooling coil length and the bypass ratio were 2.8 m and 0.1, respectively. The mean extraction temperature was the lowest at the optimum cooling coil length, and the final extraction temperature was the lowest at the optimum by pass ratio.

Key words: Refrigeration cycle, Ice storage system, Extraction temperature, Water purifier

Introduction

As interest in compact home appliance has been increasing, many researches are conducted to reduce size of household water purifier. Conventional water purifier cools the edible water directly with the refrigeration cycle. But this refrigerating method leads to size issue because volume of water tank directly related to water capacity. By applyi-

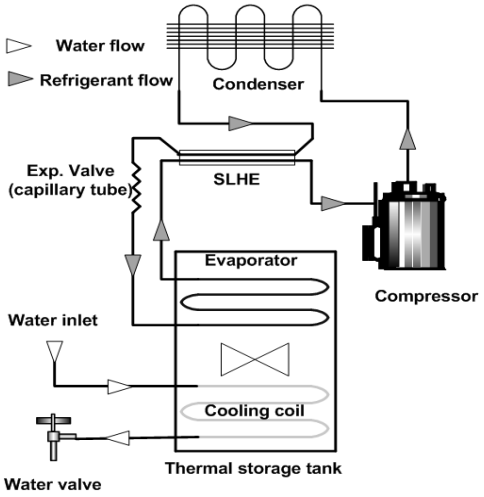


Figure 1: Schematic of water cooler with ice storage system

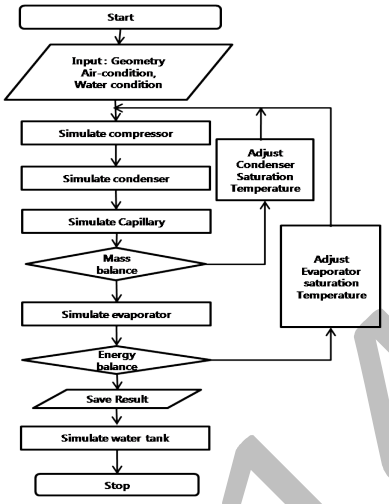


Figure 2: Flow chart of the cycle simulation

ng ice thermal storage system to a water purifier, it is possible to obtain a required amount of cooled water with smaller size of a water tank compared to conventional water purifier. Figure 1 shows schematic structure of water purifier. The system consisted of a R600a vapor-compression cycle with an ice thermal storage tank. The Edible water is cooled while passing the cooling coil in the ice thermal storage tank. Park et al. showed the performance of the refrigeration system by applying the alternative refrigerant R430A (Park K., 2009). Lee et al. reported the decrease in energy consumption by using water-cooled condenser instead of air-cooled condenser (Jeon Y., 2012).
In this study, simulation program is developed to analyze the system of the water purifier and then bypass control is proposed to reduce final extraction temperature of the cooling coil.

Simulation model

The simulation program was developed to analyze the refrigeration cycle with an ice thermal storage tank. The program was developed based on the study of heat pump modeling at ORNL (Fisher S., 1983). Figure 2 shows a flowchart of the simulation program. Initially, pressure of condenser, evaporator and superheat is assumed and then the simulation was conducted orderly for the compressor, the condenser and the capillary tube. The calculation was iterated by changing pressures until the mass flow rate of refrigerant and the enthalpy at compressor inlet are in convergence. The compressor modeling is based on map-based modeling. The related equation of the mass flow rate and the input power are presented in Eq. (1) and (2). The empirical correlation presented by Li and Wen was used for the simulation of the capillary tube (Li Y., 2007). Heat exchangers were analyzed by the tube by tube method, which divided the heat exchanger tube into multiple N segments, and each segment was treated as a single heat exchanger. For each segment of heat exchangers, the heat transfer was calculated by the ε-NTU method.

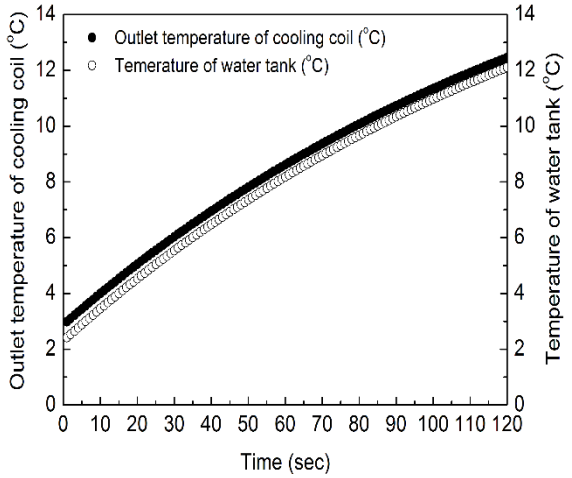
$$W_{map} = a_1 + a_2 T_e + a_3 T_c + a_4 T_e^2 + a_5 T_e T_c + a_6 T_c^2 + a_7 T_e T_c^2 + a_8 T_e T_c^2 + a_9 T_e^3 + a_{10} T_c^3 \quad (1)$$

$$\dot{m}_{map} = b_1 + b_2 T_e + b_3 T_c + b_4 T_e^2 + b_5 T_e T_c + b_6 T_c^2 + b_7 T_e T_c^2 + b_8 T_e T_c^2 + b_9 T_e^3 + b_{10} T_c^3 \quad (2)$$

Simulation results

Figure 3 shows the extraction water temperature with extraction time. The extraction water temperature in the cooling coil and the coolant temperature in the thermal storage tank increased with extraction time because of the continuous heat absorption in the thermal storage tank.

In order to reduce final extraction temperature, it is necessary to delay heat absorption in the thermal storage tank. Specific portion of the supplied water detoured ice storage tank until the extraction temperature of the cooling coil



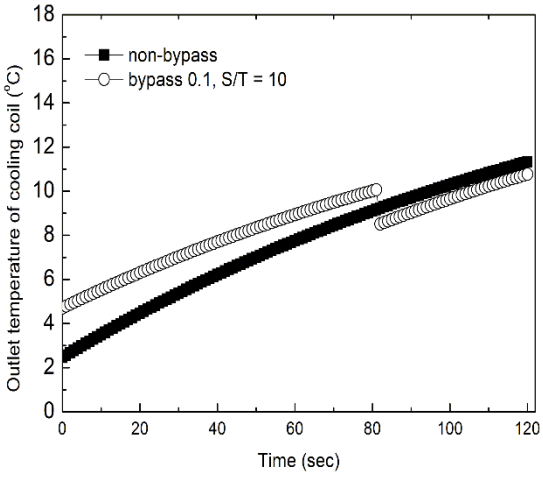


Figure 3: Extraction temperature of cooling coil

Figure 4: Extraction temperature of cooling coil

with bypass control reached the set temperature. Figure 4 shows the extraction temperature with extraction time with bypass ratio of 0.1 and 10℃ set temperature. Compared the water purifier with non-bypass control, the initial extraction temperature increased and the final extraction temperature decreased.

Conclusions

The simulation model of the refrigeration cycle for a water purifier, with ice thermal storage tank was developed. The model for a reciprocating type compressor was developed based on the map-based model, the heat exchangers were modeled based on the tube-by-tube method, and an empirical correlation was used for the simulation of the capillary tube. Based on the developed program, the extraction water temperature of water purifier with time was calculated. As a result, the extraction temperature and the coolant temperature was increased with time. But increment of extraction temperature was decreased with the bypass control, which leads to decrease of the final extraction temperature.

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Accounting in the cloud computing

Elzbieta Wyslocka, Dorota Jelonek

Czestochowa University of Technology, Faculty of Management, Poland
wyslocka@zim.pcz.pl; dorota.m.jelonek@gmail.com

Abstract The paper widely discusses not only threats and barriers, which are associated with the new model of cloud computing. It covers the benefits and prospects for the development of enterprises and all kinds of services inherent in using the cloud computing model. The results of a survey conducted among Polish entrepreneurs operating in the province of Silesia on the knowledge of the concept of cloud computing, the potential of the business model have been analyzed, discussed and compared with published results of previous studies. It has been noted that the use of cloud computing, also in the area of accounting reduces overall IT management costs, and allows large-scale consolidation and optimization of the use of hardware and software resources. It can level the competitive field, by making a large-scale computational resources available to small businesses and other organizations, which would not be able to afford adequate infrastructure otherwise. This trend represents also the ability to equal opportunities in the macro-scale, which means emerging economies, at least for those regions that have created a sufficiently reliable and fast broadband infrastructure.

Key words: Cloud computing, accounting, SME business.

Introduction

Cloud computing is a new model of computation that can bring significant benefits to consumers, businesses and government, creating new threats and challenges. "In the cloud" data processing came to be called a model of the IT systems in which the server installation location does not matter. "Cloud computing" model can be simply defined as the storage, processing and use of data to be accessed over the Internet, on a different location computers. This means that users can request to have almost unlimited computing power that do not require significant capital investment in order to meet their needs and that they can access their data from any location where they are connected to the Internet

This is the Internet which was one of the major factors influencing the fact that globalization of economic processes leading to the integration but also interdependence of countries, societies, economies, characterized by, inter alia, the flow of goods, capital and labor on a global scale is an irreversible process. Also, the internationalization of economic processes and internationalization of enterprises are already a fact. Globalization covers all areas of economic life, but the most advanced is in the area of financial markets. Along with widening of globalization and internationalization the range of users of financial information and their information needs. Taking this into account, knowledge of accounting systems existing in different countries, in particular the differences and similarities between these systems and the directions of their development gains significance. Globalization of the economy and the development of civilization undoubtedly contributed to the processes of harmonization and standardization of accounting. The advantages and tangible benefits from the use of international standards, meant that they enjoy more and more recognition around the world, which is reflected in their direct implementation in

national accounting, in such countries as China, Russia, Ukraine and African countries, or the use of selected standards under the modified national regulations, such as in Poland, the Czech Republic or so-called old EU countries.Convergence of national solutions and IFRS took place in South Africa, Japan, Israel, Malaysia, Latin America, especially in Mexico and Brazil. This progressive internationalization of business, integration within the European Union and the creation of international financial organizations forced somehow need to create a uniform system of accounting standards, which would be based on clear and explicit rules that ensured comparability of used solutions and comparability of financial statements prepared in accordance with them at the national and transnational level.

Accounting "in the cloud" is a relatively new phenomenon. Accounting is a field rather conservative and one of the last subjected to modern IT and technological. With the introduction of new solutions in recent years, it turned out that the concept of building own data center is not always effective. Moreover, in the era of globalization and performance of transnational availability of current financial information from anywhere in the world and at any time becomes a necessity. Processing of data on costs, revenues, sales, corporate finance in the cloud enables access to such data limited only by access privileges independently of place and time.

In the recent years, both in Europe and in the world a number of studies such as the effects and extent of implementation of the cloud computing model in enterprises, areas in which it is used, the protection of consumers in the EU and the use of digital services in the EU to ensure a single market have been prepared.

Model of data processing in the cloud - risks and benefits

The World Wide Web provides access to information for all and everywhere, and thanks to cloud computing, computing power is available for everyone and everywhere. Cloud computing, as the Internet network, is the result of an ongoing for some time technological development, which will continue to proceed. In contrast to the Internet, cloud computing is still in a relatively early stage of development. Bearing in mind the rapid implementation of cloud computing in the European Union, it becomes extremely important to adopt new legal framework for data protection and develop uniform standards governing their processing, which is necessary to increase the safety of the provision of this service.

Cloud computing can be seen as a form of reproduction of power and the flexibility to use various forms of outsourcing by companies or organizations. Data processing service in the "cloud" can handle all types of business applications and services, including a full range of business needs. In addition, this service allows businesses to introduce quickly new products to the market, through more effective cooperation, including international partners, as well as the availability of advanced, low-cost computing resources. Business processes run in the cloud allow for close cooperation between many different providers and increase the possibility of cooperation and access to information between different companies within the same organization, which promotes the internationalization of economic activity.

Cloud computing can produce savings and facilitate innovative web services. However, it turns out that the implementation of a wide range of use of cloud computing faces a variety of barriers. The basic condition for exploiting benefits of cloud computing activities, not only for the single market of the European Union, is to fill the gaps in the legal provisions related to the cloud. Main points are to improve conditions for users, solving security-related problems of stakeholders, to encourage the public sector to benefit from the cloud and to support further research and development in cloud computing (Directorate-General for International Policies, 2012).

One of the barriers is the fear of users whether stored and transmitted data in the cloud will not be used or disclosed in unexpected ways. This aspect is one of the fundamental considerations by business owners who want to take advantage of new solutions. Data transmission within a LAN (Local Area Network) gave business owners confidence that their interception by unauthorized persons is minimal and depends only on the level of security on its own network. When moving data across virtual servers, we have to rely on adequate collateral public network and server units service provider. Enterprises and consumers need to be confident and reassured by service providers with complete security of their data. There must be an appropriate high level of confidence on the supplier - recipient line in the field of risk management skills, backed up by the use of cutting-edge solutions in the field of cybersecurity.

Considering the technical point of storing data in the computing cloud, it is worth saying that they are accessible from any computer connected to the network. In addition, in the case of public cloud, are stored together

with the data of other clients. Although each user has individual access channels to prevent its data being spied by other recipients, but the fact itself of storing data in the same infrastructure can be worrying. Concern may also result from the fact that we entrust our resources to an unfamiliar company, which admittedly provides the maximum level of security, but against external users. The provider, if he wants, can easily browse our data.[1] National systems of protection of privacy should be predictable, transparent and avoid unnecessary burdensome registration requirements for data and cross-border data transfers for service providers, such as the cloud. Cloud Providers should be encouraged to establish a privacy policy, appropriate for this type of service and the business model they use. Another barrier to wide popularization of cloud computing is the fight against cybercrime, which usually manifests itself in the form of theft of money, goods, programs, data. Computers are also used in the so-called technological or economic espionage. There must be clear and precise legal provisions allowing the fight against criminals in the network, as in the real world. Effective enforcement mechanisms in this field should be ensured.

The problem is the lack of appropriate legislation in individual countries, which are the seats of companies providing cloud computing services, or are transit countries for data transmission. This creates conditions for the development of cybercrime[2].

Area for better regulation in connection with the implementation of a wide range of CC is the protection of intellectual property. The pace of development of services, applications available in the cloud, will depend on providing legal protection to owners and authors of these solutions. Among the countries surveyed by the BSA, the worst results are noted in Brazil and the best in Australia.

A separate issue is the free transfer of data and adaptation of international regulations in this regard. It should be possible for users to move data between different cloud providers, which require both the suppliers and governments to cooperate between each other in the field of data transmission. There is a need to develop standards, such as those already existing in transmission of image and sound.

Implementation of cloud computing in companies requires access to broadband Internet. The exchange of data is so large that the usual links operating in asynchronous ADSL (Asymmetric Digital Subscriber Line) can cause delays in the transmission of packets, which in turn will adversely affect the functioning of the company, which depends on information stored hundreds or thousands of kilometers from the place of running a business. Therefore, successful implementation of cloud computing depends essentially on building the necessary infrastructure networks and eliminate unstable work of network connections (Kobis, 2013).

Software solutions used by companies often come from different suppliers. During the migration to the Cloud Computing model it may well be that particular application is not available in the cloud, or is available in the cloud of another service provider. There may be a need to provide mechanisms for ensuring cooperation between programs or between clouds. These solutions can be very costly, and in some cases impossible to achieve. Although companies offering clouds are doing everything to ensure maximum usability, but it is remembered that, this method of supplying solutions is still in the development phase.

By their nature, cloud computing works across the countries' borders, and the success of its services depends on access to regional and global markets. It should promote trade in computer network, allowing for the sale and purchase of products regardless of the physical location of production and distribution. The promotion of "free trade".

As one can see, there are several problems that must be solved in order to use the model of cloud computing, which, however, has many advantages. By using this solution, users can request to have almost unlimited computing power, they do not require significant capital investment (computer equipment, servers) in order to achieve their needs and can access their data from any location where they are connected to the Internet. With cloud computing costs for users of information technology (IT) can be reduced and the development of many new services is possible. The use of cloud computing means that even the smallest businesses can reach out to larger markets and governments can increase the attractiveness and effectiveness of their services while reducing expenses.

[1] The Business Software Alliance (BSA) Global Cloud Computing Scorecard ranks 24 countries based on seven policy categories that measure the countries' preparedness to support the growth of cloud computing. Together, these countries account for 80 percent of the global ICT market According to this study, rules introduced in Korea provide the best data protection and the worst – in South Africa. Also, in this regard, there is no relevant data protection legislation in China, India, Indonesia and Singapore.

[2] Research conducted by BSA shows that a model system to combat cyber crime can be found in such countries as Japan, Germany, France and South Africa not included in the chart, which achieved 9.8 points. Poland in the statement is in an overall sixth place. Also in this category, Brazil occupies the last place among the 24 countries surveyed-1.6 out of 10

Kobis (2013) among the opportunities and benefits for companies in the Cloud Computing implementation lists:

No need to invest in their own IT infrastructure - this advantage relates primarily to companies that only build their infrastructure. For companies that already have their own IT infrastructure, moral aging of infrastructure is a motivation to transfer resources in the cloud. Cloud computing provides always the latest available solutions.

Scalability and Performance solutions - is related to the daily operation of the company. Software manufacturers argue that traditional infrastructure companies is used to a small extent - between 15 and 20 percent. In contrast, cloud is a solution that maximizes the use of resources, increasing it up to 90 percent. In the case of clouds, the customer decides what computing power he needs in a given period, paying only for the actual utilization.

Independence from the physical device and place of residence - in traditional solutions, where applications are installed on workstations, work is closely connected with certain physical computer. In the case of cloud computing there is a possibility of employing the so-called mobile workers.

Resistance to hazards (safety and reliability) - Cloud Computing uses redundant servers and backup all your data to enable continuous availability and reliability. The system has the ability to automatically and immediately switch back up your data as primary and start the service on the other, efficient servers.

Savings staff - having your own IT infrastructure combined with the employment of highly qualified specialists managing and monitoring the work of individual departments. When you move to a cloud computing infrastructure, the responsibility for ensuring access to services is on the supply side. This enables a significant reduction in IT staff.

The adoption of cloud computing in all sectors of the economy may help to reduce the costs associated with information and communication technologies and, in conjunction with the new digital practices within the business, can improve the productivity, growth and employment (Kretschmer, 2012). The European Union has taken actions to encourage all interested parties to participate in the implementation of these actions. This could mean additional, direct expenditure of € 45 billion for the model of cloud computing in the EU in 2020, as well as the overall total impact on GDP of EUR 957 billion and the creation of 3.8 million jobs by 2020 (International Data Corporation, 2012).

The solution of specific problems associated with cloud computing would mean faster and better harmonized adoption of this technology by enterprises, as well as organizations and public authorities in Europe. This will lead to contributing to the demand for accelerated productivity growth and increased competitiveness of the economy and, on the supply side, the broader market in which Europe becomes a key partner in the international dimension. Thus, the European ICT sector can benefit from the introduction of important new features. Under appropriate conditions, the traditional strengths of Europe in the field of telecommunications equipment, networks and services can be a very effective use of the cloud infrastructure. In addition, the large and small European application developers could benefit from the growing demand (European Economic and Social Committee and the Committee of the Regions. 2012).

Kovachev, Cao, and Klamm (2011) point out in their research on cloud computing in mobile applications. In order to better understand how to facilitate the building of mobile applications based on the cloud, they pursue work in the field of mobile computing through the prism of principles of cloud computing, which can help to build a more advanced mobile applications.

Cloud computing market is growing rapidly in Poland. According to the International Data Corporation (IDC) report "Poland's Cloud Services Market 2011-2015 Forecast and 2010 Competitive Analysis" in 2010, the value of the cloud computing market in Poland, covering both private cloud and public accounted for nearly 7% of the total IT outsourcing market is estimated at more than $ 520 million. At the same time processing in the cloud computing is the fastest growing part of the Information and Communications Technology (ICT) market. Projected average annual growth rate for 2015 is at 33 %. It turned out, however, that these predictions were too optimistic. Although the cloud is extensively promoted and the offer in this regards is growing fast, Polish companies are not as enthusiastic towards the clouds as expected. Therefore, a lower growth rate of the cloud computing market has to be accepted. In the current year among IT spending in Poland, the traditional model of purchasing will still dominate, while spending on cloud model will account for only a fraction of expenditures (International Data Corporation 2011).

Poland has one of the most comprehensive systems of intellectual property protection. However, there are minor deficiencies in the process of enforcement. The legal system in Poland has provisions governing the protection of privacy, electronic signature, electronic commerce and cybercrime. Poland promotes innovation and interoperability. The Achilles heel of the exchange of digital services in Poland is still poor access to broadband network. A functioning, comprehensive strategy would ensure the improvement of the availability of high-speed

Internet. The best situation in this area can be observed in urban areas, where thanks to a large extent to the acquisition of EU funds, the rate is at a good level. The situation in most rural areas is far below the European average. Cloud computing has significant economic potential. Enterprises benefiting from this form of services can reduce overall costs of operating systems, and also derive substantial profits from innovation adoption of new organizational processes that increase productivity. A survey conducted in 2011 on behalf of the European Commission by IDC among companies that use cloud computing shows that the savings associated with this amounted to an average of 10-20 % of the cost of IT. Among 36 % of the surveyed companies use of cloud computing has generated savings of 20% or higher in IT spending (European Economic and Social Committee and the Committee of the Regions, 2012)http://pl.wikipedia.org/wiki/Chmura_obliczeniowa - cite_note-5.

Adoption of developed in the European Union strategy "Unleashing the Potential of Cloud Computing in Europe" is designed to create in effect of 2.5 million new jobs in European countries and impact of € 160 billion to EU GDP annual (about 1%) in 2020 (European Economic and Social Committee and the Committee of the Regions, 2012).

Internet and globalization

It is known that the Internet is a challenge for traditional theories of regulatory and governmental practices. This is mainly due to blurring of concepts such as territory or sectors. Nevertheless, when we consider the future of the Internet, we see even greater challenges ahead, with many questions about privacy, security and Internet governance. It is also the moment to initiate a global discussion on the better, more efficient and more commonly used in business Internet. All these issues concerning the future of the Internet are crucial for Europe and the rest of the world. The European Union has every right to be a key player involved in deciding the future of the Internet.

The Internet is the basis for the whole economy in a growing part of the world. ICT contributed to 40% of overall productivity growth in the economy in 1994-2004. The network effect enables acceleration and global diffusion of innovation. Subsequent changes in the economy, as well as in the lives of the citizens were remarkable. The variety and multitude of applications and business models supported by the Internet also largely affects its nature and structure (Internet traffic increases by 60% per year). You could say that the Internet infrastructure has become mature and exhausted its innovation and growth potential. We are at the beginning of a new phase of the Internet, which will drive innovation and growth. However, you have to think about what to do to unleash this potential, which is even more necessary in times of economic downturn. To get out of the economic crisis, we need to encourage stable and sustainable growth of business in the goods and services that respond to the real needs of the market with high value. Europe needs to make full use of the economic potential of a single market, which is still locked in fragmented national markets. Internet-based services should be used primarily, because their nature has a cross-border dimension (Reding, 2009).

The global nature of today's marketplace requires active participants in the internationalized business. Historically, companies compete with each other on the plane up to two performance goals, such as price and quality. However, competition in existing markets is not limited only to control of demand through price and quality but also the flexibility and speed of response. Therefore, today's organizations must compete against all the competing goals.

Economic globalization and internationalization are key factors for integrating suppliers, partners and customers within and outside the country, and the goal is to achieve integrated supply chains. This can help in the implementation of technology and information systems such as enterprise resource planning (ERP). Yusuf, Gunasekaran and Abthorpe (2004) studied the cases of successful and unsuccessful implementations of technology and information systems in order to achieve a coordinated and integrated supply chain. They found that the causes of failures are often associated with poor management of the implementation process. The emergence of various information technologies such as the Internet, electronic data interchange (EDI) and Web facilitate achievement of an integrated supply chain, which allows for flexibility and rapid response to changing market requirements.

Business processes in the cloud allow to combine a number of different suppliers and increasing cooperation between different departments of the same organization. Lack of adequate infrastructure in place is irrelevant (including emerging economies in macro scale, at least for those regions that are sufficiently reliable and have fast broadband infrastructure).

Accounting in the cloud

Accounting for many centuries has been considered a discipline that did not give up fashions, and changes were introduced very carefully and in an evolutionary way. Prudent approach to changes contributed to ensure the stability of the accounting system and the ability to perform the basic function of which is to provide information to help the settlement of the ongoing management of their activities. In recent years, the pace of development accelerated accounting. Harmonization processes tend to be replaced by processes of standardization on a global scale. The current changes in accounting represent a rapidly advancing standardization processes rather than harmonization. Critics of the current processes of standardization propose a different solution, involving the harmonious co-existence of many (few) sets of standards and allowing the market to decide when and what standards should be used to prepare the financial statements. In the process of harmonization in the sense one can not talk about the process of approaching a single, universally accepted set of standards (Dobija, 2009).

The milestones of technological progress were virtual solutions such as the development of the Internet. An important element is to increase awareness among entrepreneurs' advantages of outsourcing, or outsourcing of certain services to external partners also in the field of accounting. Accounting will also be aimed in the direction of the "in the cloud" data. Systems available on the network will enable it - the world is excited about a system xero.com service that provides on-line accounting, and in Poland virtual mKsiegowa.pl. The factors reinforcing this trend will be publicly available service on the Internet and the integration of accounting systems with those services. One of the more advanced services system of this type is eDeklaracje. Submission of tax returns via the Internet will not only be more and more popular, but also will become easier. Instead of manually filling out a PDF form, accounting software will be equipped with the module sending it online.

An important issue is the integration in the area of payments. It is about not only downloading bank statements, but also direct integration with online payment systems. There are no obstacles to record electronic payments automatically. Associating payments taken from the on-line system with the sales document is usually much easier than recording a bank statement taken from traditional banking.

The attention also should be paid to the aspect of telecommuting. On-line accounting no longer requires regular coming to the office in order to perform their duties. One can easily reconcile the private sphere of work. Organization of the accounting department, where for example every employee has the right to a one day work from home, is not difficult, with a program running "in the cloud". In large cities, it could mean saving 1-2 hours a week that you have to spend on commuting. Ease of integration of "in the cloud" systems lead to a cheaper solutions and are now available to small businesses.

Results and discussion – analysis of cloud computing in polish SME businesses

To examine the extent of the interest of small and medium-sized enterprises in the region of Silesia a survey among entrepreneurs mainly from the area of Czestochowa has been conducted. The questionnaire was sent electronically to over 1,000 entrepreneurs, but responses were provided by less than 10%. 134 responses were received, which were given mainly by women (62%) aged 26-40 years (65%). 26% of respondents were in the age range 41-60 years. Most of the responders had a degree in economics - 62%, and the remainder (32%) technical education. Respondents most often pointed to the use of the Internet in business in the form of e-mail and having its own website. Communication with the public administration via the Internet becomes increasingly common.

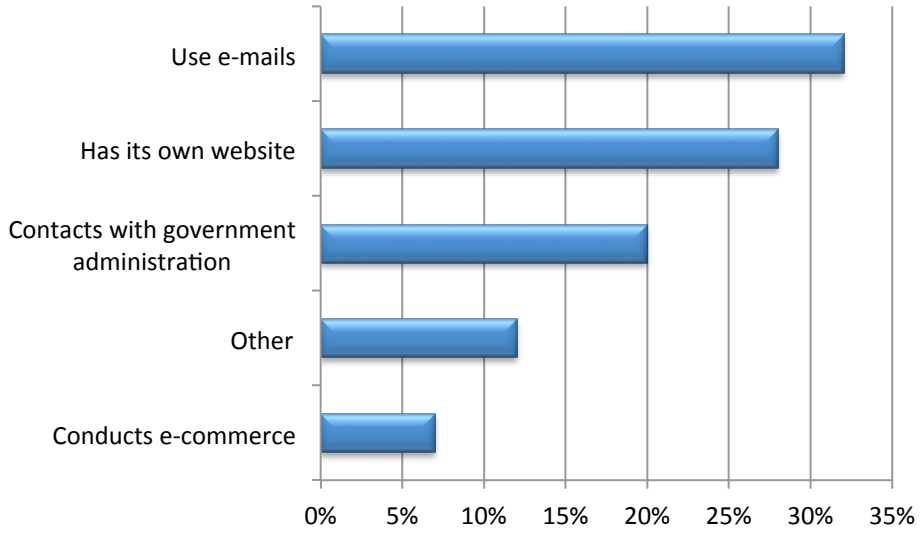

Figure 1: The use of the Internet in business

Most of respondents indicated accounting books (62%) and the income and expenses tax book (30%) as a kind of accounting records kept at the company. Among the surveyed companies, accounting is carried out by the internal financial and accounting services for 42%, by a specialist certified accountant at 28%, and by an owner at 20%. Only 8% of respondents outsourced the maintenance of accounting records to an external accounting office. Almost all respondents (96%) use computer programs for financial-accounting and payroll (80%) of their companies.

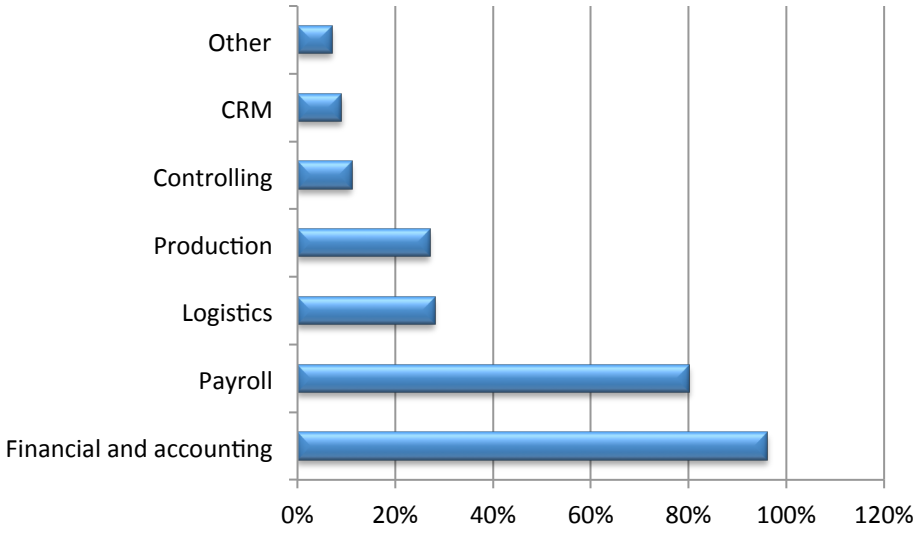

Figure 2: Area of business supported by computer programs

Perhaps because of the difficult economic situation at the macro level and because of the uncertainty, companies do not plan to change or purchase a new computer system in the next two years (62%). Only 16% of

respondents expressed an interest in the subject. The remaining 22% of respondents were not decisive. In addition, when it comes to planning implementation in the Cloud Computing model 43% of the respondents answered that they do not plan any such actions, and only 3% of companies participating in the survey currently uses this form. The majority (53%) had no opinion on the subject, which may be due to the small knowledge of the essence of the model, its benefits and risks associated with it. Most companies interested in Cloud Computing model expects that it could be used in the area of finance and accounting. It is significant that the question of what might constitute a barrier to the implementation of Cloud Computing more than half of the entrepreneurs indicated a lack of knowledge of issues related to this model. In the second place, they pointed concern for the safety of the stored data.

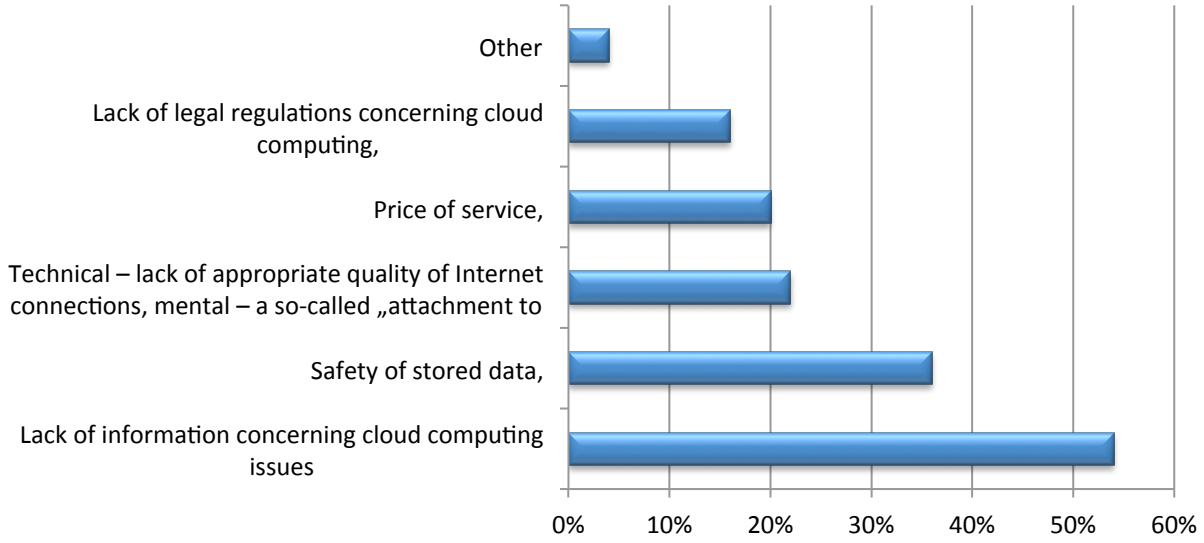

Figure 3: Barriers to the implementation of Cloud Computing

Among the benefits of using Cloud Computing primarily saving time, space and money associated with the construction, organization and maintaining their own server, storage devices, power and air conditioning, as well as the purchase of software licenses were indicated. 31% of respondents pointed at benefits of cloud computing in their availability and tie with the comfort of mobility. Resources that are leased by client are available almost anywhere, there is a possibility to perform the tasks by employees who are outside the company at the time.

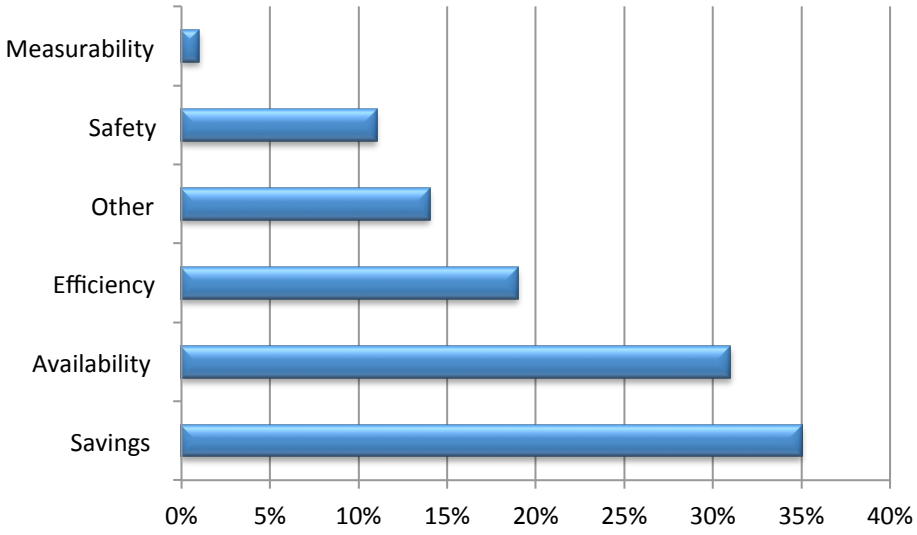

Figure 4: The benefits of using Cloud Computing

Interpretation of obtained results of the survey will be undoubtedly easier if one takes into account the information about the size of investigated companies measured by the number of employees. Among the respondents 58% of these were small businesses employing up to 50 employees.

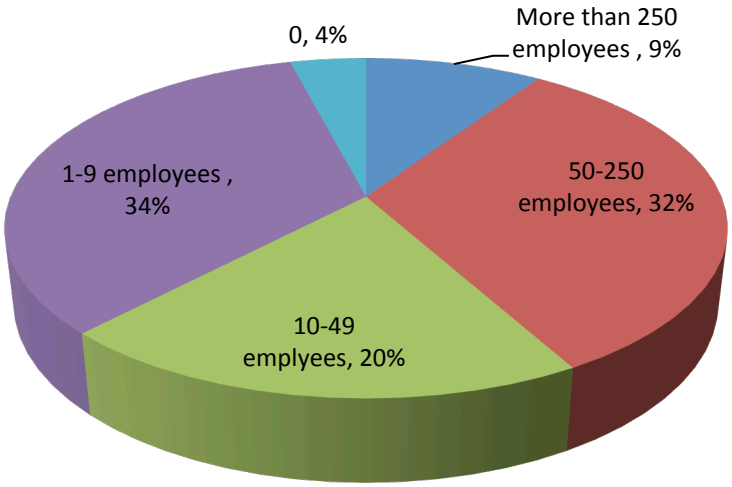

Figure 4: The size of investigated companies measured by the number of employees

Results of the survey conducted by the Cloud Industry Forum (CIF) in the UK in 2012 look completely different. They show that even then, organizations in the UK were more satisfied with the services based on cloud computing. Of the 250 organizations surveyed in the UK 61% claimed that they currently use the cloud (compared with 34% in January 2011). The private and public sectors use the cloud in the same way. However, only 52% of small firms employing less than 20 employees have adopted cloud services, compared with 68% in larger organizations. It turned out that one in four companies, which do not benefit yet from the cloud is not going to use it

within the next 12 months. 34% of organizations in the public sector and 30% of small and medium-sized companies said they intend to take action in the cloud in the coming year. Studies have shown much greater enthusiasm among large enterprises, though one would think that small businesses would benefit from the chance to save money by using Internet solutions. Another study conducted by VMware showed that 59% of IT workers said they are hesitant to purchase in the cloud. As reasons for their hesitation, respondents mentioned the issue of security in the cloud, restrictions in previously signed agreements, as well as a lack of understanding of cloud technology.

The average company in Latin America uses cloud computing in 39% of all applications. The companies of the Asia- Pacific 28% of applications process in the cloud, but in Europe and the U.S., the percentage of companies using the cloud is even lower (12% and 19%) ("Asia Pacific and Latin America firms", 2012).

Within a few years, online accounting – accounting in the cloud - will cover 50% of the total accounting software market. Research of IDC firm confirms such conclusion. In the 2011, online accounting covered 11%, but IDC believes that this percentage will increase to 50% in 2016 among enterprises employing up to 100 employees. According to IDC, the rapid development of online accounting market forces accountants to include these changes in their businesses. There are new apps for integration of accounting systems with Microsoft Outlook. They allow for example the integration of the accounting system based on the cloud with Microsoft Outlook e-mail, so that products and services can be invoiced directly in Outlook ("New app to integrate E-conomic with Microsoft Outlook", 2011). What began as cloud-based applications, such as CRM and HR software now includes office automation, marketing automation software and financial accounting. In addition, supply chain management and solutions industry-specific/vertical soon will have their applications.

Conclusions

Today's buyers expect software solutions that work with the modern workforce and mobile workers. Cloud solutions meet this requirement. CFOs often decide to adopt financial and accounting applications in the cloud. Financial and accounting software in the cloud may in future completely replace the use of software at the headquarters.

The benefits of cloud computing are too large to ignore. First, facilitation of geographical expansion, the applicability of mobile solutions and ease of integration are the basic benefits referred to. The possibility to constantly update products, which are available in the cloud (which do not require a large commitment of IT), and security of data recovery and low capital costs (such as servers) are beneficial as well ("How I Learned To Stop Worrying & Love Cloud Financial Software", 2013).

In terms of policy instruments, the main problems and risks of cloud computing can be divided into three basic categories. First of all, the legal framework that must cover the solution is the issue. The main problem is the large number of rules, often contradictory and in different ways, dependent on the country, which protect the interests of customers in terms of compliance and accountability; enforcement and pursuing claims. It is also important that other model contracts (terms and conditions) associated with Cloud computing service (Service Level Agreements; End User Agreements; privacy terms and conditions; clarity and transparency) and contracts with end-users ensure transfer of interoperability (vendor lock-in).

Small business does not need expensive software to lead the general ledger and perform basic accounting tasks. Simple accounting applications in the cloud are created to help small business owners to organize and manage their IT operations. Since this is an online accounting service, one can access business data anywhere on a mobile phone or a desktop PC and his data is safe because there are backups. Anxiety and concerns rises in terms of possible access of third parties to data of entrepreneurs (owners of servers and personnel operating them).

One of the uses of Cloud Computing in accounting for small and medium-sized enterprises are emerging recently "in the clouds" accounting offices, which are modern accounting solutions available anywhere. These are accounting offices, which do not need to be personally visited. It does not matter where physically clients and offices operate, and on what basis companies run accounting.

Although the appropriate action to promote and encourage the further development of cloud computing are already included in the program for Europe, in Poland use of services of accounting firms is still negligible. It is necessary to remove loopholes in the legislation, to ensure, inter alia, full harmonization of data protection rules across the EU, full transparency of contracts for the provision of cloud computing services, unified system of border

protection of intellectual property rights, etc. It is appropriate to conduct comparative empirical research across the EU 27 on the user experience of cloud computing, their behaviors and perceptions risk as also noted earlier.

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An Algorithm for the Solution of Second Order Fuzzy Boundary Value Problems

F. Berna BENLI, Ozgur KESKIN

Erciyes Üniversitesi
Email : akpinarb@erciyes.edu.tr

Abstract: Differential equations has played an important role to embody many biological events and situations Lately, in [1] and [2], F. Bozkurt have examined the structure of the brain tumor,itâ€™s growth and mathematical model, the relationship between the immune system of the human body and the status of the tumors. Ã–. AkÄ±n and Ã–. OruÃ§[3] has taken into account fuzzy initial values with predator-prey model. By using the concept generalized differentiability for this initial value problem they have generated graph solutions. Moreover; Ã–. AkÄ±n, T. Khaniyev, Ã–. OruÃ§ and I. B. TÃ¼rkÅŸen studied the second-order initial value problems in [4]. In this paper, we will use this method to solve the second order Fuzzy Boundary Value Problem.

Keywords : fuzzy number,fuzzy initial value, fuzzy initial value problem

An Audio Data Encryption with a Discrete-Time Chaotic System

Akif Akgül[1], İhsan Pehlivan[2]

Sakarya University, Faculty Of Technology, Electrical and Electronics Engineering, Sakarya, Turkey
[1]aakgul@sakarya.edu.tr, [2]ipehlivan@sakarya.edu.tr

Abstract : In this paper, a study on increasing security of audio data encryption with a single dimension discrete-time chaotic system was carried out. Mono audio data samples were encrypted and its security analyses were executed. In order to enhance security during encryption, a different method was applied by also using a non-linear function. Analyses results were achieved with common security analyses such as key space, key sensitivity, chaos effect and histogram.
Key words: Audio Data, Chaos Based Encryption, Information Security, Security Analyses

Introduction

A safe communication is one of the most significant needs of our era. Many studies on hiding data types like text, audio, image and so on have been carried out in order to meet such need. Many studies on audio data encryption have appeared in the literature so far (Gopalan, 2001; Chang, 2003; Chen, 2007; Fakhr, 2007; Troullinos, 1996). Some of these included directly hiding audio files while others included methods of hiding the information by embedding some other data in the audio files. The general objective of all these studies is to prevent the possession of data by undesired people. Today, telephone conversations and conversations in any other place can easily be monitored with the help of some certain technological devices. It has become a necessity to take many security precautions to protect such information. Chaotic systems have become more popular in encryption as they can successfully maintain infusion and diffusion, the basic components of encryption, by providing complexity with activities like noise and being sensitive to primary conditions.

There are numerous encryption and signal hiding studies in the literature used with the chaos technique. In some of their studies about signal hiding (Pehlivan & Uyaroglu, 2007; Pehlivan & Wei, 2012; Pehlivan & Uyaroglu, 2012), Pehlivan and his colleagues employed masking technique that included adding information signals to chaotic signals. Sakyhidasan and Santhosh (Sakyhidasan & Santhosh, 2011) carried out encryption with chaos by mixing original data and data from chaotic system. Ogras and Turk (Ogras & Turk, 2012) achieved encryption by making use of a non-linear function. To decrypt data which has been encrypted this way, one needs to know the non-linear function and all the parameters in it. By combining chaotic system based and non-chaotic encryption algorithms, Fındık performed text encryption (Fındık, 2004). Sohby and Shehata achieved chaos based encryption (Sobhy & Shehata, 2001) by adding the data to be encrypted to the Lorenz system. Zhang and Min developed a non-symmetrical numerical encryption algorithm (Zhang & Min, 2005) for audio communication and also made the security analyses of their system .

In this study, chaos based encryption applications were done for the safe transmission of mono audio data. Single dimension discrete chaotic systems are very effective for encryption. Key space, key sensitivity, chaos effect and histogram analyses about the success of the encryption procedures were performed with MATLAB program.

The second materials and method part of the article includes information about single dimension discrete chaotic systems, the chaos based encryption method, and security analyses. The last part covers the results and evaluations.

Materials and Method

The Discrete-Time Logistic Map Chaotic System Used in the Encryption Application

Single dimension Logistic Map chaotic system, which is very common in the literature, was used in this study. Logistic Map is a very commonly used single dimension chaotic system. Figure 1 exhibits bifurcation diagram that shows at which intervals Logistic Map enters chaos. r parameter was examined between 0-4 values. Bifurcation diagram in Figure 1 shows that r value must be chosen 3.5699-4 so that the system can enter chaos. Otherwise, the system will not enter chaos and keys necessary for encryption will not be produced and thus chaotic encryption will not be possible.

$$Xn+1 = r * Xn * (1-Xn) \qquad (1)$$

X value represents the system variable, and r represents the system parameter in Equation 2. n value is changeable according to the data to be encrypted. Value of n depends on how many bits of data will be encrypted.

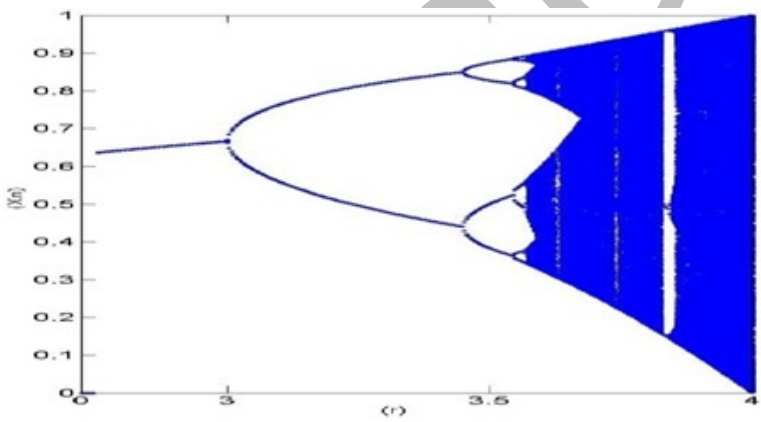

Figure 1: Logistic Map bifurcation diagram

Chaos Based Encryption Application And Security Analyses

A non-linear equation was used in order to increase security in encryption. One needs to know a and b parameters and also know what kind of equation was used in order to decrypt data encrypted with the function in Equation 5. "x" value in the function represents the keys produced with chaos generators and "m" value represents the audio data to be encrypted in bits.

$$f(x,m) = \frac{2x(1 + xm + (1-m)) + a}{b} \qquad (2)$$

In this study, a parameter is 0.9 and b parameter is 4.8. Choosing an appropriate value range for equation and parameters is necessary for achieving a chaos based encryption. When certain limits are exceeded, the system will get out of chaos and thus chaos based encryption will not be achieved.

Figure 2 exhibits the general block diagram of encryption application for safe transmission of any audio data. As can be seen on the block diagram, audio data and keys produced with chaotic systems are encrypted with the help of a function. Data encrypted later in the block diagram can be decrypted with the inverse of the function. In order to decrypt audio data encrypted in the application in this figure, one needs to know keys produced for each bit (46000 keys for 46000 bits of audio data) and the order of these keys, the chaotic system used, parameters in the chaotic system and initial values, and also non-linear equation and all parameters employed in this equation. Otherwise, it will not be possible to decrypt the encrypted data.

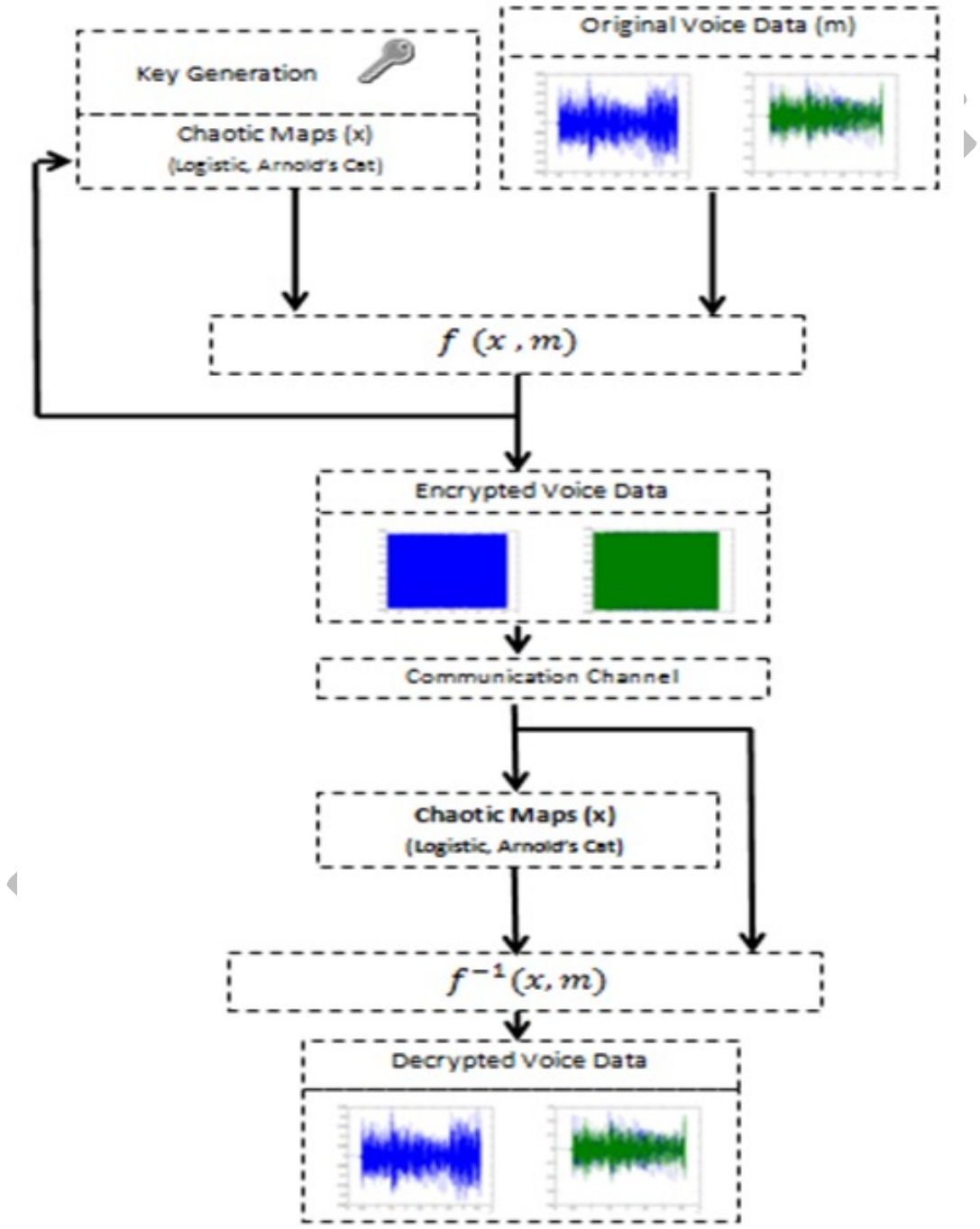

Figure 2: Block Diagram of Encryption and Decryption Audio Data

Encryption Application On Mono Audio Data

Figure 3 shows 46000 bits mono audio datas to be encrypted.

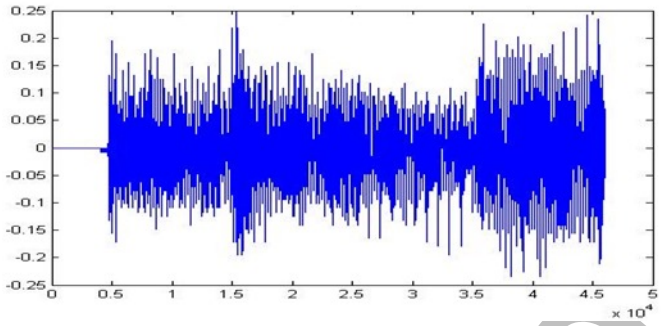

Figure 3: Original Mono Audio Data

Original mono audio data in Figure 3 was encrypted by using the Logistic Map chaotic system which is very common in the literature. Encrypted audio datas are shown in Figure 4

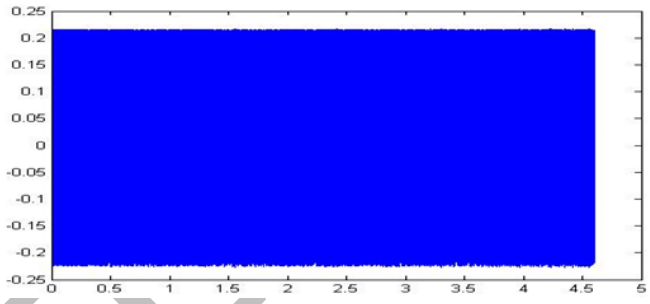

Figure 4: Mono audio datas encrypted with the Logistic Map

Figure 5 shows decrypted audio datas obtained from the decryption process which was performed as explained on the block diagram in Figure 2. There was no corruption in the audio datas, which proves that both encryption and decryption processes were performed successfully.

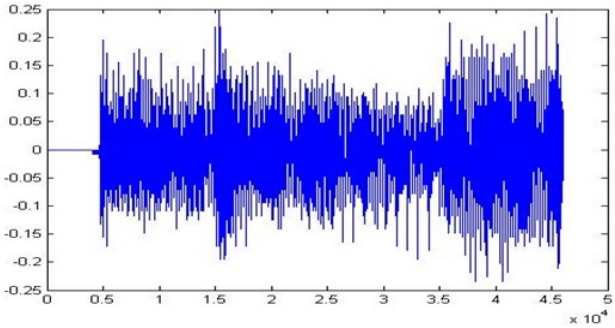

Figure 5: Decrypted mono audio data

Security Analyses of The Encryption Application

Encryption processes have been performed successfully. Yet, security analyses must be carried out in order to assess the reliability of encryption processes. Encrypted data with disappointing results in security analyses will not be preferred as they are so vulnerable to be decrypted. Key space analysis, and histogram analysis were performed in order to compare the chaotic systems utilized in this study.

Key Space Analysis

Key space needs to be large enough to prevent strong attacks. As size and other variables increase in chaotic systems, key space increases, too. When there is only one variable, key space can have 1014 different values. For instance, in a three dimension chaotic system with just one variable, total key space will be 1056 as initial conditions can be 1042 because of the size and 1014 because of the parameter. In such an application, key spaces will vary due to size, depending on Logistic Map chaotic system. Key space for Logistic Map is 1028, according to r parameter and x(0) initial value.

Histogram Analysis

Distributions of data values in a system comprise the histogram. Histogram analyses can be made by examining data distributions in many different fields. In encryption practices, if the distributions of numbers that represent encrypted data are close, this means encryption has been performed well.

Figure 6. shows the histogram diagram of mono audio datas encrypted with the Logistic Map.

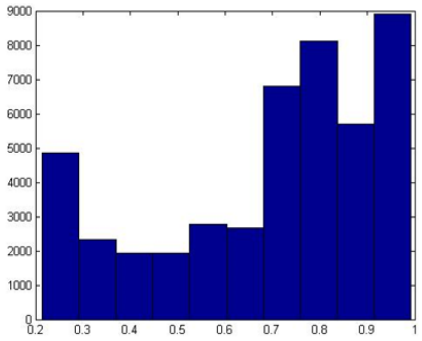

Figure 6: Histogram Diagram for mono audio datas encrypted with the Logistic Map.

Results and Discussion

In this paper, the discrete-time Logistic Map chaotic system were used to increase security of audio data and its security analyses were executed. In order to decrypt the encrypted data in chaos based encryption applied here, one needs to know which chaotic systems were used, keys produced and their order, all parameters and initial values in chaotic systems, the non-linear equation used and all parameters belonging to this equation. Because of any mistake during the decryption of the encrypted data, such as changing even just one key data (as seen in key sensitivity analysis), encrypted data can not be decrypted and the original audio data can not be retained.

Since software necessary for the chaos based encryption method used here take up very small ram space, excluding audio data, (1KB for mono), it will be more advantageous to use them in real environment applications. Moreover, this study was encrypted in Matlab, codes can be converted to C/C++ and codes can be gathered and be run in other environments without Matlab being installed, which are other advantages of this application.

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Anticipating the development on Kayseri tourism through Talas Ali Mount master project (*)

Z. Ozlem Parlak Bicer

Erciyes University Faculty of Architecture, Department of Architecture, 38039 Kayseri, Turkey
parlako@erciyes.edu.tr, parlakoz@yahoo.com

Burak Asiliskender

Abdullah Gul University School of Architecture, Kayseri, Turkey
burak.asiliskender@agu.edu.tr

Abstract: Kayseri is located on a flat area, surrounded with hills and mountains. Erciyes Mountain is the most popular attraction point of the city and milieu, according to its significant geographic situation. It is one of the well-known ski centers of the Anatolia. Nevertheless, Ali Mount is an alternative on touristic attractions with its closed location to the city center, and its geographic shape. Ali Mount is emerging as an alternative to particularly base on extreme sports. It is one of the renowned summits for paragliding. In this point of view, Talas Municipality prepared a master planning and touristic sub-structural development research supported by Middle Anatolia Deelopment Agency, which was focusing on touristic and economical development with highlighting the mount in national and international paragliding activities and extreme sports.

According to outcomes of this planning and research activity, this study aims to criticize and evaluate the essence of the Ali Mount as a property, with its geographic features and environmental properties. The effects on the touristic development of the Kayseri city and its local, national and international visibility are also examined. It is expecting to conduct similar researches and cases, as a pioneer model study based on urban, social and economical analysis and inspiring design research.

Key words: Kayseri, Ali Mount, Touristic Substructure Development, Master Planning

JEL:R11 Regional Economic Activity: Growth, Development, and Changes
JEL:R52 Land-use and Development

(*) This study is based on “Touristic Sub-Structure Development on Talas Ali Mount Research” (TR72-11DFD-01/04) of Argeus Architects and Talas Municipality, supported by ORAN (Middle Anatolia Development Agency).

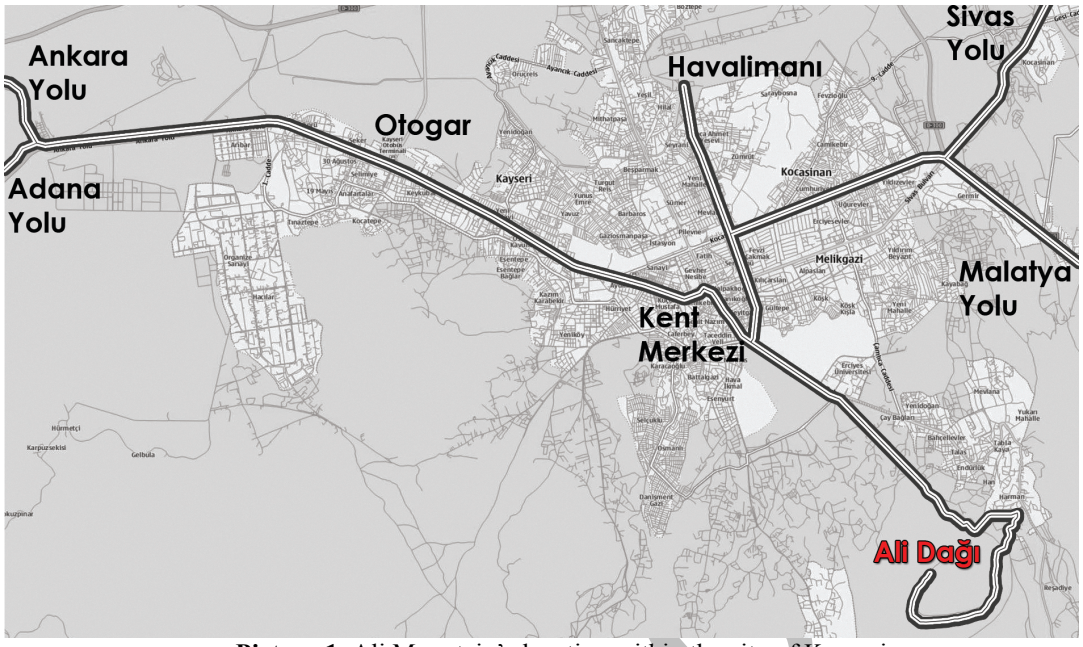
General Aim of The Project

A tourism facility is planned on Ali Mountain of Kayseri, with its rich history and convenient location. The criteria to improve transportation to Ali Mountain for domestic and foreign tourists have all been assessed. Also, preliminary work has been done for social facilities for the athletes and audience to fulfill their basic needs.

Although Ali Mountain is a place where the entire city of Kayseri can be seen from above, it is not being used. A preliminary study for the touristic facilities and the required recreation and activities for Ali Mountain was carried out. Additionally, alternatives to the current transportation opportunities were researched in order to determine the most convenient solution to solve the current transportation problem to Ali Mountain. It was aimed to draw attention to the suggested tourism and recreation facilities along with the values of the region for development. As a result of solving the transportation issue with a funicular (a system in which 2 vehicles connected with each other and to the central system with cable and can climb steep ramps), it has become possible to watch aviation sports in Ali Mountain, and to enjoy the scenery. It was also aimed to create a touristic focus that will be chosen by the suggested uses that will bring out the natural beauty.

The Importance and Necessity Of This Project

Talas has always been an important crossroad due to its historical and geographical location. It maintains its importance due to its proximity to Kayseri centrum (Picture 1). The city of Kayseri is visited by millions of domestic and foreign tourists each year. However, the historical places as well as the underground city in Talas and Ali Mountain do not receive enough recognition. It is important that the region is advertised and that it becomes and attractive touristic region. Ali Mountain is within the limits of Talas, and nature sports such as trekking and mountain biking, and aviation sports such as paragliding is done. A project of Ali Mountain Tourism and Aviation Sports Facility has been prepared to increase the tourism potential of Kayseri, to create potential investment opportunities, and to bring out the existing potential of the area such that the city can be watch over as if from a tower can be brought out. Ali Mountain continues to host various world championships due to its convenient climate properties.



Picture 1. Ali Mountain's location within the city of Kayseri

Mountain Ali Social Center For Aviation Sports

Ali Mountain is one of the well-known and preferred centers of aviation sports such as paragliding and parasailing due to the mountain location and topographical structure. There are parasailing and paragliding competitions held locally and internationally. Apart from these competitions, aviation sports are some of the most popular extreme sports. As a result of these competitions, an increasing interest in aviation sports in Kayseri and its surroundings have been observed. The Talas Municipality made several arrangements such as an observation terrace and a lifting ramp in order to have the sports performed in a higher quality setting. On the other hand, the growing interest in Ali Mountain with the help of these competitions have brought forth a concept for a social facility that is focused on aviation sports. With this approach, a social facility in order to fulfill the basic needs of the athletes and aficionados-such as watching, gathering, training, eating/drinking and obtaining sporting goods-was planned.

When the location of Ali Mountain with respect to the city, it is certain that this center will be focal point in Kayseri. Therefore, the planned social facility will provide buildings for the aviation sports infrastructure, on the other hand it also aims to attract interest in aviation sports and to transform Ali Mountain into a touristic focal point for both locals and outside visitors.

It is aimed that the planned facility would serve as a social facility that is centered on aviation sports. The structure is made up of an aviation sports club, workshops, social-cultural exhibition rooms, tourism office, administration and technical units. The structure is located for getting maximum support for aviation sports and to create maximum aspects. Also, based on the concept of developing alternative transportation to Ali Mountain, the location of the funicular transportation and the stations have influenced the choice of location. The designed structure is placed between the recommended station and the lifting ramp. Taking the flight corridors for paragliding and parasailing into account, the structure is placed towards the eastern slopes of the mountain where it is a blind spot of the lifting area. Considering the aspect potential of Ali Mountain in terms of the city, placing the structure under the road elevation was of importance. With a direction extending from the road elevation to the structure, an observation terrace was obtained to enrich the aspect point

In order to make use of the rougher mountain slope, the structure was arranged as with a section of elevation differences two meters apart. The structures were placed into the elevations between and were combined with a main structure that is perpendicular to the mountain slope. The roofing elevates perpendicular from the entrance to the slope, and with two meter elevations, a multi-purpose volume was intended. The roofing slope was directed southward to increase the length of sunlight received. Depending on the changing altitude, an experimental structure

that provides an arrangement for the aviation sport gears such as parasailing and paragliding, as well as stressing the aspect relation it has with the city. The structure brings the different functions and its users together. The entrance hall and the arm extending to the restaurant surrounds the structure. Tourism/information and sales office enriches this arm with its functionality. Reaching the restaurant through the main entrance level was the priority. This way, it was aimed to increase the interest in the structure at the center of the building. Also, the location of the restaurant and its shape was designed to give the impression of floating in the air in order to provide a special effect to the city view. The restaurant that will only be serving the contestants and the audience is also considered in terms of adding touristic value to the city with its location and aspect alternatives.

The structure's administration offices are placed with an elevation difference of two meters to the main entrance. Easy access to the offices and their central location was prioritized, but care was taken to keep them as a border unit in terms of the entire building. This way, the effect of the administration offices to the whole structure was minimized. The gallery's experimental effect was increased by creating a plane in the minus two level that extends towards the city center. This direction partially covers the multi-purpose rooms in level minus two and provides them with more light. Also, it divides the structure in two parts based on the ratio of the structure.

Level minus four is designed as a plane that is directed towards the city view and has exhibitions related with aviation sports. The entrance has the potential to relate with levels minus two, four and six visually and physically. This level is planned as an open air exhibition and as an observation terrace. An extra unit was also considered which is made up of storage, changing rooms, and a meeting room to increase the productivity under the restaurant and sales office. A second entrance is available which is only reached from level minus four. The meeting room will be a place for club members to meet up when desired, and it can also be a workshop that can be reached from the entrance when needed.

A multi-purpose room for 80 people was designed between the levels minus six and four by taking advantage of the elevation difference. Alongside an information area where technical information such as weather-route information can be given, importance was given so that it was also an open area where cultural events could take place. Level minus six was designed as a high area to be used for various activities such as exhibitions. The aim was to create spaces that present opportunities for social and cultural events, to contribute to the social environment of the city and to increase the appearance.

Level minus eight is made of two separate parts. Workshops where seminars could be given were planned to be under the part where the open air exhibition and observation terraces are located in level minus four. Below the aviation club is the technical units.

The structure provides infrastructure for the development of aviation sports (parachuting, paragliding, model planes, etc.), on the other hand it will bring out alternative tourism opportunities and increase the tourism variation in Ali Mountain by stressing its properties.

Alternative Means Of Transport For Ali Mountain

Ali Mountain Social Center for Aviation Sports will contribute greatly to the sports tourism potential of Kayseri, especially in Talas. When the current transportation options for Ali Mountain are considered, it is important that the current system is reinforced and that new alternatives are created within the scope of this project. Currently there is a dirt road that circles around the mountain and reaches the ramps. There is also an inactive pedestrian-climbing land on the northern ridges. Due to the climate change in Kayseri, the operability of both roads change based on the season. Two main targets were focused upon to provide safer and more comfortable options to reach the Aviation Sports Center and the lift-off ramps. The priority is improving the current transportation lines and increasing operability.

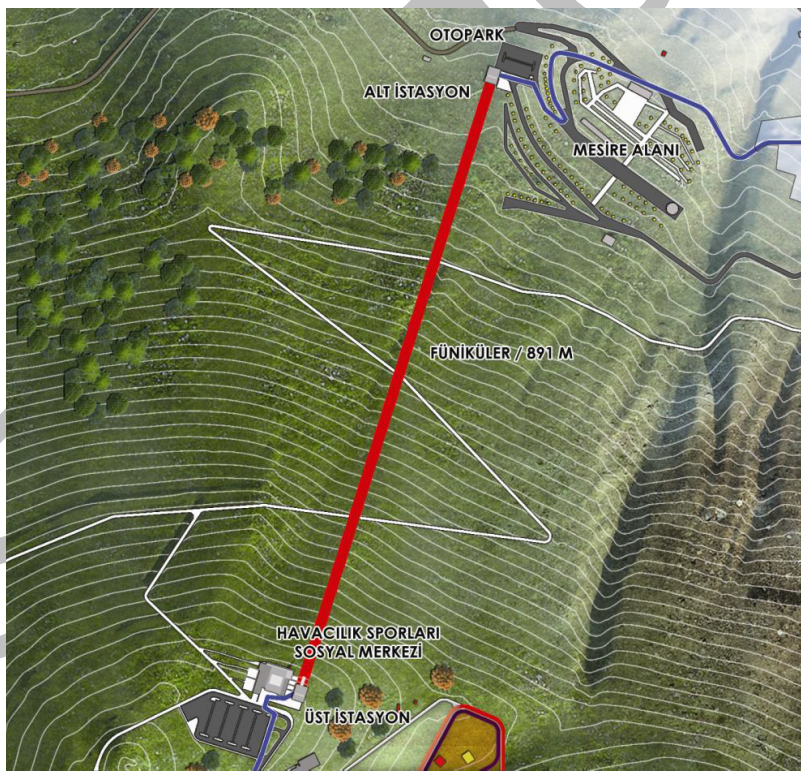
Within this scope, two new road connections for Tek Çakıl Tepe and Yedi Çakıl Tepe are suggested by splitting the road that surrounds the mountain from Camili Tepe. This way, a more comfortable and shorter route to Tek Çakıl Tepe, where the social facility is, is created. A 700m road from Camili Tepe to Yedi Çakıl Tepe and a 305m road to Tek Çakıl Tepe is suggested.

In order to reinforce the transportation connections, adding bicycle lanes to the current (and suggested) roads are considered. Also, the pedestrian-climbing lane on the northern ridge in planning to be reinforced to increase use. Another suggestion is to renovate the infrastructure of the 7km road.

Secondly, an alternative system that will reinforce the transportation from the climbing area to the center was focused upon. Within this scope, mechanical systems and their possibilities were analyzed. In the studies conducted, two systems that will use the mountain surface and installed with ropes were considered. The cable car system was omitted due to the possibility of causing problems in paragliding and parasailing. The ropes and the poles that must be at least 30 m in height cause an important issue in aviation sports.

The operational cost rises above the expected due to the geological structure of Ali Mountain. For this reason, a mechanical system operating on the surface was focused upon. The idea was discussed by international experts and users. The vertical section of the mountain was assessed and a transportation map was drawn. Accordingly, a funicular system that will work between levels 1350m and 1740m, with an altitude difference of 390m and a length of 891m was planned. On the other hand, great care was taken not to affect the endemic species of the area, so the system was placed a bit higher to avoid contact with the ground. When the winter conditions are considered, avoiding contact in cases of snow depth would help keeping the system operational. (Picture 2)

The mechanical system is planned to be built between Talas Ali Mountain Picnic Area and the Aviation Sports Center which will be built on the northeastern ridge of Tek Çakıl Tepe. Taking the transportation opportunities and the topographical structure into account, it was considered to place the lower station in the vicinity of the Picnic Area. The cabins that will work on the system will have a capacity of 40 people and a transparent structure for seeing the landscape is planned. The necessary precautions for children, the elderly and the disabled were taken into account during the design. Attention was also given to athletes that will want to carry their equipment. (Table 1)



Picture 2. Ali Mountain Funicular System Usage Decisions (Argeus Architecture)

Table 1: Properties of Funicular System

Properties of Line	Altitude Difference		390m (between 1.350-1.740m)
	Length		891m
Approximate Line Capacity	Daily	Weekdays	1.750 p/d
		Weekends	3.000 p/d
	Weekly		15.000 p/w
	Monthly		50.000 p/m
	Annually		450.000 p/y

p:people, d:days, w:weeks, y:years

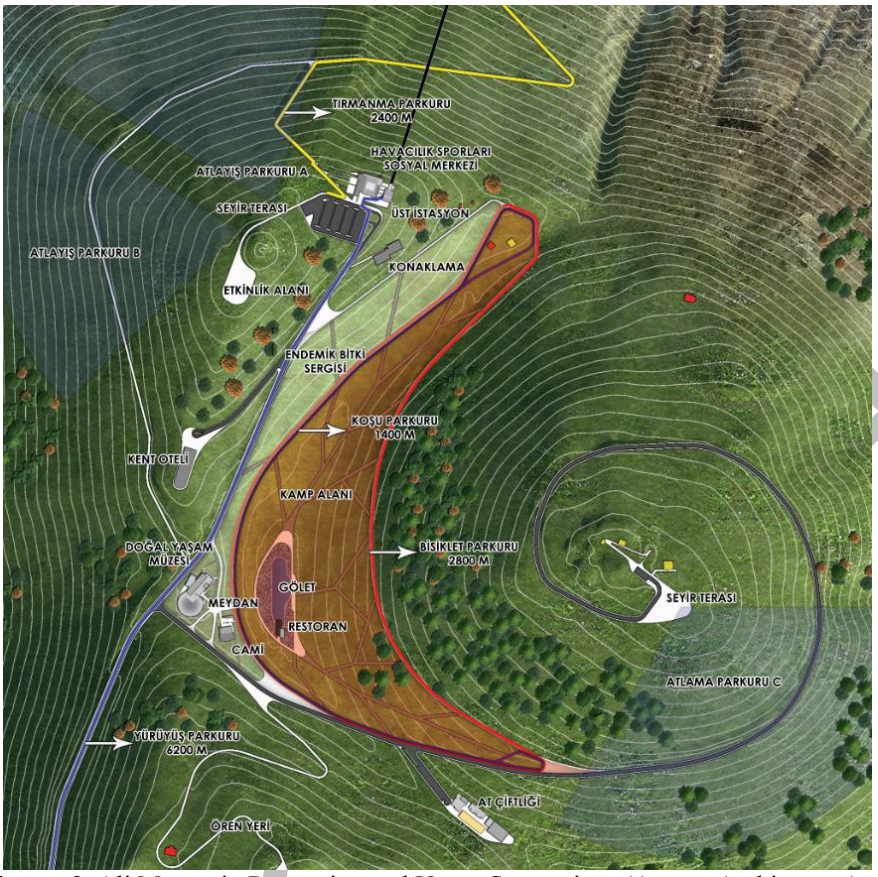
Alternatives To Develop The Touristic Infrastructure For Ali Mountain

Ali Mountain is one of the most well-known centers for parasailing and paragliding due to its location, wind and topographical properties. Without a doubt, a Social Center for Aviation Sports that aims to develop aviation sports will attract attention to the area. The center will become a meeting point for athletes and will bring interested parties to Ali Mountain.

On the other hand, aviation sports, apart from tournaments, are some of the extreme sports that have attracted the most attention lately. The structure of the mountain was analyzed in this scope and two additional lift-off strips were proposed. A strip on Yedi Çakıl Tepe southward and one on Tek Çakıl Tepe facing southwestward is planned. The strip on Yedi Çakıl Tepe is occasionally used for training purposes as it faces less wind and faces less structures. It is suggested that this area is arranged and opened to active use. A second strip on the southwestern side of Tek Çakıl Tepe will attract athletes.

It is suggested that a unit within Ali Mountain Social Center for Aviation Sports is used to guide beginners and professional athletes for the most productive use possible. This unit is planned to be used by athletes, visitors and interested parties for training, individual or group lift-offs, preparing programs such as tournaments and international contributions. For this reason, an accommodation unit that will collaborate with the center and will be in the vicinity of the Social Center for Aviation Sports. A 90-bed accommodation unit in the eastern ridge of Tek Çakıl Tepe is planned. The visual relationship of the mountain and the city was considered and it was aimed that the accommodation unit was not perceived as a part of the center. Harming the natural state of the mountain by structuring is not the goal. Beyond the standards of a many-star hotel, a guest-focused accommodation was suggested. Care was taken to include meeting rooms for athletes and the necessary training rooms within this accommodation center. It was aimed to contribute to sports-centered tourism outside of competitions as well as providing accommodation to athletes during the competitions. This way, use outside of competitions will be encouraged. The aim is to contribute to the visibility before and after the lift-off. The Social Center for Aviation Sports, Accommodation unit and the Mechanical Transportation System are vital for the development of the touristic infrastructure of the region. When the location of the mountain and its potential is considered, it is clear that it has other opportunities available. With this goal, the endemic nature of the mountain was taken into account, and a recreational center possibility was stressed for the city and its inhabitants. The opportunities will become more active with the renovations, mechanical system and opening new roads, and it will make the mountain more reachable.

Ali Mountain has the potential to fulfill the needs of the ever increasing need for green space in urban areas. For this reason, it is suggested that the area between the hills are used as a recreation area. Instead of a typical landscape arrangement, a part of the area between the natural surroundings and endemic species will be open for use. Taking the insolation trails into account, pedestrian and bike trails, jogging lanes can be opened for use along with camping grounds (Picture 3).



Picture 3. Ali Mountain Recreation and Usage Suggestions (Argeus Architecture)

Additionally, areas that can be used for concerts and etc. will trigger the usage of these places. With this in mind, a 1.4 km running parkour, 2.8 bicycle parkour and a 9 km pedestrian lane will be made. Also, a shallow pond that will be located in the hollow area between the hills is suggested to attract interest. With a shallow depth (within 2500m²), it will add different perspectives from spring to autumn, and can be converted into an ice skating rink in the winter. A restaurant was placed to support area use. The 250 decares area will begin between Tek Çakıl Tepe and Yedi Çakıl Tepe and continue towards the valley between Camili Tepe and Yedi Çakıl Tepe. The City Park will end with a horse ranch that will be between the two hills. This area is a relatively flat area where the insolation ratio is high, and horseback riding is planned in this area. In order to encourage use, a restaurant is considered near the ranch. Also, active afforestation of a 200 decare area between the hills are considered.

Aside from is recreational use, a different contribution to the touristic perception is desired by stressing the natural beauty of the mountain. An interactive natural park museum where all of the flora and fauna living in the mountain surface interacting with each other. All of the local visitors and tourists, especially primary school students, will have a unique experience and support the area with their interest.

In order to contribute to the touristic infrastructure of the mountain, building a city hotel in the south of Tek Çakıl Tepe is suggested. Under the city and Erciyes view, a hotel that can be used for thematic purposed such s symposium and congresses, and an accommodation within nature can be provided. The hotel will be in the vicinity of Ali Mountain City Park, the natural park, restaurants and ruins, and can be actively used in events related to the Social Center for Aviation Sports and aviation sports. On the other hand, it is thought that due to its surface-slope relations, this region can be used for extreme sports, such as atv-safari, grass skiing, cross-country skiing, and biathlon, and activities such as ballooning.

Accommodation (3 Floors (+B) / 90 Beds): An accommodation center that will work closely with the headquarters and will be in the vicinity of Social Center for Aviation Sports is suggested. Considering the visual relationship of the mountain and the city, it was aimed that the accommodation unit would not be perceived from the

center. There is no intention of harming the mountain's natural appeal with structuring. Beyond the standards of a many-star hotel, a guest-focused accommodation was suggested. Care was taken to include meeting rooms for athletes and the necessary training rooms within this accommodation center. It was aimed to contribute to sports-centered tourism outside of competitions as well as providing accommodation to athletes during the competitions. This way, use outside of competitions will be encouraged. The aim is to contribute to the visibility before and after the lift-off.

Natural Park: Aside from is recreational use, a different contribution to the touristic perception is desired by stressing the natural beauty of the mountain. An interactive museum where all of the flora and fauna living in the mountain surface interacting with each other. All of the local visitors and tourists, especially primary school students, will have a unique experience and support the area with their interest.

City Hotel (5 Floors (+B) / 180 Beds): A hotel under the view of the city and Erciyes will provide opportunities from thematic events such as symposiums and congresses; and it will also provide accommodation in a natural setting which has become a focal point in tourism. The hotel will be able to be used for Ali Mountain City Park, Natural Park, restaurants, and ruins along the Social Center for Aviation Sports.

Horse Ranch: In the area which is relatively flat and the insolation ratio is high, a horse-riding facility in natural conditions is planned. To encourage usage, a restaurant is considered to be placed near the facility.

Pond: A shallow pond can add new perspectives to the usage from spring until autumn, and can be converted into the skating rink for the winter. In order to encourage the usage, a restaurant is placed near the pond.

Ruins: The archeological history of Camili Hill can be stressed and by excavations and researches, a part of it can be opened to visitors.

City Park: Ali Mountain has the potential to fulfill the needs of the ever increasing need for green space in urban areas. For this reason, it is suggested that the area between the hills are used as a recreation area. Instead of a typical landscape arrangement, a part of the area between the natural surroundings and endemic species will be open for use. Taking the insolation trails into account, pedestrian and bike trails, jogging lanes can be opened for use along with camping grounds. Also, multipurpose areas for concerts etc. can be arranged, which will trigger regular use.

Results

Ali Mountain is a well-known and important center for aviation sports. IN order to increase its usage, an Aviation Sports Social Center and building new roads and mechanical systems is important. However, it is also apparent that when the mountain's potential is considered, it will provide social and cultural benefits to its visitors. The surface of the mountain was subjected the fewest construction possible, and it was aimed that a city park was created without affecting the endemic species, and to increase its visibility and usage by adding social aspects for sports, fun and recreation. As an alternative, atv-safari, grass skiing, cross-country skiing, ice skating and biathlon as extreme sports, camping and ballooning. The pedestrian climbing trails along the mountain slopes to its higher levels, new means of transportation and social facilities aims to develop the tourism potential of Ali Mountain.

JEL:R11 Regional Economic Activity: Growth, Development, and Changes
JEL:R52 Land-use and Development

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Vangölü Havzasında Yer Alan Tarihi Yapılarda Kullanılan Harç ve Sıvaların Özellikleri

Ercan IŞIK[1], Abdurezzak BAKIŞ[2],Alev AKILLI [2], Fatih HATTATOĞLU[3], Gökhan ÖZTÜRK[4], Emrullah VELİOĞLU[4]

[1] Bitlis Eren Üniversitesi, Müh.-Mim. Fakültesi, İnşaat Müh. Bölümü,
[2] Bitlis Eren Üniversitesi, Teknik Bilimler MYO, İnşaat Bölümü
[3] Erzurum Atatürk Üniversitesi, Müh.Mim. Fakültesi, İnşaat Müh. Bölümü,
[4] Bitlis Eren Üniversitesi, Fen Bil. Enstitüsü, İnş. Müh. Böl.,

e-posta: ercanbitliseren@gmail.com

Öz: Vangölü Havzası geleneksel tarihsel dokusu ile Osmanlı, Selçuklu ve Urartu medeniyetleri gibi birçok medeniyetin izlerini taşımaktadır. Tarihsel mirasımızın bir sonraki nesillere aktarılabilmesi adına tarihi yapılarda yapılacak müdahaleler önem arz etmektedir. Tarihi yapılarda, yapı malzemelerinin bir arada tutulması için kullanılan harç ve sıvaların özelliklerinin bilinmesi tarihi yapıların korunmasına yönelik yapılacak müdahalelerin ilk adımını oluşturmaktadır. Bu çalışmada havzada yer alan Van ve Bitlis illerinde yer alan tarihi yapılarda kullanılan harç ve sıvaların özellikleri ortaya konulmaya çalışılmıştır.

Anahtar Kelimeler: Vangölü, tarihi yapı, harç, sıva

Properties of the Mortars and Plasters of the Historical Structures in Lake Van Basin

Abstract: Lake Van Basin with its traditional historical fabric bears the traces of many civilizations such as The Ottoman, The Seljukian and The Urartian. In order to convey our historical heritage to the posterity, the involvements to be applied historical structures, to know the properties of mortars and plasters used for holding construction materials together forms the first step of the involvements to protect the historical structures. In this study the properties of mortars and plasters used in historical structures in Van and Bitlis provinces in Lake Van Basin are presented.

Keywords: Lake Van Basin, historical structures, plasters, mortars

Giriş

Van Gölü havzası tarih boyunca birçok medeniyete beşiklik yapmıştır. Van Gölü havzasının bilinen beş bin yıllık tarihinde büyük devletlerden olan Urartu, Ahlatşahlar, Karakoyunlular, Akkoyunlular, Safeviler ve Mervaniler bölgede kurulmuştur. Ayrıca dünyanın en büyük soda gölü olan Van Gölü'nü içermesi, yüksek dağları ve doğal güzellikleri ile hep ilgi çekmiştir (Şekil 1).

Şekil 1. Vangölü Havzası

Birçok medeniyete beşiklik eden bölgede her türlü medeniyete ait çok sayıda tarihi eser bulunmaktadır. Tarihi eserlerin asırlar boyunca ayakta durması bu yapıların yapımında kullanılan malzeme özellikleri ile doğrudan ilgilidir. Özellikle bu yapılarda, yapı malzemelerini bir arada tutan birleşim araçları yani sıvalar ve harçlar önemli bir yer tutmaktadır.

Geleneksel yapı malzemesi olarak kullanılan harç ve tuğlalar oldukça erken tarihlerden beri yapıyı meydana getiren esas malzemelerdir. Bilinen en erken örneklere M.Ö. 3500' lerde Anadolu' nun yakın çevresinde Mısır ve Mezopotamya' da rastlanmaktadır. Eski eserlerde kullanılan harç ve sıvalar, bina yapım sırasındaki ve sonrasındaki işlevleriyle, günümüz yapılarında olduğu gibi tarihi yapılarda da en önemli elemanlardır (Kılınçarslan, 2007). Tarihsel kanıtlar harçların birçok alanda kullanıldığını göstermektedir. Dış ve içi sıvalarda, kaldırım ve mozaikler için destekleyici malzeme, sarnıçlar, kuyular, su

kemerleri, kanallar için astar malzemesi ve yığma yapılarda yaygın olarak kullanılmıştır (Moropoulou, 2000).

Harçlar ve sıvalar bir yapıda yapım sırasında ya da sonrasında üstlenmiş oldukları işlev dolaysıyla, yeni yapılarda olduğu gibi, kültürel mirasımız olan tarihi eselerin üzerinde bilimsel araştırmalar yapılmadan, bilinçsizce ve sadece bilinen güncel yöntemlere dayalı olarak yapılan koruma-onarım çalışmaları telafisi mümkün olmayan hasarlara yol açabilmektedir. Bu tür uygulamaların önüne geçebilmek ve doğru malzemeleri seçebilmek için detaylı bilimsel veriler elde edilmeli, koruma ve onarım çalışmaları genel restorasyon ilkeleri doğrultusunda yapılmalıdır. Koruma ve onarım çalışmalarında amaçlanması gereken asıl hedef eser malzemelerinin nitelikleri ile birlikte eserin yapım tekniklerinin de olabildiğince korunması olmalıdır. Bu da öncellikle eserin üretiminde kullanılan malzeme ile karakterizasyonu ve gerekli analizler sonucunda yapılacak olan doğru teşhis sonucunda projelendirilecek koruma ve onarım yöntemleri ile mümkündür (Güleç, 2013, Altaş,2012).

Venedik Tüzüğünde, tarihi yapıların onarımı ile ilgili olarak belirlenen temel bazıları şunlardır: Onarım uzmanlık gerektiren bir iştir ve amacı anıtın estetik ve tarihi değerini ortaya çıkarmak ve korumaktır. Onarımda, özgün malzeme kullanılmalı, güvenilir belgelere saygı duyulmalı ve bu belgelere bağlı kalınmalıdır. Koruma, onarım ve güçlendirme işlemlerinde, geleneksel tekniklerin yetersiz kaldığı durumlarda bilimsel deneylerle saptanmış çağdaş yöntemlerden yararlanılabilir. Eksik kısımlar tamamlanırken yenilenen kısım bütünle bağdaşmalı ancak onarım yapılan bölge, sanatsal ve tarihi tanıklığı yanıltmamak amacı ile özünden ayırt edilebilir nitelikte olmalıdır (Aköz, 2009).

Tuğla kırığı ve kireç kullanılarak hazırlanan horasan harcı ve sıvaların tarihi yapıların inşasında kullanılan en önemli bağlayıcı malzemelerdendir. Tarihi yapılarda yapılacak her türlü müdahaleden önce bağlayıcı malzemelerin özelliklerinin bilinmesi ve bu özellikte harç ve sıva üretilerek koruma çalışmaları bir anlam kazanacaktır (Böke, 2004).

Ülkemizde Selçuklular ve Osmanlı dönemlerinde inşaa edilen ve değişik dönemlerde restorasyonları yapılarak halen kullanılmakta olan birçok tarihi yapı bulunmaktadır. Bu yapıların tarihsel değerlerini koruyabilmeleri için restorasyonlarının aslına uygun elaman ve malzemelerle yapılması gerekmektedir. Bu sebeple restorasyon çalışmalarında orjinal yapıya uyan malzemeler kullanılmalı ancak malzemelerin performansı da yeterli olmalıdır (Kanıt, 2004)

Horasan harcı, taş blokları birbirine bağlayabilmek için, eski Türk mimarisinde, özellikle Osmanlı dönemi mimarisinde oldukça yaygın bir şekilde kullanılmıştır. Eski mimari dönemin taşı-yıcı sistemleri olan kemerler ve kubbelerin başarılı bir şekilde yapılabilmesi, Horasan harcı sayesinde olmuştur.

Horasan harcının tam olarak muhtevası bilinmemekle birlikte içerisinde, kil, kireç, taş tozu, taş kırıntıları, mermer tozu, su, keçi kılı ve hatta yumurta akı bulunduğu tarihi kayıtlardan anlaşılmaktadır. Bununla birlikte harcın içeriğinin yöresel uygulamalarda değişiklik gösterebildiği bilinmektedir (Kanıt, 2004).

Bu çalışmada Vangölü havzasında yer alan tarihi yapıların bazılarına ait analizler sonucu elde edilen özgün harç ve sıvaların karakterizasyonu ortaya konulmaya çalışılmıştır. Bu yapılara ait bağlayıcı malzemelerin kimyasal, fiziksel ve mekanik özellikleri tespit edilerek literatüre kazandırılması amaçlanmıştır.

İncelen Yapılar ve Deneysel Çalışmalar

Bu çalışmada incelenen binalar Başbakanlık Vakıflar Genel Müdürlüğü, Bitlis Vakıflar Bölge Müdürlüğüne bağlı bulunan ve Vangölü havzasında yer alan Bitlis ve Van illerinde yer alan tarihi eserlerdir. Bunlar sırası ile Van Ulu Camii, Van Kızıl Camii, Van Abbasağa Camii, ve Bitlis ilinde yer alan ve Büyük İskender tarafından inşa ettirilen Bitlis Kalesi'nde kazı çalışmalarında ortaya çıkarılan hamam yapısıdır. Bu yapılar ile ilgili harç ve sıva özellikleri Başbakanlık Vakıflar Genel Müdürlüğü, Bitlis Vakıflar Bölge Müdürlüğünce yaptırılan bilimsel analizler kullanılarak elde edilen raporlardan alınmıştır.

Harç ve sıva özellikleri belirlenirken öncellikle örnekler alınmış ve görsel analiz gerçekleştirilmiştir. Malzemenin rengi, dokusu, dayanımı, agrega boyut ve dağılımı gibi dış görünümü (çıplak gözle veya binoküler mikroskop kullanılarak) tarif edilmektedir (Tablo1).

Tablo1. Harç ve sıva numunelerin görsel özellikleri

Örnek No	Örneğin Alındığı Yapı	Örnek Tipi	Özellikler	Dayanım
1	Ulu Camii	Harç	Koyu gri renkte, orta sert dokuda, görünür ince agregalı, kısmen gözenekli yoğun kireç lumpları ve tüfik agrega içermekte	Sert ve sağlam elle koparılabilir ancak dağılmaz
2a	Ulu Camii	Sıva	İki tabakadan oluşmakta; altta olan kalın tabaka, açık gri renkli, orta sert dokuda, görünür ince agregalı, gözeneksiz, kireç-sıva tabakası;	Sert ve sağlam elle koparılabilir ancak dağılmaz
2b	Ulu Camii	Sıva	2a numunesinin üst tabakasında yer alan gri renkli sert dokulu, gözeneksiz, görünür ince agregalı, düzeltme kireç sıva tabakası	Sert ve sağlam elle koparılabilir ancak dağılmaz
3	Kızıl Camii	Sıva	Krem renkte, sert dokulu, gözeneksiz, görünür ince agregalı	Sert ve sağlam elle koparılabilir ancak dağılmaz
4	Kızıl Camii	Harç	Gri renkte, orta sert dokuda, görünür ince agregalı, kısmen gözenekli, yoğun kireç kumpları içeren yer yer tüfik agrega ile çakıl parçacıkları görünmekte,	Sert ve sağlam elle koparılabilir ancak dağılmaz

5	Abbasağa Camii	Sıva	Krem/ebru renkte, yumuşak dokulu, gözeneksiz, görünür ince agregalı, ince sıva tabakası	Dağılganlığı az, elle kolayca parçalanabilir.
6	Abbasağa Camii	Harç	Gri renkte,yumuşak dokuda, görünür ince agregalı, kısmen gözenekli,yer yer kireç kumpları içeren görünür ince agregalı	Sert ve sağlam elle koparılabilir ancak dağılmaz
7	Bitlis Kalesi Hamam	Harç	Açık gri/ekru renkte, sert dokulu gözeneksiz görünür ince agregalı fakat yer yer iri taş parçacıkları içeren derz harcı	Çok sert zorlukla elle koparılabilir.

Alınan örnekler üzerinde ayrıca kimyasal analizler gerçekleştirilmiştir. Bu analizler ile malzeme içindeki kireç, organik madde ve nem miktarları tespit edilebilmektedir. Malzeme içindeki kireç oranının tespiti için; kızdırma kaybı (kalsinasyon) ile asit testi analizleri yapılmıştır (Tablo 2). Bu analizden amaç malzemede sürekli artan sıcaklığa bağlı olarak meydana gelen ağırlık değişiminden yararlanarak nem, molekül suyu (bağıl su) ve organik madde miktarının belirlenmesi ile CO_2 kaybından $CaCO_3$ miktarının hesaplanmasıdır (Güleç, 2013).

Tablo 2. Örneklerin kızdırma kaybı, asit kaybı ve elek analiz sonuçları

Örnek No	**Asitte Kayıp**	**Elek Analizleri (%)**					**Kızdırma Kayıpları**			**Spot Testler**	
	%	1180µ	600µ	250µ	125µ	<125µ	%Nem	%Org	%$CaCO_3$	$(SO_4)^{-2}$	Cl^-
1	73,66	17,11	15,21	30,80	17,11	19,77	12,09	15,85	45,74	+	+++
2a	68,24	13,17	13,41	34,15	30,73	8,54	2,04	3,48	58,63	+	+
2b	63,44	0,00	37,15	31,81	27,23	3,82	11,67	3,57	33,68	++	+
3	60,12	0,00	30,62	39,74	24,10	5,54	15,97	3,47	17,36	+++	++
4	45,70	38,42	18,40	24,94	11,12	7,08	1,09	4,02	52,11	-	++
5	73,77	0,00	15,29	34,39	38,85	11,46	25,59	6,66	18,90	+++	+
6	73,50	7,65	25,29	40,59	20,59	5,88	20,92	5,98	17,96	+++	+
7	52,33	11,98	2,99	7,19	19,76	58,08	2,58	16,83	27,80	-	+

-: Yok; +: Az var; ++: Var; +++: Fazla var

Günümüzde inşaat işlerinde yapılacak olan sıvalar ile ilgili karışım oranları sıva işleri ve uygulamaları teknik şartnamelerinde verilmektedir (Tablo 3).

Tablo 3. Kum Granülometrik Özellikleri

Sınıflar	Ağırlıkça Elekten Geçen (%)		
	İnce Sıva	Kaba Sıva	Yüzey Arttırıcı Sıva
Elek Açıklığı (mm)	İnce Kum (0/2)	Orta Kum (0/4)	Kaba Kum (0/8)
1	90 - 100	40 – 85	35 – 75
0,500	(1)	(1)	25-55
0,250	(1)	(1)	10-30
0,125	10-25	10-25	2-10
(1) Sınıflandırılmamıştır.			

Analizler sonucunda incelenen tarihi yapılarda kullanılan harç ve sıvaların günümüz teknik şartnamesi ile uyumlu olduğu gözlemlenmektedir.

Çalışma kapsamında sekiz adet yapıdan alınan örnekler incelenmiştir. Bu örneklerin genel özelliklerinin benzer olduğu, kullanılan agregaların birbirlerine benzediği ancak kullanılmış olan agregaların özellikle de taş tozlarının boyut dağılımında farklılıklar görülmektedir. Bazı örneklerde az miktarda da olsa tüfik agrega cüruf parçacıkları kullanıldığı deneysel sonuçlardan görülmektedir. Örnekler üzerinde yapılan analiz sonuçlarına bakılarak agrega olarak kullanılan ince dere kumu %25-%50 arasındadır. Deneysel çalışmada üretilen harçlarda maksimum dane boyutu 1,18mm olan standart kum kullanılmıştır. Yapılardan alınan örnekler üzerinde yapılan kızdırma kaybı analizi ile haç ve sıvalarda sürekli ortam sıcaklığına bağlı olarak meydana gelen ağırlık değişiminden yararlanılarak nem, CO_2 kaybından ve $CaCO_3$ miktarı saptanmıştır. Kalsinasyon analiz sonuçlarına göre harç malzemesi olarak kullanılan örneklerdeki $CaCO_3$ oranları %17,96-%52,11 arasında değişmektedir. Sıva malzemesi olarak kullanılan örneklerin ise %17,96-%58,63 arasında olduğu tespit edilmiştir. Örneklerin asit kaybı ile ilgili işlemlerde elde edilen asitle reaksiyona giren kısımların oranlarında %52,33-%73,77 arasında değerler almaktadır. Yapılmış olan spot testlere göre 3,5 ve 6 nolu örneklerde $(SO_4)^{-2}$ 'ün fazla miktarda bulunduğu; 4 ve 7 nolu örneklerde $(SO_4)^{-2}$ 2 'ün bulunmadığı; Cl^- 'ün 1 nolu örnekte fazla miktarda olduğu 2a, 2b, 5,6 ve 7 nolu örneklerde

ise az miktarda olduğu tespit edilmiştir. Örnekler üzerinde bulunan $(SO_4)^{-2}$ tuzunun fazla olması alçı bağlayıcılardan meydana gelmesinden kaynaklandığı anlaşılmaktadır.

Yapılardan alınan örneklerde elde edilen deneysel sonuçlara göre bu yapılarda tespit edilen ve onarım-koruma işlemleri yapılırken kullanılması tavsiye edilen bağlayıcı ve agrega oranları aşağıda verilmiştir (Tablo 4).

Tablo 4. Tespit Edilen/Tavsiye Edilen Karışım Değerleri

Örnek No	Örneğin Alındığı Yapı	Tespit Edilen/Onarımda Kullanılması Tavsiye Edilen Karışım Değerleri
1	Ulu Camii	%33-35 Sönmüş ve bekletilmiş kireç %40-40 Taş tozu %23-25 Yıkanmış ince dere kumu Az miktarda tüfik agrega/cüruf parçacıkları tespit edilmiştir.
2a	Ulu Camii	%33-35 Sönmüş ve bekletilmiş kireç %33-35 Taş tozu %28-30 Yıkanmış ince dere kumu
2b	Ulu Camii	%32-33 Sönmüş ve bekletilmiş kireç %28-30 Taş tozu %35-37 Yıkanmış ince dere kumu
3	Kızıl Camii	%28-30 Sönmüş ve bekletilmiş kireç %28-30 Taş tozu %38-40 Yıkanmış ince dere kumu
4	Kızıl Camii	%33-35 Sönmüş ve bekletilmiş kireç %13-15 Taş tozu %48-50 Yıkanmış ince dere kumu Az miktarda tüfik agrega/cüruf parçacıkları ve çakıl parçacıkları tespit edilmiştir.
5	Abbasağa Camii	%33-35 Sönmüş ve bekletilmiş kireç %40-40 Taş tozu %23-25 Yıkanmış ince dere kumu Az miktarda tüfik agrega/cüruf parçacıkları tespit edilmiştir.
6	Abbasağa Camii	%33-35 Sönmüş ve bekletilmiş kireç %33-35 Taş tozu

		%28-30Yıkanmış ince dere kumu
7	Bitlis Kalesi Hamam	%32-33 Sönmüş ve bekletilmiş kireç %28-30Taş tozu %35-37 Yıkanmış ince dere kumu Az miktarda tüfik agrega/cüruf parçacıkları tespit edilmiştir.

Sonuçlar

Yapılan çalışma ile tarihi dokusu ile ülkemizin önemli havzalarından biri olan Vangölü Havzasında yer alan tarihi eserlerde kullanılan harçlar ve sıvaların özellikleri ortaya konulmaya çalışılmıştır. Havzada yer alan bazı tarihsel yapılarda kullanılan harç ve sıvaların bağlayıcı, agrega ve katkılarının niteliklerinin ve oranları tespit edilmiştir. Yapılmış olan analizlerden elde edilen bilgiler ışığında yapılacak olan onarım-koruma işlemlerinde kullanılacak olan harç ve sıvalar için öneriler yapılmıştır. Genel olarak %30-35 oranında söndürülmüş ve bekletilmiş kireç bağlayıcı malzeme olarak kullanılmıştır. İnce agrega olarak taş tozu kullanılmıştır. Katkı malzemesi olarak da tüfik ve agrega ve cüruf parçacıkları kullanılmıştır. Sonuç olarak havzada yer alan bazı tarihi yapılara ait alınan örnekler üzerinde yapılan analizlerle, bu yapılarda kullanılan harç ve sıvaların bağlayıcısı, dolgusu ve katkısı tespit edilmiştir. Elde edilen bu sonuçlara göre harç, sıva ve derz karışımları için öneriler getirilmiştir.

Tarihsel ve kültürel mirasımızın korunması anlamında tarihi yapılarımız önem arz etmektedir. Tarihi yapılara yapılacak onarım ve koruma işlemlerinde, bu yapıları asırlar boyu ayakta tutan harçlar ve sıvalar ile ilgili işlemler yapılırken özelliklerinin bilinmesi yapılacak müdahalelere anlam katacaktır.

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Economic Analysis and Suggestions For Roof Damages in Region Subjected to Heavy Snowfalls

Ercan IŞIK, Abdurrezzak BAKIŞ, Alev AKILLI, Fatih HATTATOĞLU, Gökhan ÖZTÜRK, Emrullah VELİOĞLU

Abstract: Our country often suffered from natural disasters due to its topographic structure, geological and climate characteristics. Addition to loss of life, natural disasters also caused to significant economic losses for Turkey. Bitlis frequently suffered from natural disasters due to its negative topographic structure, geological and climate characteristics. Bitlis is the province centre that is getting the maximum snowfall in Turkey. The absence of heavy snowfall in winter months increases the risk of natural disasters. In this situation, Bitlis is worthy to be evaluated by natural disaster. It was not possible to predict natural disaster yet. Knowing disaster risks are very important in terms of minimizing the possible economic and life losses and taking necessary precautions for before, during and after the disasters. Recently modern disaster management was emphasized disaster preparedness but also importance of disaster prevention. Because, the losses from natural disasters that may occur in urban centres has been a size that able to roll even. Heavy snowfall is one of these natural disasters. Bitlis is the province Centre getting the maximum snowfall in Turkey. According to heavy snowfalls there can be avalanches, snow accumulation on roofs, icicle stalactites of ice formation. These have been adversely affected the life of the people and arise serious transportation problems. Also the roof collapses and damage occur due to heavy snowfalls. Generally, the roof covers the building as an umbrella although it completes the building/structure concept and is also a main structural system from an architectural point of view. Particularly, the roof shape and the dimensions are of importance during the design stage of the building. It gives attractive figure to the building in terms of beauty. When dimensioning, cross-section of roof load bearing elements should be designed in such a way that building code regulations have to be met; and these should be indicated on the roof project. Building controllers or associations should inspect the building according to the building code of practice as well as the system of roof structure. In this study, widespread roof damages due to the heavy snowfalls and the recommendations to prevent from such damages are given for the buildings in Bitlis. It is outlined that the code of practice has not been taken into account for the construction of timber roof system; the connection between the timber elements have not been tightly fitted into each other; cross-section of timber elements have not been used according to the standards; and care has not been given for the timber roof structure. Roof snow load depends on factors such as roof exposure to wind and sun, roof geometry, thermal losses from the building and roof materials. However, the roof snow load in practice is determined according to ground snow load in the building area. A new ground snow load map should be created for the whole of Turkey. The shape of the roof but also to include other properties of the roof will be taken into account for roof design. Correct calculation of the snow load is important, especially for roof design. Also knowing the real snow load value has been minimized the roof collapses or damage occurred due to heavy snowfalls.

Keywords: Bitlis, snowfalls, TS498, roof damage, Economic Analysis

Giriş

Binayı üstten gelen kar, yağmur, rüzgar, sıcak soğuk gibi dış tesirlere karşı korumak, estetik bir güzellik ve bütünlük kazandırmak amacı ile inşa edilen yapı elemanlarına çatı denilmektedir. Çatılar sadece ahşap, çelik, betonarme malzemelerden veya bu malzemelerin birlikte kullanılması ile inşa edilebilirler. Çatının şekline yörenin iklim koşulları etkimektedir. Binanın şekli, cinsi oturacağı mesnet durumu çatının şekil ve cinsinin tespit edilmesinde dikkat edilecek hususlardır. Çatıyı dış tesirlere karşı korumak için örtü kısmı ile kar ve rüzgar yükünü taşıyan taşıyıcı kısımdır. Çatı üzerine düşen kar ve yağmur sularını en kolay ve en iyi bir şekilde uzaklaştırmalıdır. Çatının üzerine gelen yağmur ve kar sularını nakletmeye yarayan dere oluk ve düşey borular çatının tamamlayıcı kısımlarıdır (Gürer, 2001). Çatı her ne kadar genelde binanın üstünü örten bir yapı elemanı ise de, yapı/bina kavramının tümleyicisi ayrıca mimari bütünlüğün sağlanmasında ana elemanlardan biridir. (Fırat,2007)

Bitlis'te aşırı kar yağışlarından dolayı çığ, kar savruntusu, özellikle düz ve toprak çatılarda kar birikimi ve saçaklarda sarkıt buz oluşumu yüzünden yerleşim birimlerinde, hem şehir merkezinde, hem de kırsal kesimde yaşayan insanların hayatları olumsuz yönde etkilemektedir. Bunun sonucu olarak ciddi ulaşım sorunları ortaya çıkmakta, ölümlü trafik kazalarına sebebiyet vermekte, çatılar hasar görmekte ve enerji hatları tahrip olmaktadır. Kar yağışı genel olarak Kasım ayının ilk haftasında başlamakta ve ilkbahar mevsimi ortalarına kadar devam etmektedir. Nisan ayının son haftasında ise yağış yerini biriken karların erime sürecine bırakmaktadır. Sene içerisinde yağış döneminin bu denli uzun olması Bitlis'te risk süresini arttırmaktadır (Işık v.d., 2012).

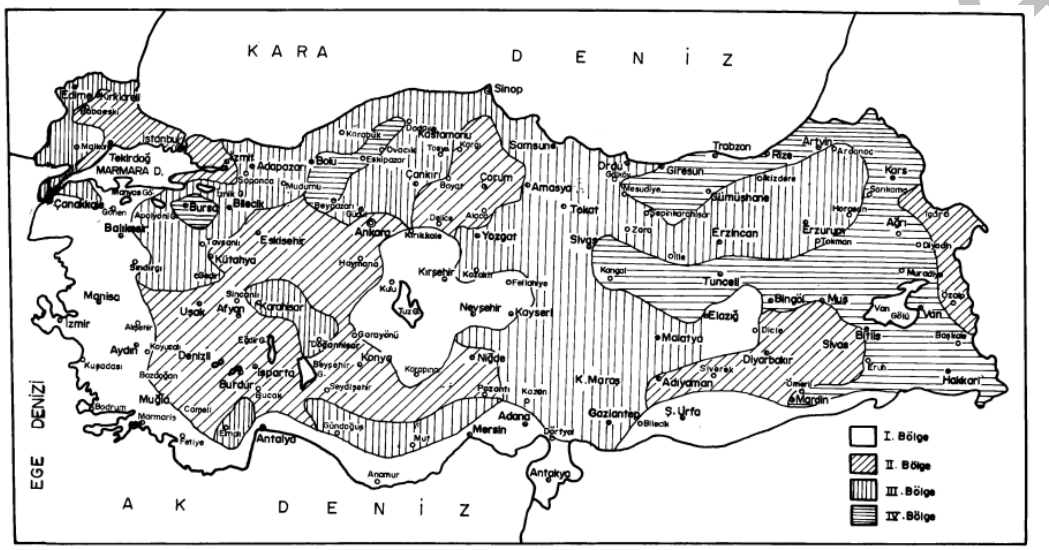
Bu çalışmada aşırı kar yağışına maruz kalan Bitlis ilindeki kar yüklerinden dolayı çöken çatılarda meydana gelen hasarlar irdelenmiş ve çözüm önerileri sunulmuştur. Çalışmada ayrıca kar yağışından çöken bir çatının ekonomik kayıpları ortaya konulmaya çalışılmıştır. Bu çalışma ile aşırı kar yağışına maruz kalan bölgelerde inşa edilecek çatılarda oluşabilecek hasarların ekonomik kayıplarının en aza indirgenmesi yönelik önerilerin sunulması amaçlanmaktadır.

Metodoloji

Yapı elemanlarının savunmasızlığı arttıkça, yapı elemanına etkiyen yüklerin oluşturacağı hasar miktarı artmaktadır. Yapı elemanlarına etkiyen yüklerin büyüklüğü ve yapıların yeterli düzeyde güvenliğinin sağlanmamış ve yönetmeliklerde belirtilen şartlara uygun yapılmamış olması oluşabilecek zararı doğrudan etkileyecektir.

Çatı tasarımı yapılırken dikkat edilecek yükler çatının öz ağırlığı, kar yükü, buz yükü, rüzgar yükü, ısı değişim yükleri, kren yükü, deprem yükü ve ilave yükler olarak tanımlanabilir. Çatılara etkiyen öz ağırlık yükleri; çatı örtüsü ağırlığı, aşık, rüzgar bağlantıları ve makas öz ağırlığıdır. Bazı özel durumlarda; tesisat ve aydınlatma elemanları, asma tavan yükleri, kren, vinç vb. diğer etkenler de öz ağırlık yükü olarak dikkate alınır. Bu çalışma ile çatının öz ağırlığı haricindeki ilave yükler kapsamında değerlendirebileceğimiz kar yükünü dikkate alarak çöken bir çatı üzerinden meydana gelen ekonomik kayıplar tespit edilerek, çatılar için çözüm önerileri sunulmaktadır. Bitlis şehir merkezinde kar yağışının çok yoğun olmasından dolayı yapılar üzerinde yaklaşık olarak 0.80-1.50 m arasında değişkenlik gösteren kar birikintileri olmaktadır. Bunun sonucu olarak çatılar çökmekte veya hasar görmektedirler. Bu bağlamda aşırı kar yağışına maruz kalan bölgelerde çatı tasarımı yapılırken öncellikle kar yüklerinin gerçekçi olarak belirlenmesi ve karın çatı üzerinde birikimini etkileyecek faktörler de dikkate alınmalıdır. Çatı üzerinde biriken karlar çatı örtüsü ve çatı karkas elemanlarına zarar vererek zaman zaman ekonomik kayıplara sebebiyet vermektedir.

Çatılarda kar birikmesi, çatının şekli, eğimi, yönü, çatı kaplama malzemesinin pürüzlülüğü, yapıya ve güneş ışınımına bağlı ısıl geçişler gibi her çatı için farklılıklar gösterebilecek çok sayıda faktöre bağlıdır. Bu faktörlerden dolayı çatı kar yükününün belirlenmesi zorlaşmaktadır. Çatı kar yükü, karın çatı üzerinde birikimini etkileyen faktörlere bağlı olarak elde edilen boyutsuz dönüştürme katsayıları ile zemin kar yükünün çarpılması sonucu elde edilen tasarım yüküdür. Çatı kar yükünün hesabında temel bileşen olan zemin kar yükü bölgeden bölgeye değişir. Herhangi bir bölgeye ait zemin kar yükü, o bölgeye ait yıllık ekstrem kar yükü verilerinin istatistiki analizinden elde edilmelidir. Boyutsuz dönüştürme katsayıları ise birçok ülkede kış mevsimleri boyunca zeminde ve çatıda düzenli olarak elde edilen kar yükü verilerinin ve laboratuvarda yapılan çalışmalarda kaydedilen verilerin analizleri sonucu saptanmış ve yapı standartları içinde verilmiştir. Kar yükünün hesap esasları, zemin kar yükü değerleri ve dönüşüm katsayıları TS498/1997 ve TS EN 1991-1-3/2007 de verilmiştir. Kar yağışının en çok olduğu il merkezi konumundaki Bitlis şehir merkezi mevcut kar yükü haritasında dördüncü derece kar yükü bölgesinde yer almaktadır (Şekil1).



Şekil 1. Türkiye için kar haritası

Bitlis için bazı yıllara ait maksimum kar yüksekliği değerleri Tablo 1'de verilmiştir.

Tablo 1: Bitlis için Bazı Yıllara ait Yıllık Ortalama Maksimum Kar Yüksekliği

Yıllar	2000	2003	1985	2006	1982	1993	1987	2012	2013	1992
h (cm)	161	170	200	212	217	235	246	250	250	275

İncelenen Çatılarda Meydana Gelen Hasarların Analizi

Her yıl kış mevsiminin yoğun yaşandığı bölgelerde, çatılar aşırı kar yükünden dolayı çökmekte veya hasar görmekte, can ve mal kayıpları meydana gelmektedir. Türkiye'de de şehir merkezi olarak en çok kar yağışı alan Bitlis'te de aşırı kar yağışından dolayı oluşan kar yükleri altında çatılar çökmekte veya hasar görmektedir. Çökme nedenleri genel olarak proje ve uygulama hatalarından kaynaklanmaktadır ve kar yükü bu hataları açığa çıkarmaktadır. Yönetmeliklerde verilen kar yükü hesabına esas değerler minimum değerlerdir. Tasarım yapılırken

mühendis veya ilgili teknik uzmanların mikro ölçekte çalışma yaparak verileri değerlendirmeli, tasarım yapılırken değerleri arttırma yoluyla güncellemedir. Çöken ahşap çatılara ait resimler Şekil 2'de gösterilmiştir.

Şekil 2. Çöken ahşap çatı

Kar yağışı Bitlis il merkezinde mikro ölçekte farklılıklar göstermektedir. Şekil 2'de gösterilen yapı Bitlis şehir merkezinde Rahva denilen mevkiide bulunmaktadır. Rahva Mevkii'si Bitlis içinde en fazla kar yağışının olduğu bölgedir. Rahva mevkiisi mikro ölçekte şehir merkezinden farklılıklar göstermektedir.

Çatılarda hasarlara ve çökmeye sebebiyet veren faktörler;

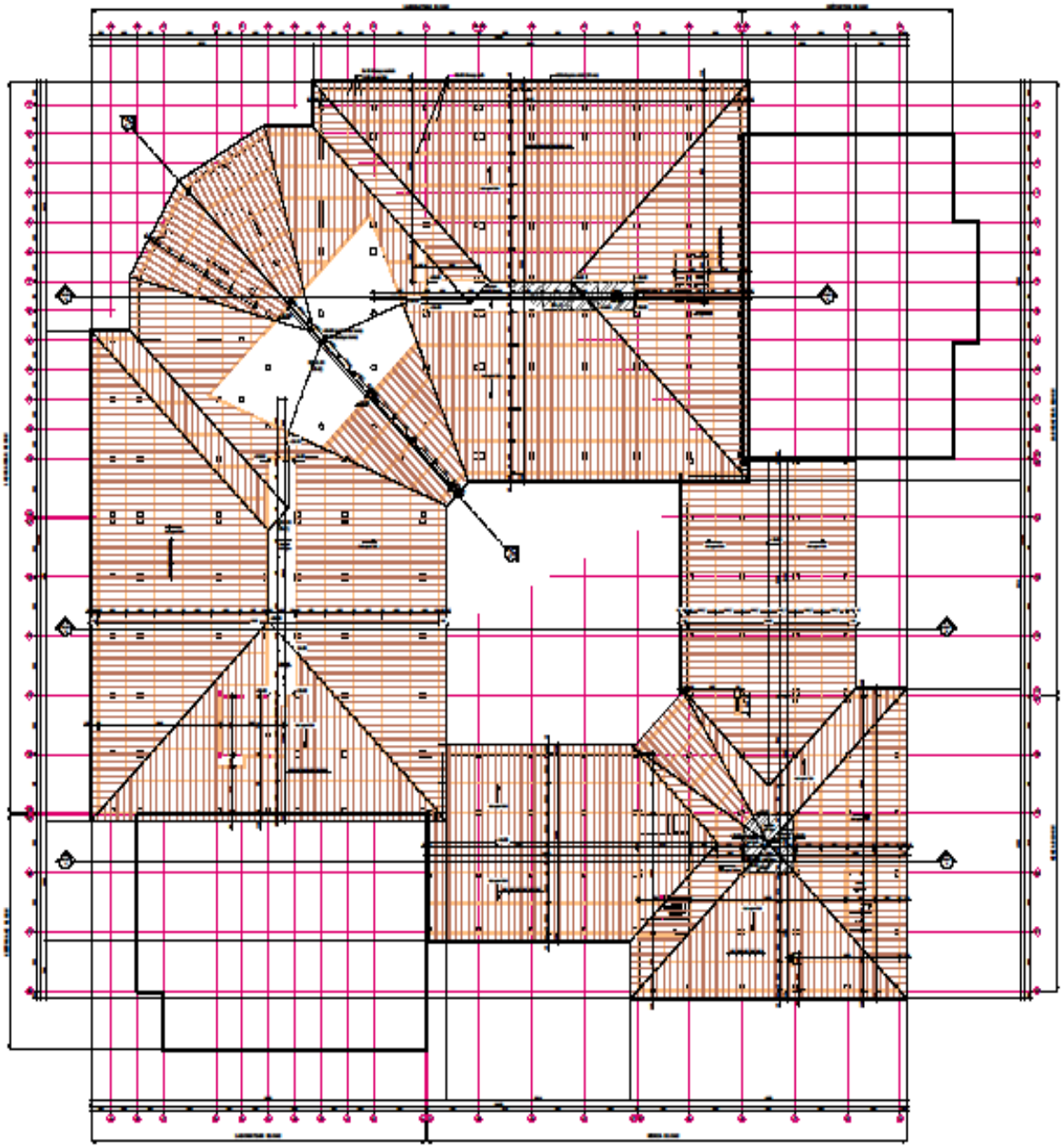
- Çatılarda kullanılan yetersiz bağlantı noktaları
- Özellikle ahşap çatıların binaya veya döşemeye yetersiz bağlanması, ana taşıyıcı iskeleti oluşturan sistemin kendi içindeki yetersiz düğüm noktaları
- Ahşap çatıların büyük çoğunluğunda kalıp vb. imalatta kullanılmış kerestenin kullanılması,
- Çatı makaslarının yapım kurallarına uygun imal edilmemesi
- Çatı saçak uçlarında yapılması gereken bağlantıların yapılmaması
- Çatıyı oluşturan elemanların birleştirilmesinde kullanılan çivileme işleminde tekniğe uyulmadan gelişi güzel çivileme yapılması
- Çatı sistemlerinin kenetli olarak yapılmaması
- Çivileme işlemi yapılırken ne kadar, nerelere ve nasıl olması gereği bilinmeden çakıldığı için çivilerin tuttuğu düğüm noktalarında yük aktarımı gerçekleştirilememiş olması
- Çatı detay çözümlerinin tekniğine uygun olarak yapılmaması
- Çatılarda zorunlu sebeplerden dolayı taşıyıcı elemanların birbirine eklenmesi yapılırken yapım tekniklerine uyulmaması
- Betonarme döşeme üzerine oturtulan çatı dikmelerinin betonarme döşemeye çivileme yoluyla tutturulmaya çalışılmış olması
- Yastık görevini yapan ahşapların kullanılmaması ya da sadece her dikmenin altına bütünlük sağlayacak şekilde değil de ayrı ayrı takozlar şeklinde konulmuş olması
- Çatı dikmelerinin gelişi güzel konulması, mesafelerin dengesizliği, simetrinin olmaması, kesitlerinin farklılığı ve dikmeler arasında hiçbir bağlantının yapılmamış olması
- Çatı elemanlarında kesitlerin yetersizliği ve hatalı çatı makası örnekleri
- Kalitesiz işçilik
- Dayanımı düşük veya uygun olmayan malzeme kullanımı

- Yetersiz çatı eğimi, farklı eğim nedeni ile kar yükü aynı çatılarda bölgesel olarak farklılık arz etmesi ve bunun projelendirme aşamasında dikkate alınmaması
- Kar yüklerinin çatı planında dağılımı belirlenmeden çatının projelendirilmesi
- Çatı ve saçaklarda oluşması muhtemel buz yükleri
- TS498/1997 verilen kar yüklerinin yeterliliği, Aydın ve vd. (2014) yaptığı çalışmada Bitlis için verilen kar yüklerinin gerçekçi olmaması
- Projelendirme sırasında bölgenin mikro klima özelliklerinin dikkate alınmaması ve direkt olarak yönetmeliklere bağlı kalarak en az % 33 olan çatı eğiminin sürekli olarak %35 seçilmiş olması
- Çatı yüksekliğinin fazla olması durumlarında bile standart ahşap çatı sisteminin tercih edilmesi
- Projesine uygun olmayan kesitlerin kullanılması
- Bilgisayar yazılım programlarına aşırı güvenilmesi
- Çatılarda biriken kar yüksekliğin mikro ölçekte bölgesel olarak değişmesi
- Çatı kar yükleri için etkiyen faktörlerin çok olması
- Çatılarda bakımın ihmal edilmesi
- Kar yağışının yoğun olduğu yerlerdeki az eğimli çatı sistemlerinde karın çatı uç noktalarında birikmesi
- Mikro ölçekte çok yoğun kar alan bölgelerdeki yapıların, mimari kaygılarla çok fazla girinti/çıkıntı içermesi ve bu bölgelerin Şekil 2'de olduğu gibi kar birikmesine sebebiyet vermesi

Çöken Çatı ile İlgili Maliyet Hesaplamaları

Bir yapının toplam maliyeti; ihtiyacın belirlenmesi ile başlayan, yapının servis ömrü boyunca devam eden ve servis ömrünün sona ermesi ile ortadan kaldırma maliyeti de dâhil tüm süreçlerde yapılan harcamalardan oluşan maliyet olarak ifade edilebilir (Özgan, 2007).

Herhangi bir inşaata başlanmadan önce yapı maliyetinin çıkarılması işine ön keşif ve keşif sonunda bulunan değere de yaklaşık maliyet denilmektedir. Projeler hazırlanmadan veya proje hazırlığının ilk aşamalarında, yapının toplam inşaat alanı ve inşaat niteliği ile ilgili bazı ön tespitler yapılarak ve bazı kabullere dayanılarak yaklaşık yapı maliyeti hesaplanabilmektedir (Pancarcı, 2002). İncelenen yapının inşaat alanı hesaplanırken kalıp planı ve yerinde ölçümler dikkate alınmıştır (Şekil 3).



Şekil 3.İncelenen çatıya ait kalıp planı

Çatının ahşap olarak inşa edilmesi durumunda yapım maliyetine esas metraj cetveli ve yapım maliyeti aşağıda verilmiştir (Tablo 2-3).

Tablo 2. Çatının yapım maliyetine esas metraj cetveli

Poz no	Tanımı	Ölçü	Çoğu
18.233	Ahşap çatı üzerine 0,50 mm kalınlıkta bakır levhadan çatı örtüsü yapılması	m²	9.875,15
Y.21.101/01	Ahşaptan oturtma çatı yapılması (çatı örtüsü altı tahta kaplamalı)	m²	9.875,15

Tablo3. Çatının yapım maliyeti

Sıra	Poz no	Tanımı	Ölçü	Miktarı	Birim Fiyatı	Tutarı (TL)
1	18.233	Ahşap çatı üzerine 0,50 mm kalınlıkta bakır levhadan çatı örtüsü yapılması	m²	9.875,15	125,95	1.243.775,14
2	Y.21.101/01	Ahşaptan oturtma çatı yapılması (çatı örtüsü altı tahta kaplamalı)	m²	9.875,15	59,35	586.090,15
2014 Yılı Birim Fiyatları ile Toplam Toplam :						**1.829.865,29(TL)**

Çöken ahşap çatının yerine çelik çatı yapılması durumunda metraj cetveli ve yapım maliyeti aşağıda verilmiştir (Tablo 4-5).

Tablo 4. Çelik olarak tasarlanacak çatının yapım maliyetine esas metraj cetveli

Poz no	Tanımı	Ölçü	Çoğu
18.194	Her türlü ahşap çatı sökülmesi	m²	9.875,15
18.198/09/Ö1	Kenetli sac ve bakır çatı örtüsü sökülmesi	m²	10.309,95
18.233/5B	Mevcut ahşap, çelik, betonarme kiriş veya aşıklı çatı üzerinde 0.70 mm kalınlığında trapezoidal alüminyum levhalar (EN AW 1050A, Al 99,5) ile çatı örtüsü yapılması	m²	10.228,76
ÖZEL-1	Çatı arası zeminine 3 cm kalınlığında sprey poliüretan köpük yapılması	m2	9.875,15
Y.18.461/006	3 mm kalınlıkta elastomer esaslı (-20 soğukta bükülmeli) polyester keçe taşıyıcılı polimer bitümlü örtüler ile iki kat su yalıtımı yapılması	m²	10.228,76
Y.21.101/06	Çatı üzerine OSB/3 kaplama yapılması	m²	10.228,76
Y.23.081	Profil demirlerinden çatı makası yapılması ve yerine konulması.	Ton	438,662

Tablo 5. Çelik olarak tasarlanacak çatının yapım maliyeti

Sıra	Poz no	Tanımı	Ölçü	Miktarı	Birim Fiyatı	Tutarı (TL)
1	18.194	Her türlü ahşap çatı sökülmesi	m²	9.875,15	12,49	123.340,62
2	18.198/09/Ö1	Kenetli sac ve bakır çatı örtüsü sökülmesi	m²	10.309,95	6,53	67.323,99
3	18.233/5B	Mevcut ahşap, çelik, betonarme kiriş veya aşıklı çatı üzerinde 0.70 mm kalınlığında trapezoidal alüminyum levhalar (EN AW 1050A, Al 99,5) ile çatı örtüsü yapılması	m²	10.228,76	34,54	353.301,34
4	ÖZEL-1	Çatı arası zeminine 3 cm kalınlığında sprey poliüretan köpük yapılması	m2	9.875,15	31,5	311.067,23
5	Y.18.461/006	3 mm kalınlıkta elastomer esaslı (-20 soğukta bükülmeli) polyester keçe taşıyıcılı polimer bitümlü örtüler ile iki kat su yalıtımı yapılması	m²	10.228,76	27,43	280.574,86
6	Y.21.101/06	Çatı üzerine OSB/3 kaplama yapılması	m²	10.228,76	21,86	223.600,67
7	Y.23.081	Profil demirlerinden çatı makası yapılması ve yerine konulması.	Ton	438,662	3.513,30	1.541.151,20
		N.YF.26 Profil nakli	Ton	469,807	85,41	40.126,22
2014 Yılı Birim Fiyatları ile Toplam : 2.940.486,13TL						

Sonuçlar ve Çözüm Önerileri

Kar yağışının yoğun olduğu, birden fazla dikdörtgenden oluşan ve eğimin az olduğu çatı sistemlerinde kar çatı uç noktalarında birikmektedir. Çatı kaplaması olarak kullanılan saç levhalar çatı uç noktasından15 cm fazla olması durumunda, kar kütlesinin uçlarda birikmesi de göz önüne alındığında oluşan bu ağırlık nedeni ile sac uçlarının eğildiği ve zamanla buzullaşan kar kütlesinin eğilen bu saç kütlesine bir kanca gibi tutarak bir bütünlük oluşturduğu gözlenmiştir. Daha sonra yağan kar kütlesi için de bir yastık görevi gördüğü görülmüş ve geriye doğru bir yığılmaya neden olduğu gözlenmiştir. Havaların ısınması ile birlikte çatıda var olan buz kütlesi ile saç arasındaki aderansın azalması nedeniyle kar kütlelerinin büyük kütleler halinde düşmeye başlamıştır; ancak sacın eğilmesi ve buz kütlesi ile bir bütünmüş gibi hareket etmesi nedeniyle tüm çatı sacının söküldüğü gözlenmiştir. Çatı sacı düzenlenmesi sırasında saçaktan itibaren 15 cm'yi geçmeyecek şekilde tasarlanması gerekmektedir.

Çatı projelendirme sırasında sadece yönetmeliklere bağlı kalmadan mikro klima özellikleri de dikkate alınmalıdır. Çatı sistemleri tasarımı sırasında klasik 5x10 -10x10 şeklindeki ölçülerden vazgeçilip yüksek yapılı çatılar için yeni ahşap ölçüleri tasarlanmalı veya çelik sistemle çözülmesi bu tür sorunların giderilmesi açısından daha uygun olacaktır.

Çok yoğun kar yağışı olan bölgelerde çatı yüksekliğini düşürmek için dar kesitli ve tek bir geometrik şekilden oluşan yapı tasarlanması, olası birçok sorunun önüne geçecektir.

Aşırı kar yağışı alan bölgelerde kısmen kullanılan çatı ısıtma sistemleri ile kar yükü sorunu çözümlenmeye çalışılmış olsa da bölge genelinde sık yaşanan elektrik kesintileri ve yüksek işletme maliyeti nedenleri ile yağış sırasında çalıştırılamamaktadır. Bu sorun çatı üstü karın yoğuşması nedeniyle buz kütlesi haline dönüşmesine neden olmaktadır. Elektrik kesintisi sonucu çalışan sistem sırasında çatı üstünde biriken kar kütlesel hareket etmekte ve çatı ısıtma sistemini de aşağı indirmektedir. Bu tür sistemlerinde bu bölgede işe yaramadığı gözlenmektedir. Aşırı kar yağışı alan bölgelerde çatı ısıtma sistemleri tasarlanışken sac altı sistemlerin uygulanması daha verimli sonuçlar doğuracaktır.

Çatıların sadece binanın üstünü örten bir yapı elemanı olarak değil de projelendirme aşamasından bitim aşamasına kadar yapı/bina kavramının tümleyicisi olarak görülmelidir.

Çatılarda meydana gelen hasarların nedeni kar yükü gibi gözükse de aslında çatının kar yükü altındaki dayanımı; mevzuat dahilinde yapılan tasarım ve uygulama hatalarını ortaya çıkarmıştır.

Çatı tasarımı yapılırken proje, inşaat ve bakım hataları en aza indirgenmelidir.

Aşırı kar yağışı alan bölgelerde çatı kar temizliği önceden planlanmalı, düzenli olarak yapılmalıdır. Çatı üstü kar yüksekliği 10-20cm yüksekliğe ulaşınca mutlaka temizlenmelidir.

Çatı hesaplarında kullanılan yönetmeliklerin güncellenmesi önem arz etmektedir. Kar yağışı aşırı olan bölgelerde, kar yükü değerlerinin meteoroloji bölge müdürlüklerinden alınması gerekir.

Çatı kaplama örtüsünün kullanım amacına ve yerel koşullara göre uygun seçilmesi çatı hasarlarını azaltacak önlemlerden birisidir.

Kar yükünün aşırı olduğu yerlerde ahşap ve çelik yapı maliyetleri hazırlanmalı ve karşılaştırılmalıdır. İncelenen yapıda ahşap yapının sadece söküm maliyeti 190.664,61TL olarak hesaplanmıştır. Ahşap olarak inşa edilen çatının maliyeti 1.829.865,29TL olarak hesaplanmıştır. Ancak yapının çatısı ahşap yapılmadan önce doğrudan çelik çatı olarak tasarlansaydı çatı yapım maliyeti 2.749.821,52TL olmaktadır.

Ülke ekonomisinin lokomotif sektörlerinin başında gelen inşaat sektörü, kamu kesiminin ve özel kesimin kaynaklarının büyük bölümü ile dışarıdan bulunan yabancı kaynakların büyük bölümünü tüketmektedir. Kaynakların verimli kullanılması kalkınma hamlelerinin temel eylemidir. Bu nedenle planlama yapılırken uygulanacak bölgede mikro ölçekte nitel veya nicel gözlemlerin yapılarak verilerin toplanması, bu verilerin analiz edilerek tasarım kriterlerinin gözden geçirilmesi ve yük/boyutlandırma hesaplamalarında ilgili teknik uzmanın kontrolü dahilinde revizyonların yapılması gerekmektedir. Bu doğrultuda yapılacak tasarım çalışması; uygulama aşamasında ve sonrasında ortaya çıkabilecek sorunları minimum seviyeye indirerek kaynakların verimli kullanılmasına önemli oranda katkıda bulunacaktır.

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Turkish State Meteorological Service

Betonarme Düzlem Bir Çerçevenin Doğrusal ve Doğrusal Olmayan Analiz Yöntemleriyle İncelenmesi: 8 Katlı Çerçeve Örneği

Hakan ÖZTÜRK, Gökhan DOK

Department of Civil Engineering, Sakarya University, Sakarya, Turkey
hakanozturk@sakarya.edu.tr, gdok@sakarya.edu.tr

Özet: Aktif deprem kuşağı üzerinde yer alan ülkemizde bulunan ve yeni yapılacak olan yapıların yüksek deprem riski altında olması kaçınılmazdır. Bu nedenle yapıların deprem etkisi davranışlarının doğrusal ve doğrusal olmayan farklı yöntemler kullanılarak incelenmesi gerekmektedir. Deprem etkisi altında güvenli ve ekonomik tasarım doğrusal olmayan davranışların incelenmesi ile elde edilebilir.

Bu çalışmada, Türk Deprem Yönetmeliği'ne (TDY2007) uygun olarak tasarlanmış 8 katlı betonarme düzlem bir çerçevenin modal analizi, artımsal statik itme analizi (pushover) ve zaman tanım alanında doğrusal ve doğrusal elastik olmayan analizi yapılmıştır. Yapıların analizlerinde SAP2000 paket programı kullanılmıştır. Doğrusal ve doğrusal elastik olmayan zaman tanım alanında analizlerde dünyada meydana gelmiş olan 3 adet deprem kaydı kullanılmıştır. Yapılan analizler sonucunda, taban kesme kuvvetleri, kat yer değiştirmeleri ve göreli kat ötelemeleri karşılaştırılmıştır.

Anahtar Kelimeler: Betonarme çerçeve, Modal Analiz, Artımsal statik itme analizi, Zaman tanım alanında doğrusal elastik ve doğrusal elastik olmayan olmayan analiz.

Giriş

Ülkemiz oldukça aktif deprem kuşağı üzerinde yer almaktadır. Bu bölgelerdeki mevcut yapılar ve yeni inşa edilecek olan yapılar da deprem riski altında bulunmaktadır. Bu nedenle yapıların depreme karşı dayanıklı ve yeterli güvenliğe sahip olup olmadığının önemi ortaya çıkmaktadır. Yaşanılan depremler göstermektedir ki; mevcut yapıların ve yeni yapılacak yapıların deprem etkisi altında davranışlarının incelenmesi gerekmektedir.

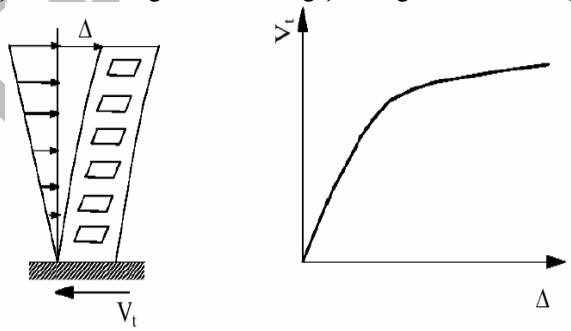
Türk Deprem Yönetmeliği'nde (TDY2007) betonarme yapıların deprem performanslarının belirlenmesi ve değerlendirilmesi amacıyla doğrusal elastik ve doğrusal elastik olmayan hesap yöntemleri olarak iki grupta verilmektedir. Birinci grupta Eşdeğer Deprem Yükü Yöntemi ve Mod Birleştirme Yöntemi, ikinci grupta ise Artımsal Eşdeğer Deprem Yükü Yöntemi, Artımsal Mod Birleştirme Yöntemi ve Zaman Tanım Alanında Hesap Yöntemi yer almaktadır (TDY, 2007).

Bu çalışmada, TDY2007'de yer alan modal analiz, artımsal statik itme analizi doğrusal ve doğrusal elastik olmayan yöntemler karşılaştırılmıştır. Bu amaçla TDY2007'ye uygun olarak tasarlanmış 8 katlı betonarme bir çerçeve incelenmiştir. Analiz sonucunda meydana gelen kat kesme kuvvetleri, taban kesme kuvvetleri ve göreli kat ötelemeleri karşılaştırılmıştır.

Statik İtme (Pushover) Analizi

Statik itme analizi, yapıları deprem davranışlarının belirlenmesinde kullanılan ve doğrusal olmayan statik analiz prosedürüdür. Statik itme analizi, bilimsel altyapısı oturmuş ve kullanılabilir derecede pratik bir metottur (Lawson, Vance, & Krawinkler, 1994). Bu metot ile yapı elemanlarının hasarları sonrası yapı içindeki kuvvet dağılımı ve yapını davranışının nasıl değiştiği gibi birçok bilgi elde edilebilmektedir (Krawinkler & Seneviratna, 1998).

Artımsal statik itme (pushover) analizi, önceden belirlenmiş bir dağılıma göre yatay yüklerin sisteme etki ettirilmesi ve bu yüklerin belirli bir eşik değerine kadar adım adım arttırılması prensibine dayanmaktadır. Bu eşik değeri, ya yapısal stabilitenin bozulması veya önceden belirlenmiş olan bir yatay yer değiştirme limitidir. Artımsal statik itme analizinin her adımında, iç kuvvetler, yer değiştirmeler ve plastik şekil değiştirmeler hesaplanır ve yapının global itme eğrisi yani kapasite eğrisi (pushover curve) belirlenir [Şekil 1]. Kapasite eğrisi, statik itme analizinin her adımında belirlenen taban kesme kuvveti ile tepe noktası yatay yer değiştirmesinin doğrusal ötesi değişimini göstermektedir (Koçak, 2007).



Şekil 1: İtme şekli ve kapasite eğrisi (Koçak, 2007)

Yapının yatay olarak itilmesi için değişik yük desenleri kullanılabilmektedir. Yöntemin tanımlandığı ATC-40'da, Statik İtme Analizinde kullanılmak üzere, yapı davranışına bağlı olarak önerilen itme şekilleri tanımlanmıştır (ATC-40, 1996). Yapıya etkiyen yatay yükün tamamının en üst kat seviyesinden etki ettirilmesi de bu itme şekillerinden biridir. Bir başka itme şeklinde ise çatıya ilave yük koyulmadan, her kat seviyesine eşdeğer deprem yükü yönteminden hesaplanan deprem yükleri etki ettirilir. Ayrıca, birinci modun baskın olduğu binalarda, hâkim mod şekli ile kat kütlelerinin çarpımının oranları olan yatay yüklerin kat seviyelerine etki ettirilmesi diğer bir itme şeklidir (Koçak, 2007).

Zaman Tanım Alanında Doğrusal Elastik Olmayan Analiz

Zaman tanım alanında doğrusal elastik olmayan hesap yönteminin amacı taşıyıcı sistemdeki doğrusal olmayan davranış göz önüne alınarak sistemin hareket denkleminin adım adım entegre edilmesidir. Analiz sırasında her bir zaman artımında sistemde meydana gelen yer değiştirme, plastik şekil değiştirme ve iç kuvvetler ile bu büyüklüklerin deprem istemine karşı gelen maksimum değerleri belirlenir. Bina ve bina türü yapılarda zaman tanım alanında doğrusal elastik olmayan analiz için, yapay yollarla üretilen, daha önceden kaydedilmiş veya benzeştirilmiş deprem yer hareketleri kullanılabilir (Güngör, 2010).

Zaman tanım alanında doğrusal elastik ve elastik olmayan hesap yöntemi yapıların deprem yüklerine karşı davranışını inceleyen ve en çok kullanılan yöntemlerden biridir. Yapılar deprem yükleri altında lineer davranmadıkları için bu yöntemin kullanılması daha uygundur (Aydınoğlu, 2003). Ancak zaman tanım alanında doğrusal elastik ve elastik olmayan hesap yöntemlerinde en önemli nokta uygun deprem kayıtlarının seçilmesi ve ölçeklendirilmesidir. Bir deprem kaydının seçilebilmesi için depremin büyüklüğü, fay tipi, faya olan mesafe, yerel zemin koşulları, yırtılma yönü ve kaydın spektral içeriği göz önüne alınmalıdır (Fahjan, 2008).

Zaman tanım alanında doğrusal elastik olmayan analiz yapılmadan önce düşey yüklerin dikkate alındığı doğrusal elastik olmayan statik itme analizi yapılmıştır. Doğrusal elastik olmayan statik itme analizinin sonuçları, zaman tanım alanında doğrusal elastik olmayan hesap yönteminin başlangıç koşulu olarak verilmiştir. Başlangıç koşulu olarak verilen statik itme analizi hesabında düşey yükler ölü yüklerin tamamı ile azaltılmış hareketli yükler şeklinde $(G + n * Q)$göz önüne alınmıştır. Analizlerde 3 adet gerçek deprem ivme kaydı kullanılmıştır. Seçilen ivme kayıtları tek serbestlik dereceli %5 sönüme sahip doğrusal bir sistemin spektrumu olacak şekilde belirlenmektedir (Aydınoğlu, 2003).

TDY2007'de, bina ve bina türü yapıların zaman tanım alanında doğrusal veya doğrusal olmayan deprem hesabı için yapay yollarla üretilen, daha önce kaydedilmiş veya benzeştirilmiş deprem yer hareketi kayıtlarının kullanımına izin verilmektedir. Deprem kayıtlarının aşağıda verilen özellikleri taşıması istenir:

- Kuvvetli yer hareketi kısmının süresi, binanın birinci doğal titreşim periyodunun 5 katından ve 15 saniyeden daha kısa olmayacaktır.

- Deprem yer hareketinin sıfır periyoda karsı gelen spektral ivme değerlerinin ortalaması Aog'den daha küçük olmayacaktır.

- Üretilen her bir ivme kaydına göre %5 sönüm oranı için yeniden bulunacak spektral ivme değerlerinin ortalaması, göz önüne alınan deprem doğrultusundaki birinci (hakim) periyot T1'e göre 0.2T1 ile 2T1 arasındaki periyotlar için, yönetmelikte tanımlanan elastik spektral ivme değerlerinin %90'ından daha az olmayacaktır.

- Zaman tanım alanında doğrusal veya doğrusal olmayan hesapta, üç yer hareketi kullanılması durumunda sonuçların maksimumu, en az yedi yer hareketi kullanılması durumunda ise sonuçların ortalaması tasarım için esas alınacaktır (TDY, 2007).

Mod Birleştirme Yöntemi

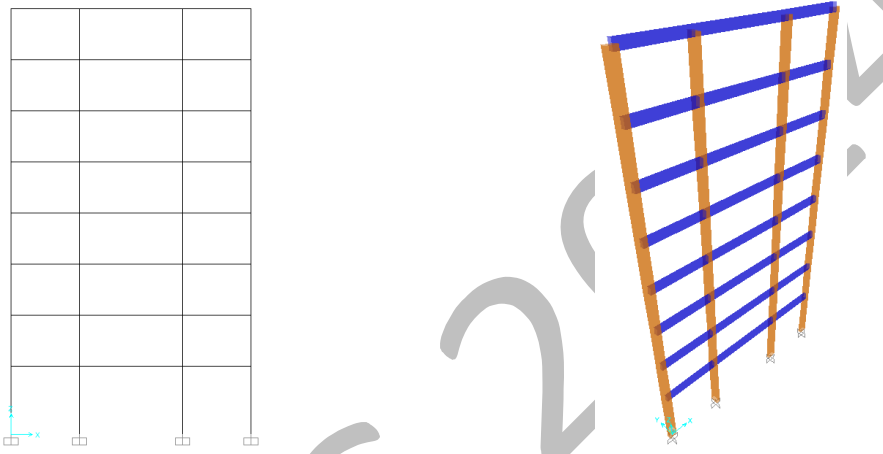
Bu yöntemde yapı veya sistemde oluşan maksimum iç kuvvetler ve yer değiştirmelerin hesaplanmasında, her bir doğal titreşim modunda hesaplanan maksimum katkıların istatiksel olarak bir araya getirilmesi ile yapılır. Yapıya etkiyen toplam deprem yükü, kat kesme kuvveti, iç kuvvet bileşenleri, yerdeğiştirme ve göreli kat ötelemesi gibi büyüklüklerin her biri için ayrı ayrı uygulanmak üzere titreşim modu için hesaplanan ve eşzamanlı olmayan maksimum katkıların istatistiksel olarak birleştirilmesi için iki yöntem uygulanır. Eğer ardışık iki titreşim modunun doğal periyotları oranı 0.8'den az ise; maksimum mod katkılarının bir araya getirilmesinde Karelerinin Toplamının Karekökü kuralı uygulanabilir. Eğer bu oran sağlanmıyorsa, tam karesel yöntem uygulanabilir. Ancak bu yöntemde kullanılacak çapraz korelasyon

katsayılarının hesabında, bütün modlarda sönüm oranı % 5 alınmalıdır (TDY, 2007).

Sayısal Çalışma

Bu çalışmada, Türk Deprem Yönetmeliği'nde (TDY2007) verilen tasarım ilkeleri dikkate alınarak hazırlanmış 8 katlı betonarme bir çerçevenin modal, artımsal statik itme analizi (pushover) ve zaman tanım alanında doğrusal elastik ve doğrusal elastik olmayan analizi yapılmıştır.

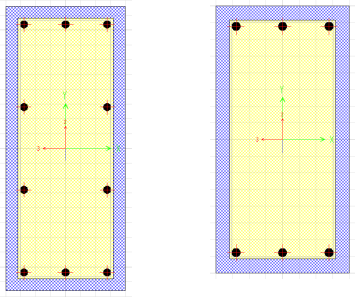
Yapıda kullanılan betonun basınç dayanımı 25 Mpa ve çelik akma dayanımı ise 420 Mpa olarak alınmıştır. Betonarme yapı modeli X yönünde 3 açıklığa sahiptir. Model açıklığı toplam 14 m olup 25 m yüksekliğe sahiptir. [Şekil 2]. Kullanılan model için bina önem katsayısı $I = 1$, deprem bölgesi $A_0 = 0.4$ (1. derece deprem bölgesi) ve zemin sınıfı Z4 olarak alınmıştır.



a) Çerçeve Planı b) Çerçeve 3D Modeli

Şekil 2. Yapı Plan ve 3D Görünüşü

Yapı modelleri oluşturulurken TS 498 ve TS 500 şartnameleri göz önünde bulundurulmuştur [9,10]. Yapı modeli 8 katlı olup, zemin kat yüksekliği 4,0 m ve diğer katların yüksekliği 3,0 m, kolon boyutları 25 x 60 cm, kiriş boyutları 25 x 50 cm olarak seçilmiştir [Şekil 3]. Kolonların tamamında boyuna donatı oranı minimum 0.01 ve maksimum 0.04 olacak şekilde (10Ø16), kirişlerde ise (3Ø16) düz ve (3Ø12) montaj donatısı seçilmiştir. Kolonlarda kullanılan etriye (Ø10/100) ve kirişlerde kullanılan etriye (Ø8/100) şeklindedir.



Kolon **Kiriş**

Şekil 3. Taşıyıcı eleman kesitleri ve donatı özellikleri

Çerçeve modelleri oluşturulurken, taşıyıcı sistem eleman boyutları, kesit özellikleri, donatı durum ve düzenleri ile taşıyıcı sistem elemanlarına etkiyen yük durumları dikkate alınmıştır (SAP2000, 2012).

Taşıyıcı sistem üzerinde plastik mafsal oluşması beklenen özellikle kolon-kiriş birleşim bölgeleri için kesit özellikleri (beton ve donatı sınıfı, donatı dizaynı) dikkate alınmıştır. XTRACT programı yardımı ile kolon kabuk betonu için Mander sargısız beton modeli, etriyelerle çevrili çekirdek betonunda ise Mander sargılı beton modeli dikkate alınarak eksenel kuvvet moment etkileşim diyagramları elde edilmiş ve bu diyagramlar SAP2000 programına girilerek ilgili kesitlerin plastik mafsalları oluşturulmuştur. Oluşturulan bu plastik mafsallar, taşıyıcı sistem üzerinde ilgili kesitlere atanmıştır (Xtract, 2013). Donatı çeliği için literatürde genel kabul görmüş deney sonuçlarından elde edilen gerilme-birim şekil değiştirme eğrilerinden faydalanılmıştır.

Yöntem

Bu çalışmada SAP2000 paket programı kullanılarak 8 katlı betonarme bir çerçeve modeli için modal analiz, artımsal artımsal statik itme (pushover) analizi ve zaman tanım alanında doğrusal elastik ve doğrusal elastik olmayan analiz yapılmıştır.

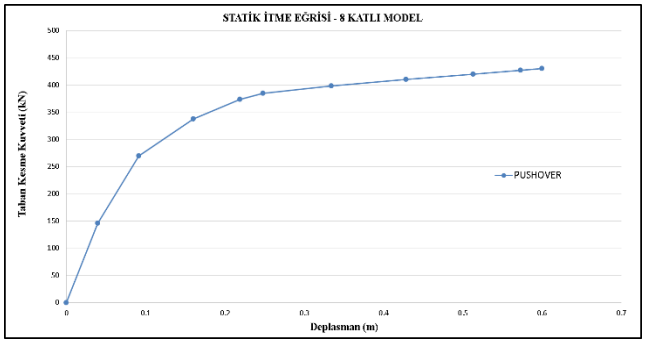
Modal analiz sırasında 3 mod incelenmiştir ve yapının modal kütle katılım oranı olan ve DBYBHY 2007'de de geçen %90'lık modal kütle katılım oranı 2 mod ile sağlandığından sonuçlar 2 mod ile değerlendirilerek yorumlanmıştır. Tablo 2'de modal kütle katılımı oranları ve periyotlar ayrıntılı olarak verilmiştir. Elde edilen tüm taban kesme kuvveti, devrilme momenti ve yerdeğiştirme değerleri 2 mod gözönüne alınarak değerlendirilmiştir. Mod birleştirme yönteminde analiz sonuçları birleştirilirken karelerinin toplamının karekökü (KTKK) uygulanmıştır.

Statik artımsal itme analizi (pushover) bina taşıyıcı sistemine birinci mod şekli dikkate alınarak etki ettirilmiştir (Chopra & Goel , 2001; Priestley & Kowalsky, 2000). Öncelikle taşıyıcı sistem düşey yük etkisi altında analiz edilerek kiriş ve kolonlara ait çatlamış kesit eğilme rijitlikleri ve plastik mafsallar ilgili elemanlara atanarak artımsal olarak yükleme yapılmıştır. Artımsal yükleme etkisi altında analiz edilen 8 katlı betonarme çerçeveye ait statik itme eğrisi çizilmiştir. Elde edilen itme eğrisinden kapasite diyagramı çizilmiştir. Tasarım depreminden ivme spektrumuna geçilerek, modal yer değiştirme talebi belirlenmiş ve taşıyıcı sistem belirlenen bu talebe kadar yeniden itme analizi yapılmıştır.

Zaman tanım alanında doğrusal ve doğrusal elastik olmayan dinamik analiz (Time History), yapıların sismik davranışlarının belirlenmesinde en etkin yöntemlerden biridir. Bu yöntemde deprem yükleri yapıya doğrudan uygulanmaktadır. Uygulanacak deprem kaydının belirlenmesinde, yönetmelikte (TDY2007)'de verilen yerel zemin koşullarına bağlı spektrum eğrisine uygun ve yeterli sayıda (en az 3 adet deprem kaydı) farklı kayıt kullanılarak çözüm yapılması gerekmektedir (Fahjan, 2008). Çalışmada, Kocaeli, Northridge ve Loma Prieta deprem kayıtları kullanılmıştır. Analizlerde kullanılan deprem ivme kayıtları Pasifik Deprem Mühendisliği Araştırma Merkezindeki (Pacific Earthquake Engineering Research (PEER) Center) kuvvetli yer hareketi veri bankasından alınmıştır (PEER, 2006).

Sonuçlar ve Tartışma

Yapılan analizler sonucunda taşıyıcı sisteme ait itme eğrisi [Şekil 4] verilmiştir. Sistem çerçeve olduğu için yani tek bir doğrultuda taşıyıcı sisteme sahip olduğu için dikkate alınan yönde statik itme eğrisi çizilmiştir.

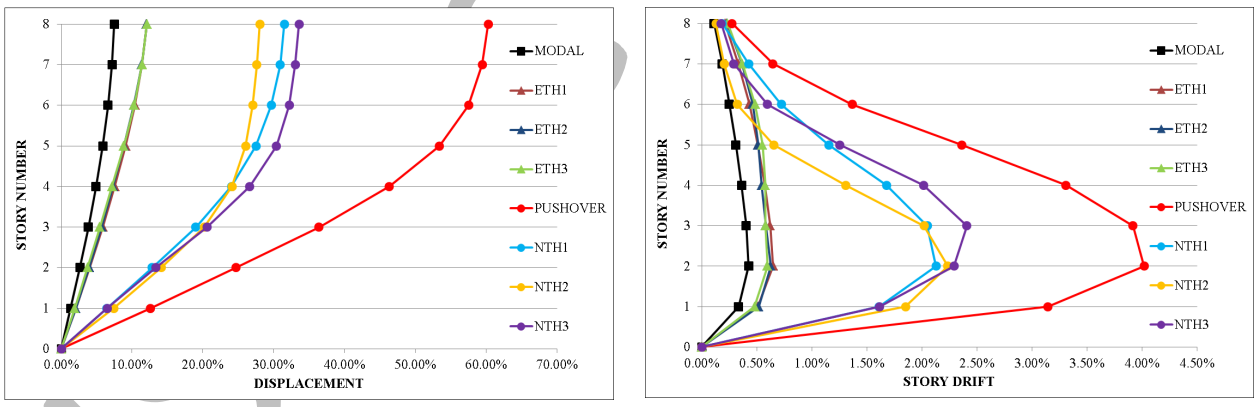


Şekil 4. Çerçeve Sistemin Kapasite Eğrisi

Yapılan analizler sonucunda çerçeve sisteme ait taban kesme kuvvetleri ve yerdeğiştirme değerleri Tablo 1'de verilmiştir. Bu tabloda Eth1-2-3 (Elastik Time History) Nth1-2-3 (Nonlinear Time History) simgeleri sırasıyla Kocaeli, Northridge ve Loma Prieta deprem kayıtlarını simgelemektedir. Yapılan analizler sonucu bulunan maksimum taban kesme kuvveti değerleri ve bu kuvvetlere karşılık gelen yapı tepe yer değiştirme değerleri verilmiştir.

Tablo 1. Deprem Kayıtlarına Ait Taban Kesme Kuvveti Sonuçları

	Modal	Eth1	Eth2	Eth3	Pushover	Nth1	Nth2	Nth3
Max Taban Kesme (kN)	282.3	543.9	499.7	451.6	430.208	477.3	422	421.4
Max Yerdeğiştirme (m)	0.0752	0.1205	0.1206	0.121	0.603	0.315	0.2803	0.336

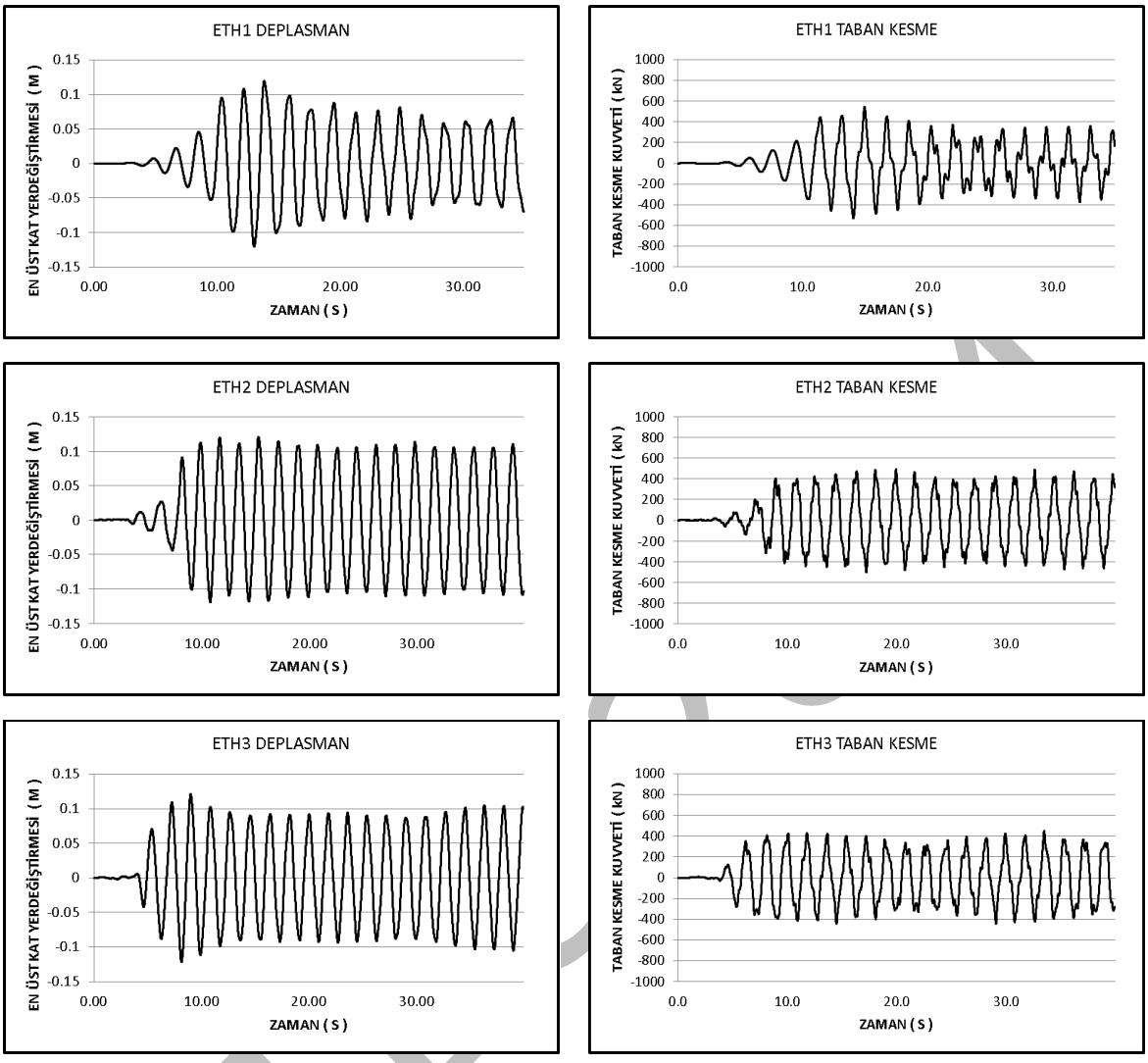


a) Yer Değiştirme b) Göreli Kat Ötelemesi

Şekil 5. Analiz Sonuçlarına Göre Yer Değiştirme ve Göreli Kat Öteleme Değerleri

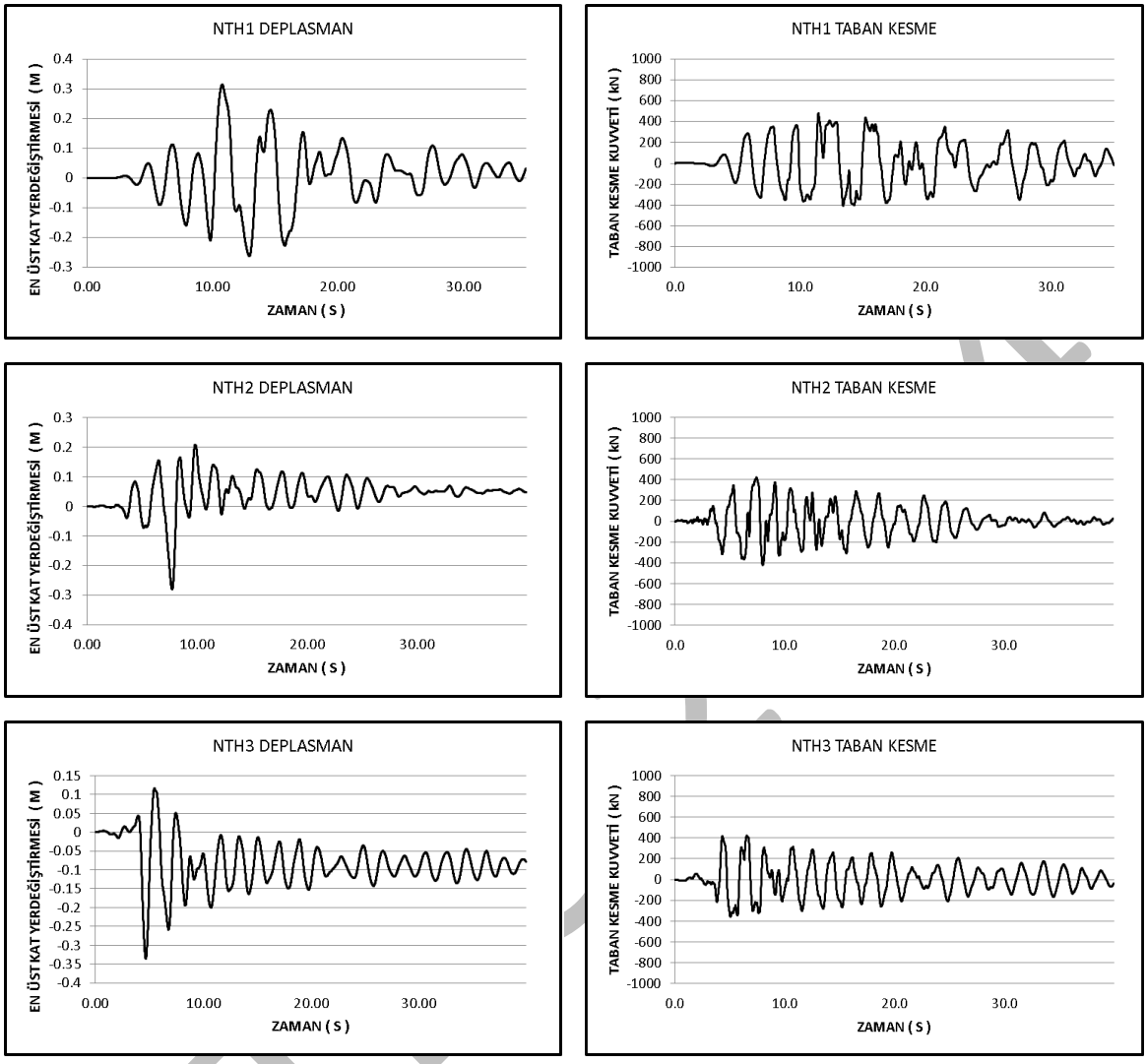
Yapılan analizlerden elde edilen yer değiştirme değerleri ve göreli kat öteleme oranları her bir kat için sırasıyla Şekil 2 ve Şekil 3'te verilmiştir. TDY2007'de belirtilen 3 deprem kaydı kullanılması durumunda sonuçların maksimum değerlerini veren yükleme durumunun göz önüne alınması nedeniyle her iki doğrultuda da maksimum yer değiştirme değerleri ve göreli kat öteleme oranları için Düzce deprem kaydının dikkate alınması gerekmektedir.

Zaman tanım alanında doğrusal ve doğrusal elastik olmayan analizler için 3 adet ivme kaydı kullanılmıştır. Sonuçlar zaman bağlı şekilde elde edilmiş ve incelenmiştir. Zaman tanım alanında doğrusal elastik analiz sonucu zamana bağlı olarak elde edilen taban kesme kuvveti ve tepe noktası yer değiştirme grafikleri Şekil 6'da sunulmuştur.



Şekil 6. Elastik Time History Analiz Sonuçları: Zamana Bağlı Yerdeğiştirme ve Taban Kesme Kuvveti

Zaman tanım alanında doğrusal ve doğrusal elastik olmayan analiz sonuçları zamana bağlı olarak elde edilen taban kesme kuvveti ve tepe noktası yer değiştirme grafikleri sırasıyla Şekil 6 ve Şekil 7'de sunulmuştur.



Şekil 7. Nonlinear Time History Analiz Sonuçları: Zamana Bağlı Yerdeğiştirme ve Taban Kesme Kuvveti

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Betonarme Düzlem Çerçeve Elemanlarında Hareketli Yük Düzenine Göre Oluşan Kesit Tesirlerinin Genetik Algoritma ile Belirlenmesi

Tamer DIRIKGIL[1], Hakan OZTURK[2]

[1]Department of Civil Engineering, Erciyes University, Kayseri, Turkey

[2]Department of Civil Engineering, Sakarya University, Sakarya, Turkey

dirikgil@erciyes.edu.tr, hakanozturk@sakarya.edu.tr

Özet: Genetik algoritmalar, doğadaki evrim yöntemlerini kullanan ve topluluğun bireylerine doğal seçilim ilkelerini uygulayarak bir tasarım problemine ait en iyi çözüme ulaşmayı amaçlayan arama yöntemleridir. Sınır şartlarına bağlı olarak sezgisel bir arama ve optimizasyon yaparlar. Mühendislik açısından birçok hesaplamanın yapılmasında olasılıksal değerlendirmelerin de göz önünde bulundurulması optimum değerlerin elde edilmesinin önemini artırmaktadır. Bir çok farklı alanda başarılı uygulamalarından dolayı büyük ilgi gören genetik algoritmalar, İnşaat Mühendisliği alanında yapay sinir ağları ve bulanık mantık uygulamaları ile beraber oldukça önemli bir yere sahiptir.

Bu çalışmada, 5 açıklıklı 4 katlı düzlem bir çerçevenin sabit yükle birlikte, hareketli yük kombinasyonları değerlendirilmiştir. Seçilen hareketli yük kombinasyonlarının taşıyıcı elemanlarda oluşturduğu kesit tesirleri sonlu elemanlar yöntemi ile belirlendikten sonra, en elverişsiz yük kombinasyonları genetik algoritma ile aranmıştır. Seçilen yük kombinasyonlarına bağlı olarak genetik algoritma ile elde edilen kesit tesirlerinin hata oranları değerlendirilerek, ilgili açıklıktaki herhangi bir eleman için en elverişsiz kesit tesirinin belirlenmesinde alternatif bir çözüm olarak sunulmuştur.

Anahtar Kelimeler: Genetik algoritma, hareketli yük, düzlem çerçeve, kesit tesiri.

Giriş

Günümüzün karmaşık ve zor olan mühendislik problemlerinin çözümünde, kullanılan geleneksel yöntemler yeterli olmamaktadır. Teknolojik gelişmeler ışığında, son otuz yıl içerisinde optimizasyon problemlerinin çözümü için birçok matematiksel programlama metodu geliştirilmiştir. Bu çalışmada geliştirilen genetik çok amaçlı optimizasyon tekniği de, bu metotlardan biridir. Genetik Algoritmalar (GA), insan ve ekosistemlerdeki doğal gelişme, sosyal sistemlerdeki taklit etme ve psikolojideki sonuçları değerlendirmeyi içine alan dinamik metotların, geniş bir şekilde modellenmesi ile oluşmaktadır. Modellenen örneklerin bir zaman dilimi içerisinde kötüden iyiye doğru gitmesi, bir optimizasyon probleminin başlangıç çözümünden optimum çözüme doğru yaklaşımını andırır (Arslan, Turgut, & Calayir, 1996).

Evrim sistemlerinin bilgisayarda modellenmesini yapmak çoğu konvansiyonel modellemelere kıyasla biraz daha zor olmaktadır (Lieppins & Hilliard, 1989). Genetik Algoritmalar da bilgisayar üzerinde oluşan bir evrim şeklidir. GA'nın amacı hem problemleri çözmek, hem de evrimsel sistemleri

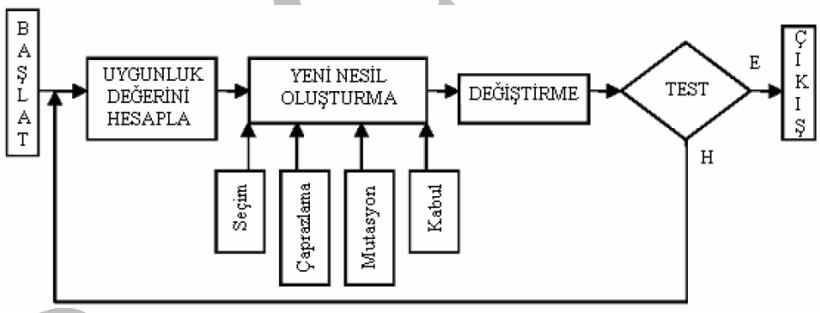
modellemektir. Fonksiyon optimizasyonu, çizelgeleme, mekanik öğrenme, tasarım ve hücresel üretim gibi alanlarda başarılı uygulamaları bulunmaktadır.

GA'nın performansını, üreme, çaprazlama, mutasyon operatörleri, çaprazlama ve mutasyon olasılıkları önemli ölçüde etkilemektedir (Goldberg, 1989). Problemlerin GA ile çözümünde, kısa işlem süreleriyle optimum veya optimuma yakın çözümlere ulaşmak için bu parametrelerin seçimi ile ilgili herhangi bir kural mevcut değildir (Cleveland & Smith, 1989). Optimum çözümü bulunamayan problemlerin çözüm performansını artırmak için en etkili çaprazlama yöntemini belirlemek, çözüm süresi ve optimum sonucu bulma açısından büyük önem taşımaktadır.

Son yıllarda genetik optimizasyon ile çok sayıda çalışma yapılmış ve etkin algoritmalar geliştirilmiştir. Geliştirilen algoritmalar ile mühendislik sistemlerinin çok amaçlı optimizasyonu yapılmıştır. Çok amaçlı optimizasyon üzerine ilk notlar Pareto tarafından verilmiş ve Pareto optimizasyonu olarak adlandırılmıştır (Pareto, 1971)

Genetik Algoritmalar

Genetik Algoritma (GA) üzerine ilk çalışmalar Michigan Üniversitesinde Psikoloji ve Bilgisayar Bilimi Uzmanı olan John Holland tarafından yapılmıştır. Holland, Darwin'in evrim kuramında bulunan canlılardaki genetik aktarım ve değişim olaylarını mekanik ve bilgisayar ortamına aktarmaya çalışmıştır (Gözütok, 2002).
Genetik algoritmalar stokastik bir arama yöntemidir. Darwin'in en iyi olan yaşar prensibine dayalı olarak biyolojik sistemlerin gelişim sürecini modellemektedir (Gözütok, 2002). Doğada geçerli olan en iyinin yaşaması kuralına dayanarak sürekli iyileşen çözümler üretir, bunun için "iyi"nin ne olduğunu belirleyen bir uygunluk (fitness) fonksiyonu ve yeni çözümler üretmek için yeniden kopyalama (recombination), değiştirme (mutation) gibi operatörleri kullanır. Genetik algoritmaların bir diğer önemli özelliği de bir grup çözümle uğraşmasıdır. Böylece Şekil 1'de verilen akış şemasına bağlı olarak çok sayıda çözümün içinden iyileri seçilip kötüleri elenerek sonuca ulaşılabilir.



Şekil 1. Genetik Algoritmaların Genel Akış Şeması

Bir problemin GA ile çözümünde takip edilecek işlem adımları aşağıda verilmektedir (Croce, Tadei, & Volta, 1995):

1. Arama uzayındaki bütün muhtemel çözümler, dizi olarak kodlanır. Bu diziyi (kromozom) oluşturan her bir elemana gen denir. Her bir dizi, arama uzayında belirli bir bölgeye tekabül eder.
2. Genellikle rassal bir çözüm seti seçilir ve başlangıç toplumu olarak kabul edilir.
3. Her bir dizi için bir uygunluk değeri hesaplanır; bulunan uygunluk değerleri dizilerin çözüm kalitesini gösterir.
4. Bir grup dizi (kromozom) belirli bir olasılık değerine göre rassal olarak seçilip üreme işlemi gerçekleştirilir.

5. Üreme işleminde çeşitli genetik operatörler kullanılabilir. Uygunluk fonksiyonu, GA'da probleme özel olarak kurulan tek kısımdır. Bu fonksiyon, bireyleri problemin parametreleri haline getirir ve bireylerin uygunluk değerlerine bakarak herhangi bir bireyin problem için ne kadar uygun bir çözüm olacağına karar verir. GA'ın problemin çözümündeki başarısı, çoğunlukla bu fonksiyonun etkin kurulmasına bağlıdır.

Genetik Operatörler

Seçme

Üreme işlemi, daha geniş uygunluk değerlerine sahip dizilerin daha yüksek olasılıkla yeni nesilde geniş sayıda kopyalarını üretebilen işlemdir. Uygunluk değeri, ortalama değer ile normalize edilir. Üreme için diziler, ortalama uygunluk değerinin altındaki dizilerden daha fazla ürüne sahip olur. Uygunluk değerlerine göre dizileri kopyalamak, bir sonraki nesilde daha fazla ürünün oluşma olasılığının yüksek olması demektir. Doğal seçim, oluşturulan diziler arasından en uygun olanının kalması olarak tanımlandığında bu işlem, doğal seçimin yapay sürümü olacaktır.

Çaprazlama

GA içinde çaprazlama işlemi bireyler arasındaki bilgi değişimini gerçekleştirerek daha iyi bireylerin üretilmesini sağlar. Çaprazlama yapılırken iki bireyin belirli genleri karşılıklı olarak yer değiştirir. Böylelikle iki yeni birey başka bir deyişle iki yeni olası çözüm üretilmiş olur. Çaprazlama işlemini gerçekleştirmek için ilk olarak üreme işlemi ile oluşturulmuş eşleştirme havuzundaki yeni kopyalanmış dizinin elemanları rasgele eşlenir. İkinci olarak, seçilen dizilerin bitleri, rasgele seçilmiş çaprazlama noktasından itibaren karşılıklı olarak değiştirilirler. Çaprazlamalar, problemlerin türüne göre değişiklikler göstermektedir. Düzenli çaprazlama en çok kullanılan çaprazlama türlerindendir.

Mutasyon

Nüfus içerisinde tek tip bireyler varsa çaprazlamalarından elde edilecek bireylerde yine aynı tip olur. Dolayısıyla nüfusu oluşturan bireyler arasında çeşitlilik olmaz. Bunu engellemek için mutasyon işlemcisi kullanılır. Bu çalışmada kullanılan işlemci, yer değiştirme (mutasyon) işlemcisidir. Bu işlemcide rastgele bir sayı seçilir ve önceden belirli mutasyon oranıyla karşılaştırılır. Eğer seçilen sayı mutasyon oranından küçükse, birey içinde rasgele iki genin yeri değiştirilerek yeni bir birey üretilir. Aksi durumda birey değişikliğe uğramadan olduğu gibi kalır.

İkili kodlamada "1" olan gen "0" olur, "0" olan gen ise "1" olur. Onluk tabanda ise durum farklıdır. Bir rakamın alabileceği 10 değer vardır. Rakamın değeri mutasyon sırasında geriye kalan 9 değerden biri olur.

İkili Kod		Onlu kod
1 0 1 1 0 1 0 1	→	181
1 1 1 1 0 1 0 1	→	245

Elitizm

Üreme, çaprazlama ve mutasyon işlemleri sonrasında kuşakta bulunan en iyi uyumluluğa sahip birey sonraki kuşağa aktarılamayabilir. Bunu önlemek için bu işlemlerden sonra oluşan yeni kuşağa bir

önceki kuşağın en iyi (elit) bireyi, yeni kuşaktaki herhangi bir birey ile değiştirilir. Buna elitizm adı verilir (Mansfield, 1990), (The University of Manchester, 2013), (The University of Sunderland, 2013).

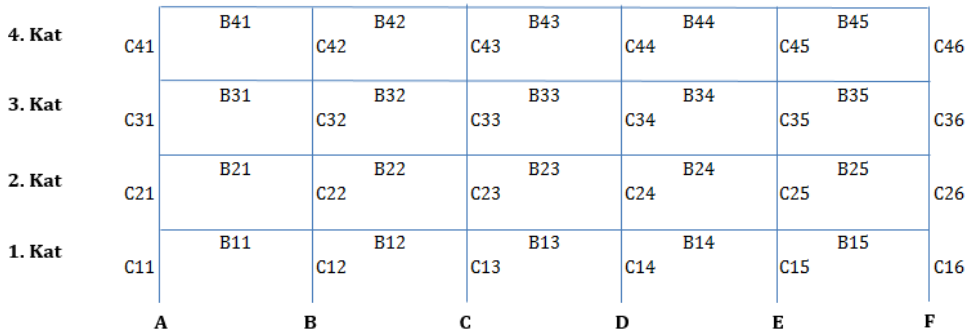
Genetik Algoritma Uygulaması

Yapı taşıyıcı elemanlarının boyutlandırılıp donatılandırılması, elemanın maruz kaldığı yük durumuna göre yapılır. Taşıyıcı elemanların düşey yükler için analizinde ölü ve hareketli yük olarak tanımlanan iki tür yük göz önünde tutulmaktadır. Ölü yükler yer değiştirmeyen sabit yüklerdir. Hareketli yükler ise insan, makine ve eşyaların oluşturduğu yerleri sabit olmayan yüklerdir. Yapıdaki yüklerin, eleman üzerindeki etkisinin değerlendirilmesinde yükün konumu ve etkime şekli büyük önem taşır. Sürekli bir yapı kirişi, hareketli yüklerden dolayı oluşacak olan en elverişsiz yükleme kombinezonları dikkate alınarak düzenlenmelidir. Bu yük kombinasyonlarının hepsinin kullanılmasının yerine ilgili açıklıktaki taşıyıcı elemanlar için en elverişsiz yükleme koşullarını göz önünde bulundurmak en makul çözümdür. Hareketli yüklerin hepsinin aynı anda bütün açıklıklarda bulunması olasılığı oldukça azdır. Bir açıklıktaki herhangi bir eleman için en elverişsiz yükleme durumu, aynı açıklıktaki başka bir eleman için istenen yükleme durumu olmayabilir. Bu durumda ilgili açıklıktaki taşıyıcı elemanların tümünün birlikte değerlendirilerek, istenen bir ya da birkaç yük kombinasyonun optimum olarak göz önüne almak gerekir. (Nilson & Winter, 1991).

Sürekli bir kirişte elverişsiz yükleme durumları klasik olarak, gerek mesnette gerekse açıklıkta elastik eğrinin şeklinden faydalanılarak tespit edilmektedir. Bu elverişsiz yükleme kombinezonları dikkate alınarak maksimum açıklık veya mesnet momentlerinin bulunması için sistemin birkaç defa çözülmesi gerekmektedir. Bu ise uzun zaman almakta ve pratik olmaktan çıkmaktadır. Bu amaçla birçok basitleştirilmiş yükleme modelleri geliştirilmiştir. Bunlardan en önemlileri Furlong ve Ersoy tarafından geliştirilenleridir. Ancak tüm bu yöntemler yaklaşık sonuç vermektedir (Furlong, 1981), (Ersoy, 1989).

Günümüzde bilgisayar kullanımının yaygınlaşması ile birlikte, yapı sistemlerinin çözümünde de bilgisayar uygulamaları ağırlık kazanmıştır. Bu nedenle, elverişsiz yük kombinezonlarının basitleştirilerek kullanılması ve yaklaşık çözüm sonucunun yeterli görülmesi anlamsız olmaktadır. Bu amaçla yük kombinezonlarını otomatik olarak oluşturan ve buna göre kesin çözüm yapabilen sistemlere ihtiyaç duyulmaktadır.

Bu çalışmada, Şekil 2'de görülen 5 açıklıklı 4 katlı düzlem bir çerçeve ele alınmış ve sabit yükle birlikte, hareketli yük kombinasyonları değerlendirilmiştir. Seçilen hareketli yük kombinasyonlarının taşıyıcı elemanlarda oluşturduğu kesit tesirleri sonlu elemanlar yöntemi ile belirlendikten sonra, en elverişsiz yük kombinasyonları genetik algoritma ile aranmıştır. Seçilen yük kombinasyonlarına bağlı olarak genetik algoritma ile elde edilen kesit tesirlerinin hata oranları değerlendirilerek, ilgili açıklıktaki herhangi bir eleman için en elverişsiz kesit tesirinin belirlenmesinde alternatif bir çözüm olarak sunulmuştur.

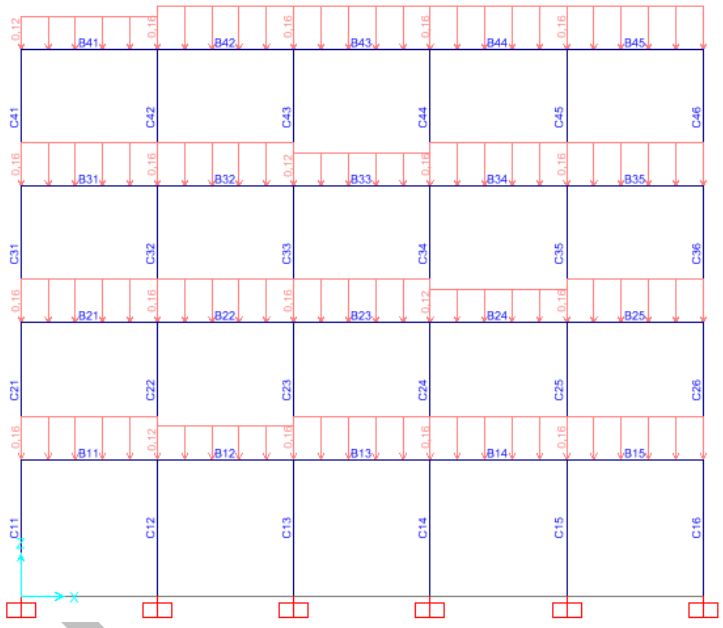


Şekil 2. 5 Açıklıklı 4 Katlı Düzlem Çerçeve

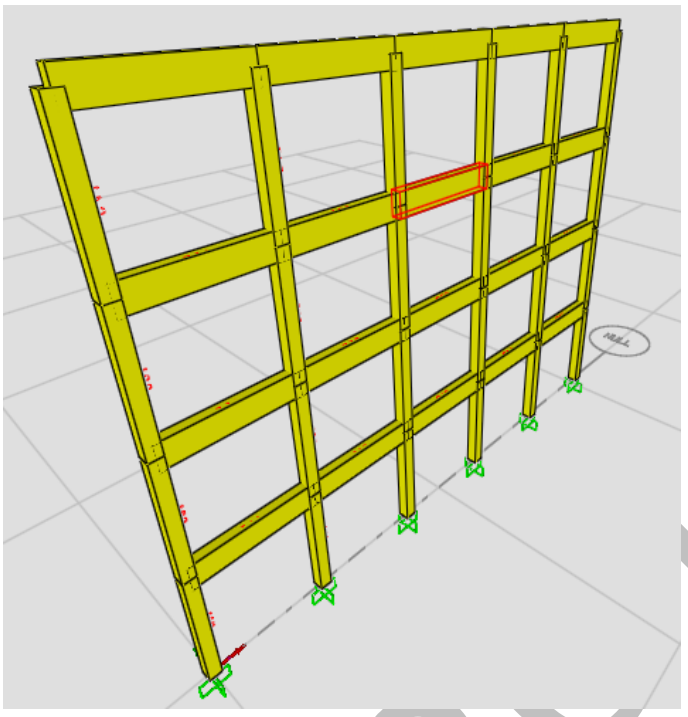
Bulgular ve Tartışma

Çalışma 5 açıklıklı 4 katlı bir düzlem çerçeve üzerinde yapılmıştır. Düzlem çerçeve üzerinde kirişin çözümünde, her bir açıklığa 0 veya 1 geni verilmiştir. Bu genlerin toplamıyla oluşan kromozomun uzunluğu dolayısıyla kiriş açıklık sayılarının toplamına eşit olmaktadır. Şekil 3'de görüldüğü gibi 0 geni kiriş açıklığının hareketli yükle yüklenmeyeceğini, 1 geni ise yükleneceğini ifade etmektedir. Bu genlerinin yerinin sürekli olarak değiştirilmesi sonucunda açıklıklarda veya mesnetlerde farklı moment değerleri elde edilmektedir. Ölü yükün toplam yüke oranı λ katsayısı ile gösterilmektedir.

Şekil 4'de, üzerinde çalışılan 5 açıklıklı 4 katlı düzlem çerçevenin üç boyutlu görünümü verilmiştir. Burada kirişler bütün açıklıklarda sabit kesitli olup 25/60 cm kolonlar 40x40 cm boyutlarında alınmıştır. Toplam yük değeri pratikte kullanılan ortalama değerlere yakın olarak seçilmiş ve P = 20 kN/m olarak alınmıştır. Tüm açıklıklar eşit olup L = 3 m'dir. Hareketli yükün toplam yüke oranı λ = 0.5 alınmıştır.

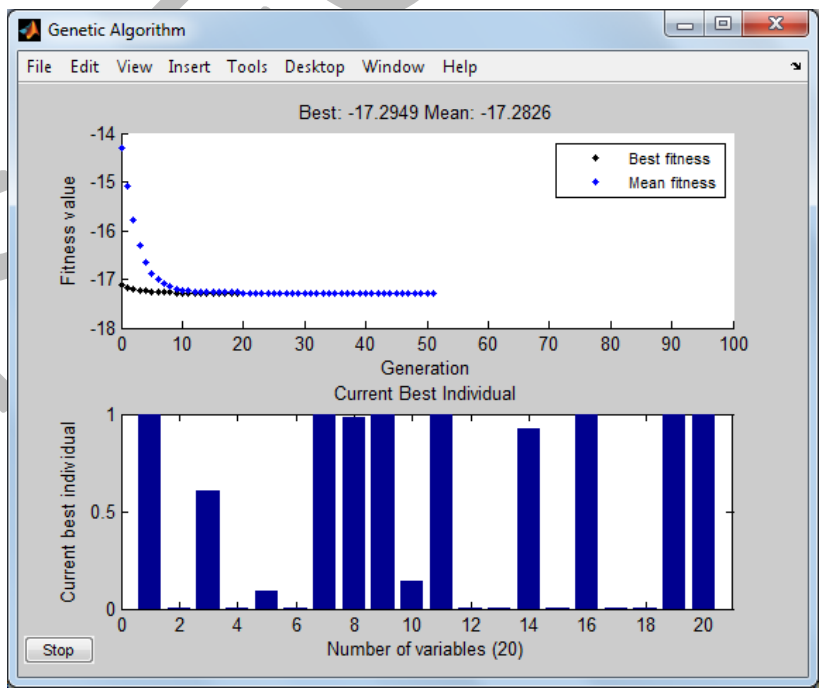


Şekil 3. Düzlem Çerçeve Yükleme Durumu



Şekil 4. Düzlem Çerçeve 3D Görünüm

Çözümleme sırasında öncelikle gen havuzu oluşturulmuş ve SPSS programı yardımı ile kromozomların problemin çözümünde gösterdiği performansı belirleyen uygunluk fonksiyonu oluşturulmuştur. Uygunluk fonksiyonu yardımı ile istenilen kiriş ve kolonların, açıklık ortasındaki, kenar ve alt-üst uç kısmında oluşan maksimum moment ve kesme kuvvetlerini veren kromozomlar belirlenmiştir. Şekil 5'de GA tarafından bulunan kromozom görülmektedir.



Şekil 5. Uygunluk Fonksiyonu Yardımı ile Bulunan En Elverişsiz Kromozom

Yapılan çalışmada kullanılan düzlem çerçeve 5 açıklık ve 4 kattan oluştuğu için toplam 20 adet kiriş bulunmaktadır. Maksimum momenti belirlemek için bu kirişlerin sabit ölü yük altında hareketli yük ile yüklenmesi durumu GA tarafından bulunan uygunluk fonksiyonu kromozom dizilişi yardımı ile Şekil 5'de gösterilmiştir. Buna göre belirlenen bir kirişe (B13 – Beam 1. Kat 1. Açıklık) ait en büyük açıklık momentine ait en elverişsiz yükleme durumu 10100011101001010011 şeklinde 20 adet genden oluşan bir kromozom şeklindedir. GA ile bulunan maksimum açıklık momenti değeri 17.295 olarak belirlenmiştir. Yine istenilen aynı kirişteki (B13) maksimum mesnet moment için yükleme durumu 10111111011101101111 ve değeri 21.550 olarak belirlenmiştir. Belirlenen bir kolon (C46 – Column 4. Kat 6. Kolon) için alt ve üst üç moment değerleri sırasıyla 8.597 ve 9.441 olarak bulunmuş ve yükleme durumu 00011000110001100011 şeklindeki kromozom dizilişindedir. Seçilen bir kiriş (B15 – Beam 1. Kat 5. Açıklık) için belirlenen maksimum kesme kuvveti değeri 44.849 ve yükleme durumu 11111111101110011000 şeklindedir. Seçilen bir kolon (C41 – Column 4. Kat 1. Kolon) için belirlenen maksimum kesme kuvveti değeri 6.012 ve yükleme durumu 11000110001100011000 şeklindedir.

Sonuçlar

Genetik Algoritmalar, evrim sürecinden etkilenilerek canlılarda yaşanan genetik sürecin bilgisayar ortamında gerçekleştirilmesidir. Bir tek mekanik yapının öğrenme yeteneğini geliştirmek yerine, böyle yapılardan oluşan bir topluluğun çoğalma, çiftleşme ve değişim gibi genetik süreçlerden geçirerek başarılı bireyleri oluşturmak, Genetik Algoritmanın temel felsefesidir. Yapılan bu çalışmada, 5 açıklıklı 4 katlı düzlem çerçeve sistemin bir kirişine ait maksimum mesnet ve açıklık momentleri için yük kombinezonunu otomatik olarak düzenleyen GA esaslı program geliştirilmiştir. Genetik Algoritmanın sürekli kirişler için verdiği sonuçlar klasik yöntemle aynıdır. Takdim edilen metodun hızı konvensiyonel programlama tekniği ile yapılan çözüme kıyasla oldukça yüksektir.

Bilgisayarların tüm bilim dallarında hakim olduğu günümüzde, evrimsel modellemelere olan bağımlılık gittikçe artmaktadır. Bunun sonucu olarak, Genetik Algoritmalar inşaat mühendisliği problemlerinin hassas bir şekilde çözümünde ve optimizasyonunda gelecekte kullanımı oldukça önemli bir yer tutacaktır. Yapılan çalışma ile Genetik Algoritmanın özellikle yapı mühendisliği problemlerinin çözümünde kullanılabilirliği ortaya konmaktadır.

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Bilgi toplumunda insan kaynakları muhasebesinin yeri ve önemi

Rabia Özpeynirci[a], İbrahim Apak[b], Haluk Duman[b], Enver Karakışla[c]

[a] Karamanoğlu Mehmetbey Üniversitesi, İktisadi ve İdari Bilimler Fakültesi, İşletme Bölümü
rabiaozpeynirci@hotmail.com

[b] Aksaray Üniversitesi, İktisadi ve İdari Bilimler Fakültesi, İşletme Bölümü,
apakibrahim@gmail.com, halukduman70@hotmail.com
c Karamanoğlu Mehmetbey Üniversitesi, Sosyal Bilimler Enstitüsü, Doktora Öğrencisi,
enver_karakisla@hotmail.com

Özet: Sanayi toplumundan bilgi toplumuna geçişle birlikte bilgi, üretim faktörleri kadar önemli bir unsur halini almıştır. Bilginin öneminin artması, bilgi toplumunda ihtiyaç duyulan insan kaynaklarının niteliği, değeri ve bilgi düzeyinin de önemini artırmıştır. İnsan kaynakları muhasebesi kavramının gelişmeye başladığı 1960'lı yıllardan günümüze kadar işletmelerin insan kaynaklarına bakış açıları değişmiş ve insan kaynaklarının diğer üretim faktörleri kadar önemli olduğu anlaşılmaya başlamıştır. Çalışmada insan kaynakları muhasebesi'nin kapsamı, amaçları, önemi ve insan kaynaklarının değer hesaplama yöntemlerine değinilerek literatür incelemesi yapılmıştır.

Anahtar Kelimeler: İnsan Kaynakları, İnsan Kaynakları Muhasebesi, İnsan Sermayesi

Giriş

Bilgi temelli ekonomi çağında en önemli rekabet aracı olarak "bilgi" ve onun üreticisi olan "insan kaynakları"(İK) işletmeler için vazgeçilmez entellektüel varlık konumuna gelmiştir. İK'nın üretime katılım düzeyi sektör, işletme, mal ve hizmet türüne göre değişiklik gösterse de bütün işletme türleri için önemli bir üretim faktörüdür. Bu nedenle işletme faaliyetlerinin devamında diğer varlıklar gibi İK'nında işletme bünyesindeki yerinin belirlenmesi, değerinin hesaplanması, yapılan yatırımın takip edilmesi ve işletmenin finansal tablolarında gösterilerek ilgili taraflara raporlanması gerekmektedir.

Bir işletmenin faaliyetlerini sürdürmesinde kullandığı varlıklar ve bu varlıkların kaynakları işletme bilançolarında gösterilerek ilgili taraflara raporlanmaktadır. Raporlardan hareketle yöneticiler, yatırımcılar ve diğer kullanıcılar farklı düzeyde ve öneme sahip finansal ve finansal olmayan kararlar almaktadırlar. İşletmenin sahip olduğu varlıkların üretimde kullanılmasında önemli bir faktör olan İK'nın da işletmenin varlıkları içerisinde gösterilmesi, izlenmesi ve değerinin raporlarda ifade edilmesi büyük önem arz etmektedir. Örneğin bir ülkenin sahip olduğu silah gücünün büyüklüğü; sahip olduğu asker sayısı, askerlerin yetenekleri, becerileri ve tecrübeleri ile birlikte değerlendirildiğinde anlamlı olmaktadır.

İşletmeler sahip oldukları İK'yı sonuca ulaşmak için kullanmaktadırlar. İşletmenin ulaşacağı sonuçların kalitesi, sahip olduğu varlık, kaynak ve entellektüel sermaye unsurları ile ilgilidir. Entellektüel sermayenin bir unsuru olan İK da işletmenin sahip olduğu varlıklar arasında gösterilmelidir. Çünkü

işletmelerin sahip olduğu iş gücü işletme için değer meydana getirmektedir. Sahip olunan İK'nın niteliği, tecrübeleri ve bilgisi işletme için artı değerleri ifade etmektedir. Sahip olunan bu İK'nın işletmeden ayrılması şüphesiz ki işletme çıktılarını etkileyecektir. Çünkü İK'nın sahip olduğu tecrübe, beceri ve bilgi, işletmeyi ulaşmak istediği sonuçlara götürecek önemli unsurlardan biridir. Bu nedenle İK'nın işletme içerisinde değeri ölçülüp finansal tablolara yansıtılarak bilgi kullanıcılarına aktarılmalıdır. Bu aşamada İK'nın işletme varlığı olarak değerlendirilmesinde temel olacak ölçütleri ortaya koymaya çalışan bir alt muhasebe dalı olarak "insan kaynakları muhasebesi"(İKM) literatürde yer almaktadır.

İnsan Kaynakları Muhasebesi

İşletme süreçleri bir bütün olarak değerlendirildiğinde, İK'nın bütün işletme süreçlerinde yalnızca fiziki bir varlık olmanın ötesinde soyut özellikleri ile de bir varlık olarak yer aldığı gözlemlenebilmektedir. Mal ve hizmet üretiminde yer alan İK, bilgi, tecrübe ve yeteneklerinin üretime katılması suretiyle girdilerin çıktılara dönüşmesinde önemli rol oynamaktadır. Bu üretim sürecinde kullanılan diğer üretim faktörleri ekonomik değer olarak izlenmektedir. Üretime katılan İK'nın ekonomik değer olarak değerlendirilmesi ise İKM sınırları içerisine girmektedir.

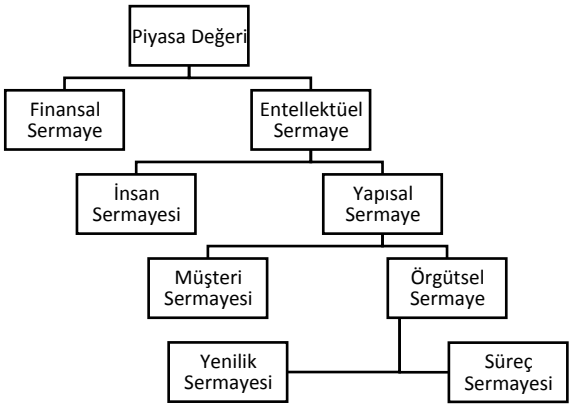
İK'nın dışa dönük raporlarının temeli 1960'lı yıllara dayanmaktadır. 1960'lı yıllardan 1970'li yılların sonuna kadar hızlı bir gelişme kaydetmiştir. Bazı araştırmacılar İK kavramı üzerine eğilerek İK'nın finansal kararlarda önemli bir kaynak olarak görülmemesinin potansiyel etkileri üzerine çalışmalar yapmıştır. Michigan Üniversitesi'nden Pyle vd. İKM kavramını kullandığı ilk günden günümüze kadar ki süreçte konuya olan ilgi artmıştır. Günümüzde ise İKM, entellektüel sermayenin önemli unsurlarından birisi konumundadır (Theeke, 2005; AAAC, 1973; Michael, 2013; Gröjer ve Johanson, 1998).

AAAC[3]'nin (1973) İKM'ye ilişkin olarak yayınlamış olduğu raporda İKM "insan kaynakları hakkındaki verileri tanımlama, ölçme ve ilgi duyanlara aktarma sürecidir" şeklinde tanımlanmaktadır. Bu süreç içerisinde tanımlanan ve raporlanan veriler, işletmenin sahip olduğu İK'nın ekonomik değeridir.

İKM'nin amacı işletmenin gerek içe dönük, gerekse de dışa dönük finansal karar verme süreçlerinde karar vericilere daha kapsamlı veriler sunularak verilen kararların güvenilirliliğini artırmaktır. Finansal kararlara etki edecek verilerin elde edilmesi ise, soyut nitelikteki verilerin somut verilere dönüştürülmesi ile mümkün olacaktır. Soyut verileri sayısal verilere dönüştürecek etkin bir İKM sisteminin geliştirilmesi ile işletmelerin içe dönük ve dışa dönük karar verme süreçlerinde kullanılacak nitelikli veriler elde etme yeteneği sağlayabilir (AAAC, 1973).

İKM, insan sermayesi yönetiminde bir yaklaşım olarak işletmenin finansal tablolarında insan sermayesini bir varlık olarak göstermeyi ve raporlamada bilgi kullanıcılarına aktarmayı hedeflemektedir. İKM, hem yönetim muhasebesi hemde finansal muhasebe kapsamında bir varlık olarak insanın ekonomik değerinin ölçümünü içermektedir (Toulson ve Dewe, 2004). Skandia değer şemasına göre İK, entellektüel sermayenin bir unsurudur. İşletmenin piyasa değerini meydana getiren finansal sermaye ve entellektüel sermayedir. Şekil 1'de Skandia'nın değer şeması gösterilmiştir.

[3] American Accounting Assocation's Committee



Şekil 1. Skandia'nın Değer Şeması

Kaynak: Bontis, 2001.

İnsan sermayesi, işletme faaliyetlerinin gerçekleştirilmesinde görev alan personelin bilgi, beceri, yenilikçilik ve kapasite gibi özelliklerinin toplamıdır. İnsan sermayesi, İK olarakta ifade edilmektedir. Yapısal sermaye ise donanım, yazılım, veritabanı, organizayonel yapı, patent, haklar, ticari markalar gibi işletme çalışanları dışında işletmede var olan bütün değerleri ifade etmektedir (Bontis, 2001). Yapısal sermaye ve İK birbirinden ayrılmaz unsurlardır. Herhangi bir unsurun yokluğu entellektüel sermayeyi etkilemekte ve dolayısıyla piyasa değerini de etkilemektedir.

Kapsamı ve Önemi

Genel olarak İK uygulayıcıları organizasyonlarda yer alan bireylerin, örgütleri için en az maddi ve maddi olmayan duran varlıklar kadar önemli birer varlık olduğunu ifade etmektedir. Maddi ve maddi olmayan duran varlıklar için yapılan kaydetme, sınıflandırma, değerleme ve raporlama faaliyetleri İK için de yapılmalıdır (Theeke, 2005; Cherian ve Faroug, 2013). İşletmeler sahip oldukları maddi olmayan duran varlıklarını değerlemektedir. Ancak İK'nın temeli olan varlıklara ilişkin açıklamaları; anlamsız muhasebe kuralları olarak görme, gereğinden fazla bilgi sunma korkusu veya raporlama formatı eksikliğinin olması gibi nedenlerle finansal tablolarına dahil etmemektedirler. (Toulson ve Dewe, 2004)

İKM, işletme yönetimine İK'nın değerinin ölçülmesine ve bir muhasebe varlığı olarak aktifleştirilmesine yardımcı olan bir araçtır (Steen ve Wlech, 2011). Ayrıca, İKM'nin sunduğu bilgiler günümüz bilgi temelli ekonomi çağında işletme faaliyetlerinin sürdürülmesi ve geleceğe ilişkin karar alma sürecinde karar vericilere atacakları adımlarda yol göstermektedir (Micah vd. 2012; Dhade, 2005). İKM, işe alma, eğitim ve çalışanların geliştirilmesine ilişkin ölçümlemelerin yanısıra çalışanların finansal durumlarının değerlenmesi ve izlenmesidir (Steen ve Welch, 2011; Cherian ve Faroug, 2013). Çalışanları fiziksel birer varlık olarak izlemenin ötesinde İKM, çalışanların beceri, yetenek ve tecrübe gibi soyut özelliklerini sayısal verilere dönüştürerek karar verme süreçlerinde kullanılacak veriler haline getiren bir süreçtir. Bu yönüyle İKM, işletme süreçleri ve çıktıları üzerinde de fayda sağlamaktadır.

Dar anlamda İKM "insanların organizasyonel kaynak olarak muhasebeleştirilmesi" şeklinde ifade edilmektedir. İKM'de en önemli nokta İK'nın maliyeti ve değerinin ölçülmesi için ölçüm metodlarının geliştirilmesidir. Bu ölçüm metodları; yönetici ve yatırımcılar için karar verme süreçlerinde soyut değerleri sayısal veriler haline dönüştürerek yol gösterici rol oynamaktadır (Flamholtz, 1974). İKM'nin genelde üç önemli fonksiyonu vardır. Bunlar: Organizayon kaynağı olan çalışanlar hakkında sayısal veriler sunmak, karar verme sürecinde kullanılacak analitik bir sistem oluşturmak ve İK perspektifini benimsemeleri için karar vericileri motive etmek (Flamholtz vd. 2002). Geniş açıdan bakıldığında İKM işletme yöneticilerine, aşağıdaki açılardan faydalı bilgiler sunmaktadır. İKM (Sharma ve Kumar, 2014);

- Personel istihdamı ve çalıştırılmasında,
- Transfer, terfi, eğitim ve personel azaltmada,
- Fiziksel varlıklarla İK'nın karşılıklı olarak planlanmasında,

- Personel eğitimi ve gelecek eğitim faaliyetleri için gerçekleşen harcamaların değerlendirilmesinde,
- Farklı seviyelerdeki yüksek işgücü devir nedenlerinin belirlenmesinde ve önleyici tedbirlerin alınmasında,
- Yatırımdan düşük getiri elde edildiğinde uygun olmayan (veya yetersiz) fiziksel varlık ve/veya İK'nın belirlenmesinde,
- Bir örgütün iş gücünü değerlendirmede ve olumsuz, elverişsiz ortamlarda hayatta kalmasında,
- İşletmeye uzun vadeli yatırım yapmayı planlayan üçüncü kişilere önemli bilgiler sunulmasında,
- Çalışanlara performansları hakkında önemli bilgiler sunulmasında ve çalışanların işletme ile pazarlık gücünü artırmalarında,
- İşletmenin iş gücüne yapmış olduğu harcamaların ve personelin işletmeye sunduğu faydanın personel bazında karşılıklı olarak değerlendirilmesine ilişkin faydalı bilgiler üretebilmektedir.

İşletme faaliyetleri sonucunda ulaşılan çıktılar faaliyet raporları ile bilgi kullanıcılarına iletilmektedir. Karar vericilerde elde ettikleri bu raporlar ile çeşitli kararlar vermektedir. TMS 1'e göre faydalı finansal bilginin niteliksel özellikleri ihtiyaca uygunluk ve gerçeğe uygun sunum olarak ifade edilmektedir. İşletmenin yönettiği İK'nın ekonomik değeri işletme içi ve dışı bilgi kullanıcılarının kararlarını etkileyecek nitelikte olduğu için önemlidir. İşletmeye ilişkin önemli bilgilerin verilmemesi ihtiyaca uygun ve gerçeğe uygun sunumu ortadan kaldırmaktadır[4]. Karar vericilerin kararlarını etkileyecek İK'ya ilişkin ekonomik verilerin olmayışı ihtiyaca uygun ve gerçeğe uygun sunumu ortadan kaldıracaktır. Bu durumun ise finansal tabloların fayda niteliğini azaltacağı söylenebilir.

Hesaplama Modelleri

İşletme bilançolarının işletmenin performansı hakkında yeterli bilgi sunma konusunda eksik yönlerinin bulunması, İK'nın değerlemesinden kaynaklı ölçüm problemlerinin olması ve İK yönetiminde meydana gelen gelişmeler İKM hesaplama yöntemlerinin ortaya çıkmasına neden olmuştur. İKM'nin değerleme modelleri aşağıdaki gibidir (Pandey, 2014; Dhade, 2005; Ionel vd. 2010).

1. Maliyet Temelli Modeller:
    a. Tarihi Maliyet Yöntemi
    b. Değiştirme Maliyeti Yöntemi
    c. Fırsat Maliyeti Yöntemi
2. Parasal Değer Temelli Modeller:
    a. Harmanson Modeli
    b. Lev & Schwartz Modeli
    c. Flamholtz Modeli
3. Parasal Değer Temelli Olmayan Modeller:
    a. Likert ve Bowers Modeli
    b. Brummet, Flamholtz ve Pyle'ın Ekonomik Değer Modeli
    c. Davranışsal Model

Bu modellerden maliyet temelli modeller ve ekonomik değer model ön plana çıkmaktadır. Maliyet temelli modeller çalışanla ilgili olarak ortaya çıkan işe alma, eğitim, promosyon vb. bütün maliyetleri kapsamaktadır. Bu maliyetler tarihi maliyet, değiştirme maliyeti ve fırsat maliyeti olarak sınıflandırılabilir. Maliyet temelli modeller insan varlığını elde etme sürecinden başlayarak yapılan her ilave harcamayı insan varlığı değeri ile ilişkilendirmektedir. Ekonomik değer modeli ise insan kaynağını bir varlık olarak ele alır ve insan varlığının şimdiki değerinden gelecek kullanımların sonucu olarak elde edeceği sonuçları tanımlamayı ifade etmektedir (Michael, 2013; Stephenson ve Franklin, 1981). Ekonomik değer modeli elinde bulundurduğu insan varlığının kullanımının gelecekte ortaya çıkaracağı faydaları bugüne indirgeyerek değer hesaplaması yapmaktadır. Maliyet temelli modeller geçmiş yönlü iken ekonomik değer modeli gelecek yönlüdür.

[4] TMS 1'e göre bilginin önemi "bir bilginin verilmemesi veya yanlış verilmesi kullanıcılarının kararlarını etkileyebiliyorsa bu bilgi önemlidir" şeklinde ifade edilmiştir.

İKM uygulamasında önerilen ölçüm modellerinde maaş ve ücretlerin bir kısmı veya tamamının aktifleştirilmesi, edinme maliyetleri, değiştirme maliyetleri ve fırsat maliyeti yer almaktadır. Diğer teknikler ise gelecek kazanımların indirgenmesi, kâr ve gelecekte kullanım potansiyeline katkıdır (Fleming, 1977). Finansal açıdan bakıldığında Hermanson modeli, Lev & Schwartz modeli tarihi/şimdiki maliyet tutarını (gelecek harcamaların bugünkü değeri) esas almaktadır. Flamholtz modeli gelecekte sağlanacak nakit akışlarının bugünkü değerini esas almakla birlikte, cari maliyet ve maaş tutarları da dahil edilebilmektedir. Likert ve Bowers modeli finansal olmayan değişkenler arasındaki ilişkiyi esas almaktadır (Fulmer ve Ployhart, 2013). Davranışsal model İKM hesaplamasında parasal değerden ziyade çeşitli göstergeler ve puanlardan yararlanmaktadır. Bu model İK'nın sahip olduğu beceri ve kapasite gibi özelliklerinin çeşitli ölçüm teknikleri ile ölçülmesini ve envanterinin tutulmasını esas almaktadır. Elde edilen İK envanteri ile sahip olunan İK'nın işletme için önemi gösterilmektedir (Pandey, 2014).

Eleştiriler

Bazı akademisyenler ve uygulayıcılara göre İK'nın değerlemesi başarısız olmuştur. Bunun nedeni ise insanın finansal varlık tanımına uymamasıdır. Benzer şekilde İK uygulamalarındaki bir diğer başarısızlık nedeni, İK yöneticileri dışındaki birim yöneticileri (örneğin, finans, muhasebe yöneticileri) İK ölçüm önerilerini kabul etmemektedir. Bunun nedeni ise muhasebe sistemi ile İKM sürecinin birbiriyle uyumlu olmaması şeklinde ifade edilmiştir (Theeke, 2005; Steen ve Welch, 201).

İKM'nin işletme bilançolarında gösterimi konusunda genel kabul görmüş bir şekli henüz bulunmamaktadır. İKM'nin ortaya çıkışından bu yana yapılan çok sayıda çalışmada İK'nın işletmeler için önemli bir varlık olduğu ve finansal tablolarda izlenmesi gerekliliği ifade edilmiş olmasına rağmen İKM uygulaması halen şekillenememiştir (Dhade, 2005; Cherian ve Faroug, 2013; Michael, 2013; Toulson ve Dewe, 2004; Batra, 1996). Literatürde yer alan çalışmalarda İKM'ye yönelik çok sayıda eleştiri bulunmaktadır. Genel olarak bu eleştiriler üç noktada toplanmaktadır. Bunlar (Fleming, 1977; Steffy ve Maurer, 1988);

- İnsanların varlık olup olmadığı,
- İnsanlar varlık ise; hangi maliyetlerin aktifleştirileceği,
- İnsanların varlık olarak izlenmesinde uygun metodun ne olacağıdır.

Günümüz rekabet ortamında en önemli rekabet aracı "bilgi" ve bilginin üreticisi "bilgi işçisi" ise en önemli üretim faktörü haline gelmiştir. Bu kapsamda geleneksel yaklaşımlara karşılık insanın bir işletme varlığı olarak kabul edilmesi doğru olacaktır. İşletme bünyesindeki sürekli öğrenme felsefesini benimseyen, esnek, işbirlikçi ve ortaklığı destekleyen bir ücret ve organizasyon yapısının kurulması, İK verimliliğini, kalitesini ve en önemlisi işletmenin sürdürülebilirliğini değişim, yönetme ve uygulama konusunda avantajlar sağlayacaktır (Aybas, 2014). Tablo.1'de İKM'yi destekleyenlerin ve karşıtlarının görüşleri karşılaştırmalı olarak düzenlenerek gösterilmiştir.

Tablo.1 İKM Savunucularının ve Karşıtlarının Görüşleri

Savunucular	Karşıtlar
1.Genel olarak işletmelerin en önemli kaynağı sanılanın aksine para değil insan gücüdür. İnsanlar işletmelerin en kıymetli varlıklarıdır ancak muhasebe uygulamaları insanların değerini ölçmemekte ve raporlamamaktadır.	1.İK işletmelerce satın alınamaz veya sahip olunamaz. Eğer gerçek bir iş sözleşmesi yoksa, gelecek fayda ve gelecek maliyetler hem çalışan hem de işveren arasındaki taahhüdü temsil etmez. Bu nedenle bir varlık ve yükümlülükten bahsedilemez.
2.Çalışanlar gelecekte fayda sağlanacak potansiyel varlıklardır. Çalışanların değeri ölçülmediği ve raporlanmadığı için varlıklar eksik olarak raporlanmakta, alınan kararlar yetersiz ve yanlış bilgi temelinde gerçekleşmektedir.	2.Çalışanlar zaten maaşlarıyla kendilerinin ekonomik değerini içinde bulundukları zaman diliminde almaktadırlar. Hizmetin faydası içinde bulunulan dönemde tükenmektedir. Bu nedenle İK bir varlık değildir.
3.İKM özellikle işletme dışı bilgi kullanıcılarına özellikle yatırımcılara işletmenin insan varlığında meydana gelen artış ve azalışlar hakkında bilgi sunmaktadır. Benzer şekilde devlet, çeşitli kurum ve kuruluşlara da bilgi sunmaktadır.	3.Halihazırda, İK için geçerli, objektif ve güvenilir bir ölçüm metodu yoktur. İKM'nın alt unsurları için herhangi bir ortak görüş bulunmamaktadır. Bu nedenle İKM uygulaması finansal tablolarda manipülasyona ve hileli finansal raporlamalara yol açabilecektir.
4.İKM insanların gelecekte fayda sağlayacak varlıklar olduğu konusunda yönetimi zorlayacaktır. Bu nedenle insanlara karşı sorumluluklarını yerine getirecektir. Böylelikle daha gelişmiş yönetim uygulamalarını ortaya çıkaracaktır.	4.Pek çok işletmenin mevcut bilgi sistemleri istenilen bilgileri üretmekte yetersiz kalmaktadır. Bu sistemlerin uyarlanması zaman alıcı ve maliyetli olacaktır. İKM'nin faydaları yol açtığı ek maliyetlerin ötesine geçemeyecektir.
5.Mevcut muhasebe uygulamaları İK'nın yanlış yönetimi	5.İKM'nin alt unsurlarının küçük bir kısmı aktifleştirilebilecek ve

konusunda koruma sağlamamaktadır. İK insan gücü bütçeleme, eğitim ihtiyaçları ve promosyonların planlanmasında ve kontrol edilmesinde İKM çok önemli bir araç olacaktır.	amortisman ayrılabilecek, geriye kalan kısmı sabit kalacaktır. Bu nedenle karar verme süreçlerinde kullanıcılara kanıtlanmış bir yararı yoktur. Finansal tablo kullanıcıları ve muhasebeciler az ilgi göstermekte veya göstermemektedirler.
6.Mevcut kâr tahmin araçlarının yanısıra İKM işletmenin gelecek kâr ve büyüme projeleri için yardımcı olabilecek ek bir araçtır.	6.İKM gerçekte şerefiyenin bir parçasıdır ve şerefiyenin değerlemesinde sorunlar vardır. İKM aynı zamanda reklam, finansal kiralama ve AR-GE harcamaları gibi muhasebe uygulamalarına benzemektedir. Tüm bu muhasebe uygulamaları için genel kabul görmüş muhasebe uygulamaları bulunmaktadır.
7.İKM çalışan motivasyonunu ve örgüt hedefleri doğrultusunda çalışanlar arası bağlılığı teşvik edebilecek bir araçtır.	7.İKM'nin etik gerekçeler nedeniyle gösterilmesi sakıncalıdır. Bu durum insanın ve işletmenin gizliliğini ihlal etme manasına gelebilmektedir. Özellikle çalışanların değeri için rastgele numaralandırmaların yapılması insan onuru için küçük düşürücü ve yöneticilerin çalışanları baskılaması şeklinde algılanabilir. Ayrıca işletme rakipleri kalifiye çalışanları kendi bünyelerine katma yoluyla rekabet üstünlüğü arama yollarına gidebilir.

Kaynak: Fleming 1977'den uyarlanmıştır.

Dean vd. (2012) yapmış oldukları çalışmada işletmelerde muhasebe biriminde çalışanlara ve serbest muhasebecilere anket uygulayarak İK'nın bilançoda yer alıp almaması konusunu incelemişlerdir. Anketin gönderildiği 500 kişiden 180'i geri dönüş yapmıştır. Katılımcıların %82'si İK değerinin bilançoda yer almaması gerektiğini ifade etmiştir. Bunun nedenini ise genel olarak İK değerinin tam manasıyla ölçümünün imkansız olduğu, sübjektif sonuçların ortaya çıkacağı ve işletmeler arasında uyumlu ortak bir değer ölçütünün sağlanamayacağı olarak ifade etmişlerdir. Ayrıca İKM'nin finansal tabloların manipüle edilmesini kolaylaştıran bir varlık olacağını ifade eden katılımcılar, İK devir hızının yüksek olmasının İKM sürecinde iş yükünü artıracağını ifade etmişlerdir. Ayrıca, İK'nın finansal tablolarda yer almasının gerekmediğini ifade eden katılımcılar, finansal performansın halihazırda işletmede yer alan İK'nın değerini gösterdiğini belirtmişlerdir. Başarılı bir işletmenin en iyi insan varlığına sahip olduğu görüşünü savunmuşlardır.

Literatür Taraması

Geçtiğimiz on yıl içinde İKM üzerine yapılan çalışmalarda İKM'nin işletme veya örgüt performansına etkisi, İKM'nin değerlemesi ve ölçümü, İKM'ye ilişkin düzenlemeler, standartlar ve raporlanması konularına odaklanıldığı gözlenmektedir (Cherian ve Faroug, 2013; Theeke ve Mitchell, 2008). Benzer şekilde literatürde İK'nın değerini ve işletmeye katkılarını gösterecek ölçüt geliştirilmesi üzerine çalışmalar yer almaktadır (Steen ve Welch, 2011).

Micah vd. (2012), yapmış oldukları çalışmada Nijerya'da İKM raporları ile işletmelerin finansal performansı arasındaki ilişkiyi incelemişlerdir. Hisseleri Nijerya borsasında işlem gören 52 işletmenin 5 yıllık finansal verilerinden faydalanılarak yapılan çalışmada işletmelerin özkaynak kârlılığı ile İKM raporları arasında pozitif ilişki olduğu sonucuna ulaşılmıştır.

Enofe vd., (2013), yapmış oldukları çalışmada borsada işlem gören kâr amaçlı kuruluşlar ve kâr amaçsız kuruluşların İKM raporlamaları ile finansal performans arasındaki ilişkiyi incelemişlerdir. İKM raporlamaları ile finansal performans arasında pozitif ilişki olduğu saptanmıştır. Ayrıca kâr amaçlı kuruluşların kâr amaçsız kuruluşara göre daha fazla İKM raporlamaları yaptığı ifade edilmiştir. Karlılığın işletmeleri finansal tablolarında İKM raporlamalarına yönlendirdiği belirtilmiştir.

Sharma ve Kumar (2014), özel ve kamu bankalarının kamuya açıkladıkları bilgileri İK raporları üzerinden analiz etmişlerdir. Çalışma ile kamu bankalarının özel bankalara kıyasla İK'ya ilişkin daha nitelikli ve fazla bilgi sundukları sonucuna ulaşılmıştır.

Ceran (2007), İKM'nin kapsamı, önemi ve hsaplama yöntemlerine ilişkin bir çalışma gerçekleştirmiştir. Gambling (1974), sistem dinamiği yaklaşımının İKM uygulamasında kullanışına ilişkin bir çalışma gerçekleştirmiştir. Steffy ve Maurer (1988), İKM'de ekonomik etkinliğin ölçümlemesine yönelik olarak aktifleştirme ve ölçmeye yönelik bir model önerisinde bulunmuşlardır. Gröjer ve Johanson, (1998) 1960-1990 dönemini ele alan bir literatür taraması gerçekleştirmiş ve İKM'de meydana gelen gelişmeleri değerlendirmişlerdir. Bullen ve Eyler (2010), İKM uygulamalarına ilişkin literatür taraması yaparak birbirinden farklı ülkelerde yapılan çalışmalara değinmiştir.

Michael (2013), Nijerya'daki banka ve üretim işletmelerinde İKM uygulamalarını incelemiştir. Seçilmiş 12 işletmenin raporları üzerinden analizler gerçekleştirmiştir. Çalışmada İKM raporlamalarının bankalarda üretim işletmelerine göre daha yüksek olduğu sonucuna ulaşılmıştır. Ayrıca işletme büyüklüğü ile İKM raporlamaları arasında pozitif ilişki olduğu ifade edilmiştir.

Steen, Welch ve McCormack (2011), yapmış olduğu çalışmada İKM'nin farklı algılanış biçimleri ve kavramsallaştırmalarını incelemişlerdir. İK, entelektüel sermaye ve şerefiye konularının birlikte değerlendirildiği çalışmada, İKM'nin uygulamasında çok sayıda etkenin varlığı nedeniyle gerçekleşemediği ifade edilmiştir.

Toulson ve Dewe (2004), İKM'nin muhasebe açısından önemini, kimler için önemli olduğunu ve örgütsel stratejiler ile ilişkisini araştırmışlardır. Yapılan anket çalışması ve içerik analizi sonucunda İKM'nin hesaplanmasının stratejik ve rekabetçi üstünlük kazandıracak bir araç olduğu ve işletmenin güvenilirliği için önemli olduğu sonucuna ulaşılmıştır.

Kaur, Raman ve Singhania (2014), Hindistan'da faaliyet gösteren ve borsada işlem gören ilk 500 şirket arasından farklı sektörlerde faaliyet gösteren beş şirketin yıllık raporlarını incelemişlerdir. İKM'ye ilişkin raporlamanın oldukça düşük seviyede olduğu ifade edilmiştir. Bu beş firmadaki raporlamalardan İKM'nin sektörden sektöre farklılık gösterdiği sonucuna ulaşılmıştır. Ayrıca işletme raporlarında İKM'ye ilişkin bilgilerin belirli bir biçimde olmadığı, firmadan firmaya farklılıklar gösterdiği belirtilmiştir.

Sonuç ve Öneriler

Üretim faktörlerinden biri olan İK'nın sahip olduğu bilgi, tecrübe, yetenek işletme süreçleri ve sonuçlarını etkilemektedir. Başka bir ifadeyle işletmenin sahip olduğu İK, işletmenin başarısı üzerinde etkili olmaktadır. Yetersiz veya eksik İK kullanımı, elde edilecek çıktıların niteliğini etkileyecektir. Bu nedenle işletme faaliyetlerinin sürdürülmesinde İK önemli bir unsurdur. İşletmenin sahip olduğu diğer varlıklar gibi değeri hesaplanmalı, yatırımlar takip edilmeli ve finansal tablolarda bilgi kullanıcılarına aktarılmalıdır. İK'nın varlık olarak izlenip ilgi duyanlara aktarılması konusunda İKM önerilmiştir.

İKM, İK'nın varlık olarak izlenip, değerinin hesaplanması ve ilgi duyanlara aktarılması sürecidir. İşletme içi ve işletme dışı bilgi kullanıcıları elde edecekleri bu verileri karar verme sürecinde kullanacaklardır. İşletme içi bilgi kullanıcıları, İKM ile terfi, promosyon, teşvik, gelecek eğitim ihtiyaçları gibi konularda veri sağlayacak bir araç elde etmiş olmaktadır. İşletme dışı bilgi kullanıcıları ise, işletmenin sahip olduğu varlıklarla birlikte İK'nın değerini de görerek yatırım kararlarını daha fazla veriyle gerçekleştirmiş olacaklardır.

İKM'nin literatürde çok sayıda çalışmada faydaları ifade edilmiş olmasına rağmen, uygulamacılar açısında henüz yeterli kabulü sağlayamamıştır. İK'nın varlık olarak değerlendirilemeyeceği görüşü, İKM'nin nasıl hesaplanacağı, hangi maliyetlerin aktifleştirileceği ve nasıl raporlanacağına ilişkin standartların olmayışı İKM'nin uygulanmayışının nedenlerindendir. Bazı işletmeler yıllık raporlarında İKM'ye ilişkin veriler sunmasına rağmen genele yayılmış İKM uygulaması henüz oluşmamıştır.

Literatürde yer alan çalışmalarda İKM'nin finansal tablolarda yer alması gerektiğini ifade eden çok sayıda çalışma yer almaktadır. Buna karşın İKM'ye ilişkin çok sayıda olumsuz eleştiri vardır. Bu eleştirilerden bazıları şöyledir: insanlar varlık tanımına uymamaktadır, insanlar varlık olarak kabul edilse bile değeri hesaplanamaz, insanların sayısal olarak ifade edilmesi iş gücü arasında karmaşaya yola açabilecektir. Benzer şekilde İKM'nin uygulamasında standardın olmayışı işletmeler arasında farklı hesaplamalara neden olacaktır. Bu durum ise finansal raporların güvenilirliğine gölge düşürecektir şeklinde eleştiriler vardır.

İşletmelerin sahip oldukları İK, işletmeler için son derece önemli bir varlıktır. Steve Jobs'un vefatında, Bill Gates'in emekliliğinde şirketlerin hisseleri belirli bir düşüş eğilimi göstermiştir. Bu durum işletmelerin entellektüel sermayelerinin unsuru olan İK'nın işletmelerin önemli bir varlığı olduğunu göstermektedir.

İKM'nin işletme bilançolarında gösterilmesi için gerekli düzenlemeler gerçekleştirildiğinde bilgi kulanıcıları fayda sağlayacaktır. Bunun için öncelikle İKM uygulamaları için önerilmiş modeller geliştirilerek örnek uygulamalar gerçekleştirilmelidir. İşletme yöneticilerine ve İKM uygulayıcılarına İKM'nin öneminin anlatılması gereklidir. İKM uygulamalarına ilişkin değer hesaplama yöntemleri, maliyet kalemleri ve raporlama standartları geliştirilerek işletmeler arası farklılıkların giderilmesi, objektif ve karşılaştırılabilir raporlama dilinin oluşturulması gerekmektedir.

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Bilgisayar Ekranlarının Yaydığı Manyetik Alanlar Üzerinde Kaktüs Bitkisinin Etkisi

Eren ERENSAYIN, Nurettin TOPALOĞLU, M. Hanefi CALP, Ahmet DOĞAN

Gazi Üniversitesi, Bilişim Enstitisü, Türkiye
erenerensayin@hotmail.com, nurettin@gazi.edu.tr, mhcalp@gazi.edu.tr, doganahmet@gazi.edu.tr

Özet: Günlük hayatın büyük bir bölümünü bilgisayarlı ortamlarda veya laboratuvarlarda geçiren insanlar, yüksek miktarlarda manyetik alana maruz kalmaktadırlar. Özellikle, bilgisayar ekranlarının yaydığı zararlı ışınlar, insan sağlığını olumsuz etkilemektedir. Bu çalışmada, öncelikle literatür taraması yapılarak elektromanyetik alanların insan sağlığı üzerindeki olumsuz etkileri incelenmiştir. Daha sonra, bilgisayar ekranlarının yaydığı zararlı ışınların kaktüs bitkisi ile minimize edilip edilmediği araştırılmış olup yapılan ölçümlerle bu durum ortaya konmuştur. ELF (Çok düşük frekanslı) ölçümleri; kaktüs bitkileri ve bilgisayar ekranları çeşitli şekillerde ve ortamlarda bulundurularak gerçekleştirilmiştir. Sonuç olarak, farklı özellikteki (LCD, Tüplü) ekranlar üzerinde defalarca yapılan ölçüm ve testler ile birbirine yakın sonuçlar elde edilmiş ve ortamda bulunan manyetik alanın kaktüs bitkileri tarafından minimize edilmediği ortaya çıkmıştır.

Anahtar Kelimeler: Manyetik alan, ELF, kaktüs bitkisi, LCD ve tüplü ekran

Effect of Cactus Plants on Magnetic Fields Bruited by Computer Screens

Abstract: People, who spend most of their lives in computerized environments or laboratories, are exposed to high measures of magnetic field. Especially harmful rays bruited by computer screens affect people's health in a dangerous way. In this study, firstly literatüre review was performed, later the effects of harmful rays and radiation bruited by computer screens were investigated whether or not minimized with cactus plants The minimizeation or non-minimizeation of these harmful rays and the radiation by the cactus plant is displayed with the calculations and is demonstrated with the tests. The Extremely Low Frequency (ELF) calculations are displayed with the cactus plants which are in differents shapes and surroundings. In conclusion, after the tests and calculations applied on differential screens (LCD, CRT) gave always nearly same results and the magnetic field present in the surroundings were clearly not minimized by the cactus plant.

Key words: Magnetic field, ELF, cactus plant, LCD and CRT screen

Giriş

Bilimsel araştırma ve geliştirme çalışmaları sonucu bir yandan modern bir yaşam kalitesi üretilirken diğer yandan, yaşam kalitesini zorlayan kirliliğin de aynı oranda üretildiği görülmektedir. 19. yüzyılda elektriğin keşfi ile yeni bir yaşam boyutu açılmış ve bunu izleyen teknolojik yenilikler çoğalmıştır (Tatak, F., 2005). Bu bilgi ve teknolojik gelişimin olumlu yönü yaşamı kolaylaştırmak iken olumsuz yönü ise, yaşam kalitesini bozan unsurları içermektir.

Günlük hayatta elektrikli ev araçlarının kullanımı, toplumların gelir seviyesine bağlı olarak gittikçe artmaktadır. Elektrik akımı ile çalışan her araç veya ona enerji taşıyan kablolar, çevresinde elektrik, manyetik veya elektromanyetik alan oluşturur. Bu aletlerin çalışması sırasında, canlıların aletlerden kaynaklanan elektromanyetik alan etkisinde kaldığı bilinmektedir (Cameron, I. W., Hardman, W. E.,Winters, W. D., Zimmerman, S., Zimmerman, A. M., 1993). Manyetik alanın, gözle görülmemesi, etkisinin çoğu zaman doğrudan hissedilmemesi ve uzun zaman sonra artarak ortaya çıkması insanlar tarafından yeterince önemsenmemektedir. Elektronik Manyetik (EM) alan olarak da adlandırılan radyasyon doğada çok az miktarda bulunur ve insan vücudu bundan etkilenmez. Ancak, teknolojinin gelişmesi ve radyasyon yayan cihazların kullanımının artmasıyla radyasyona maruz kalan kişilerin vücut dengesi bozulmakta ve çeşitli rahatsızlıklar ortaya çıkmaktadır. Son yıllarda teknoloji harikası olan bilgisayarların günlük hayatımıza girmesiyle birlikte özellikle monitörlerden yayılan elektromanyetik alanlar insanların sağlığını olumsuz yönde etkilemektedir (Arnetz, B. B, Berg, M. J.). Bilgisayar monitörleri 0-1015 Hz arası belirli bazı frekanslarda elektromanyetik ışıma yaparlar. Söz konusu olan bu aralıktaki elektromanyetik dalgaların paketçik (quantum) enerjileri bir elektronu yörüngesinden koparacak kadar yüksek değildir. Fakat yukarıda belirtildiği gibi bu elektromanyetik ışımaların canlı organizmalara olumsuz biyolojik etkileri vardır (İnternet: TMMOB, Erişim Tarihi: Ekim 2014.).

Bu çalışmada, bilgisayar ekranlarının yaydığı zararlı ışınların ve radyasyonun kaktüs bitkisi ile minimize edilip edilmediği araştırılmıştır. Bu durum, yapılan ölçümlerle açıkça ortaya konmuş ve testler sonucunda ise ispatlanmıştır. Çalışma günlük hayatın büyük bir bölümünü bilgisayarlı ortamlarda veya laboratuvarlarda geçiren insanların manyetizmadan korunması gerektiğini ortaya koymak açısından çok önem arz etmektedir.

Çalışmanın ikinci bölümünde, elektrik ve manyetik alana; üçüncü bölümde, bilgisayar ekranlarının insan sağlığı üzerindeki etkilerine; dördüncü bölümünde, araştırma kapsamında yapılan ölçümlere ve son olarak beşinci bölümde ise, çalışmadan elde edilen sonuç ve öneriler kısmına yer verilmiştir.

Elektrik ve Manyetik Alan

Elektrik alanı, bir elektrik yükünün başka bir elektrik yükü üzerinde yarattığı çekme veya itme kuvveti etkisini ifade eder. Her elektrik yükü (şarj) bir elektrik alanı üretir. Elektrik alanını meydana getiren şey, elektrik yüklerinin varlığıdır. Bundan dolayıdır ki, elektrik şebekesine bağlı bir lamba, içinden akım

geçip yanıyor olmasa bile bir elektrik alanı yaratır. Bir cihazın beslenme gerilimi yükseldikçe, bunun sonucu olarak ortaya çıkan elektrik alanı da yükselir. Elektrik alan şiddeti kaynaktan uzaklaştıkça hızla azalır. Elektrik alanı için dikkate değer bir nokta, az da olsa yalıtkan nitelikli küçük bir engelin bile (bina, ağaç vb.) elektrik alanını engelliyor olmasıdır. Manyetik alan ise, elektrik yükleri yer değiştirdiğinde, yani bir elektrik akımı sirkülâsyonu olduğunda ortaya çıkar. Lamba yandığında, elektrik alanının yanı sıra, akımın besleme kablosundan lambaya geçişinden kaynaklanan bir manyetik alan da söz konusudur. Akım ne kadar yüksekse, bunun bir sonucu olan manyetik alan da o kadar yüksek olur. Elektrik alanında olduğu gibi, manyetik alan şiddeti de mesafe ile hızla azalır. Buna karşın manyetik alan, elektrik alanında olduğu gibi engel teşkil eden nesnelerce neredeyse hiç engellenemez (İnternet: TÜBİTAK, Erişim Tarihi: Ekim 2014).

Özetle, elektrik ve manyetik alanlar elektrikle çalışan her cihazın etrafını saran kuvvet çizgileri olarak tanımlanmaktadır. Elektrik alan oluşumu, ortamda yüklerin varlığına bağlıdır. Manyetik alan ise, yüklerin hareketli olmasıyla (akım akmasıyla) oluşur. Elektrik alan, ortamda bulunan diğer bir yüke uygulanan kuvvet şeklinde açıklanmaktadır. Manyetik alanlar ise, ortamdaki hareketli yüklere kuvvet uygularlar. Elektrik ve manyetik alanların hem şiddeti hem de yönü söz konusudur, yani vektörel büyüklüklerdir (Karaoğlu, B., 1996).

Elektrik Alanının İnsan Bedeninde Hissedilme Şekli

İnsan bedeninde, elektriği iletme özelliği (iletkenlik) bulunmaktadır. Vücut, bir elektrik alanına maruz kaldığında, elektrik yükleri indüksiyon olgusunu takiben bedenin yüzeyinde birikir. Elektrik yüklerinin birikmesi, kendini farklı etkilerde gösterir. Temas sırasında cilt ile cisimler arasında mikro-kıvılcımlar görülür. Bu olgular ciltle temas eden cisimlerin iletken olduklarını gösterdikleri gibi, insan tarafından daha fazla algılanabilir niteliktedirler. Saçların ve vücut tüylerinin titreşmesi (elektriklenmesi) gayet çarpıcı bir şekilde, statik elektriklenme durumunda saçların kafa derisi üzerinde dikleşmesiyle kendini gösterir. Bu karakteristikler elektrik alanının kişiye bağlı olarak az veya çok algılanmasını sağlar. Vücut tüyü/saç miktarının fazlalığından ötürü özellikle erkekler kadınlardan daha duyarlıyken hayvanlardaki hassasiyet hem kadınlardakinden hem de erkeklerdekinden fazladır. Aynı mantık çerçevesinde, elin üst kısmı avuç içinden 2 ila 3 kat daha hassastır. Kollarımızı yukarı kaldırdığımızda, kollar ve ellerin yüzeyindeki elektrik alanını lokal olarak artırırız. Elektrik alanının algı eşikleri kişiden kişiye değişir.

- 10 kV/m altında, çok az sayıda insan ciltlerinin üzerine "üfleniyormuş" gibi hisseder,
- 10-20 kV/m arasında, kimi insanlar derilerinde iğnelenme hisseder,
- 20 kV/m itibaren, insanların %5'inden fazlası iğnelenme hissederken bazıları bunu nahoş bir his olarak nitelendirmektedir (Aral, B. S., 2008).

Elektromanyetik alanlar ve insan sağlığı dendiğinde önce radyasyon ve özellikle iyonlaştıran–iyonlaştırmayan radyasyon tanımlarına açıklık getirmek gerekmektedir. Radyasyon sözcüğü, madde içine nüfuz edebilen ışınlar için kullanılmaktadır. Madde içine nüfuz edip atomları iyonlaştırması (elektron koparması) ya da iyonlaştırmamasına göre iki grup söz konusudur.

- DC - 300 GHz arası iyonlaştırmayan Elektromanyetik Radyasyon,
- 300 GHz üstü iyonlaştıran Nükleer Radyasyon (nötron, proton, alfa, beta tanecikleri, x ve gama ışınları gibi) (Karaoğlu, B., 1996).

Burada incelenen konu, iyonlaştırmayan elektromanyetik radyasyondur.

Elektromanyetik Seviyeler

Uluslararası iyonlaştırmayan radyasyondan koruma kurulu (ICNIRP)'nun kılavuzlarında iki sınıfta limitlerden söz edilmektedir. Bunlar; Temel Sınırlamalar ve Referans Seviyeler'dir.

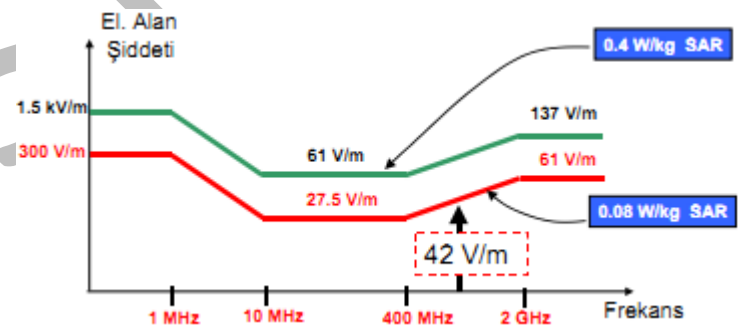
Temel Sınırlamalar: Doğrudan sağlık etkileri yaratan ve zamanla değişen elektrik, manyetik ve elektromanyetik alanlardır. Temel sınırlamalar için kullanılan parametreler frekansa göre;

- Akım yoğunluğu (J) [A/m^2]
- Özgül soğurma oranı (SAR) [W/kg]
- Güç yoğunluğu (S) [W/m^2]'dur.

Bunlardan sadece ortamda bulunan (insan vücudunun dışındaki) güç yoğunluğu kolayca ölçülebilir.

Referans Seviyeler: Bu seviyeler temel sınırlamaların sağlanıp sağlanmadığının belirlenmesine yarayan ölçülebilir büyüklüklerdir. Bu seviyeler yapılan ölçüm ve testlerden olduğu kadar bilgisayar simülasyonlarından da elde edilir. Referans seviyelerin sağlanması temel sınırlamaların da sağlanması anlamına gelir. Ölçülen ya da hesaplanan değer referans seviyeden yüksek çıkması doğrudan temel sınırlamaların aşılması anlamına gelmeyebilir. Ancak, böyle durumlarda doğrudan temel sınırlamaların sağlanıp sağlanmadığı test edilmelidir.

Şekil 1'de sınır değerlerin frekansla değişimi görülmektedir. Üstteki eğri çalışanlar için sınır değerleri gösterirken alttaki eğri genel halkı göstermektedir. DC'den 1 MHz'e kadar, örneğin genel halk için 300 V/m sınır değer olurken, bu değer cep telefonları için ayrılan 900 MHz frekansında 42 v/m değerine düşmektedir. Bu sınır değerler onlarca kat güvenlik payı bırakılarak oluşturulmaktadır (Sevgi, L., 2005).



Şekil 1: Şebeke frekanslarında vücuttan akan akım ile süre arasındaki ilişki (Sevgi, L., 2005)

Dünya Sağlık Örgütü (World Health Organization – WHO), özellikle kanserojen maddelerle ilgili çalışmaları dört grupta toplamaktadır; (1) kanserojen, (2) olası kanserojen, (3) muhtemel kanserojen, (4) henüz sınıflandırılamayanlar. Yüksek gerilim hatlarıyla ilgili uzun süreli, geniş katılımlı ve güvenilir çalışmalar/araştırmalar gerçekleştiği için WHO eldeki araştırma verilerine dayanıp ELF manyetik alanları artık (olası) kanserojen sınıfında göstermektedir (Sevgi, L., 2005). Tablo 1'de, genel halk ve mesleki maruziyet standartları verilmiştir.

Tablo 1: Genel halk ve mesleki maruziyet standartları

<table>
<tr><td colspan="2">Genel Halk Standartları</td><td colspan="2">Mesleki Maruziyet Standartları</td></tr>
<tr><td rowspan="2">TS ENV 50166–1 standardı</td><td>E-Alan: 10 kV/m</td><td rowspan="2">TS ENV 50166–1 standardı</td><td>E-Alan: 30 kV/m</td></tr>
<tr><td>B-Alan: 6.4 G</td><td>B-Alan: 16 G</td></tr>
<tr><td rowspan="2">ICNIRP standardı</td><td>E-Alan: 5 kV/m</td><td rowspan="2">ICNIRP standardı</td><td>E-Alan: 10 kV/m</td></tr>
<tr><td>B-Alan: 1 G</td><td>B-Alan: 5 G</td></tr>
<tr><td>IARC</td><td colspan="3">ELF manyetik alanlar 2B sınıfı karsinojen ilan edilmiştir (Ekim 2001).</td></tr>
<tr><td>WHO</td><td colspan="3">ELF manyetik alanlar için 3 mG'un lösemi riskini 1,7 kat, 4mG'un ise 2 kat artırdığı bildirilmiştir (2004).</td></tr>
</table>

Tablo 2'de bazı aletler ve oluşturdukları manyetik alanlar, Şekil 2'de ise, bazı cihazlardan yayılan elektrik ve manyetik alan değerleri gösterilmiştir.

Tablo 2: Bazı aletler ve tipik manyetik alanları (miliGauss cinsinden) (Sevgi, L., 2005)

Cihaz / Uzaklık d	d = 10 cm	d = 30 cm	d > 1m
Elektrik süpürgesi	300-400	30-50	3-5
Ütü	5-10	1	0.5
Çamaşır makinası	20-30	3-5	1
Saç kurutma makinası	400	10	1
Elektrik traş makinası	200	5	0.5
Mikser	70-200	5-10	0.5
Kahve makinesi	3-5	0.5	0.5
Bulaşık makinası	20-40	5-10	0.5-1
Elektrik fırını	5-10	0.5	0.5
Tost makinası	5-10	0.5	0.5
Buzdolabı	5-10	1	0.5
Müzik seti	3-5	1	0.5

Renkli TV	3-5	1	0.5
Digital saat	2-5	1	0.5
Klima	100	3-5	0.5
Fotokopi makinası	80-150	10-30	1-3

Bilgisayar Ekranlarının İnsan Sağlığı Üzerindeki Etkileri

Bilgisayarlar, tüm dünyada insanların günlük yaşamında önemli bir rol oynamaktadır (Szeto v.d; 2014). Bilgisayarların popülerliğinin artmasına paralel olarak kişisel alım gücünün de artması bilgisayarların hem ev hem de iş yaşamında çok daha yaygın kullanılmasına yol açmıştır. Bilgisayar kullanımının bu yaygın etkisinin artmasıyla birlikte ekranların sağlığa olan etkisi tartışılmaya başlanmıştır. Araştırmaların büyük bir çoğunluğu ekranların yaydığı radyasyon seviyesi üzerine odaklanmıştır (Blehm vd; 2005).

Ekranların vücuda verdiği zararların ilki, bedeni statik elektrik yükü ile yüklemesidir. Ayrıca, ekranların bir diğer zararı, kullandıkları renk skalası yüzünden özellikle oyunlarda beyni yormalarıdır. Özellikle, 0–6 yaş grubundaki çocukların uzun süre televizyon ya da bilgisayar başında kalmaları sonucu göz bozuklukları ve yoğunlaşma sorunu yaşadıkları bilinmektedir. Normal bir ekran saniyede 70Hz dediğimiz bir hızda titreşir ve görüntüsünü tazeler. Oysa sağlık için alt sınır 100Hz'dir. Bu TV'ler için de böyledir. Daha düşük hızlarda bozulmaya yüz tutan flüoresan lambalar gibi gözleri ciddi anlamda yorarlar (İnternet: TÜBİTAK, Erişim Tarihi: Ekim 2014).

Yapılan çalışmalar, bilgisayar kullanıcılarının bilgisayar ekranı karşısında 10 yıldan fazla ve haftada en az 30 saat zaman geçirmeleri durumunda birtakım sağlık problemleri ile karşı karşıya kaldıklarını ortaya koymuştur. Ekranların bahsedilen radyasyon etkilerinden dolayı bilgisayar kullanıcılarının karşılaştıkları sağlık problemleri arasında bedensel rahatsızlıklar, depresyon, saplantı gibi hastalıklar gelmektedir. Bahsedilen hastalıkların yanı sıra ekran karşısında zaman harcayan bilgisayar kullanıcılarını en çok etkileyen sağlık probleminin ise gözle ilişkili semptomlar olduğu belirtilmektedir (Blehm vd; 2005). Thomson'da yaptığı bir araştırmada bilgisayar kullanıcılarının görsel semptomları üzerinde durmuş ve bu semptomların neden olduğu sağlık problemlerini, göz yorgunluğu, gözle ilgili rahatsızlıklar, göz kuruluğu, şaşılık, bulanık görme şeklinde belirtmiştir (Portelle vd.; 2012).

Bilgisayar, kullanıcılarında görülen göz semptomları genel olarak "Bilgisayar Görme Sendromu (BGS)" olarak adlandırılmaktadır ve semptomlar bilgisayar ekranı karşısında geçirilen sürenin uzamasıyla artış göstermektedir (Büyükbaş vd; 2012). Özetle; ekranlardan kaynaklandığı iddia edilen fiziksel risk faktörleri genellikle;

- Ekrandan yayılan X (Röntgen) ışınları, optik ışınlar, radyo frekans ışınları, çok düşük frekans ışınları, aşırı düşük frekans ışınları (Blehm vd; 2005)
- Morötesi (ultraviolet) ve Kızılaltı (infrared) ışınlar,
- VLF, ULF, ve ELF elektrik ve magnetik alanlar,
- Statik elektrik yükleri,
- Akustik gürültü (ultrason, infrason),
- Elektronik devre elemanlarından havaya yayılan kimyasallar (polichlorinated biphenils),
- Ekran titremesi,

- Gözü etkileyen ışık yansımaları v.b. olarak tanımlanmaktadır (İnternet: Artun, T., Erişim Tarihi: Ekim 2014.).

Araştırma Kapsamında Yapılan Ölçümler ve Sonuçları

Bu bölümde, kaktüs bitkisinin elektromanyetik alanı minimize edip etmediğini ortaya koyan ölçüm, test ve bu analiz sonuçlarına yer verilmiştir.

Ölçüm Cihazı

Ölçümlerde kullanılan cihazlar Gazi Üniversitesi Tıp Fakültesi Non-İyonizan Radyasyondan Korunma (GNRK) Merkezi'nden alınmış olup aşağıda belirtilmiştir.

- **Narda EFA 300 Ölçüm cihazı**
  - Manyetik (B) Alan (5Hz – 32 kHz) Probu
- **Narda EMR 300 Ölçüm cihazı**
  - Elektrik Alan (100 kHz– 3 GHz) Probu (tip 8.3)

Resim 1: Ölçüm cihazı

Ölçümde Kullanılan Kaktüs Çeşitleri

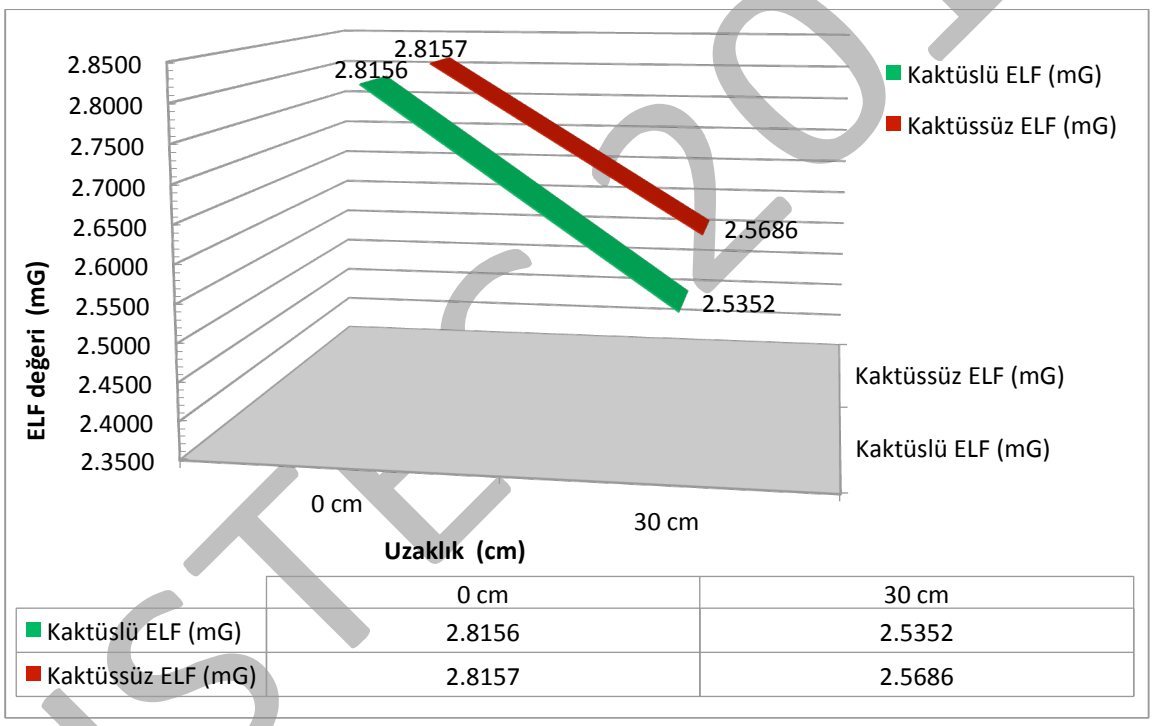
- Acanthocalycium Glaucum
- Agevea Americana Blauw
- Aloe Morlatis
- Armatocereus Cartwrigthtianus
- Pachycereus Pringlei
- Trichocereus Huascha

LCD Ekran Önünde Yapılan Ölçüm

Çalışmada, öncelikle kaktüs bitkisinin LCD ekranların yaydığı manyetik alanı minimize edip etmediği incelenmiştir. LCD ekran üzerinde yapılan ölçüm sonuçları şekil, resim ve tablolar halinde verilmiştir. ELF ölçümleri, çeşitli kaktüslerin çeşitli şekillerde ve farklı ortamlarda bulundurularak yapılmıştır. LCD ekran önünde defalarca yapılan ölçümlerde, genel olarak birbirine yakın sonuçlara ulaşılmıştır. Ortamda bulunan bu manyetik alanın, kaktüsler tarafından minimize edilmediği yapılan testler

ile ortaya konulmuştur. Resim 2'de, ölçüm ortamı; Şekil 2'de ise yapılan ölçümlerden elde edilen veriler gösterilmiştir.

Resim 2: LCD ekran ile yapılan çeşitli ölçümler



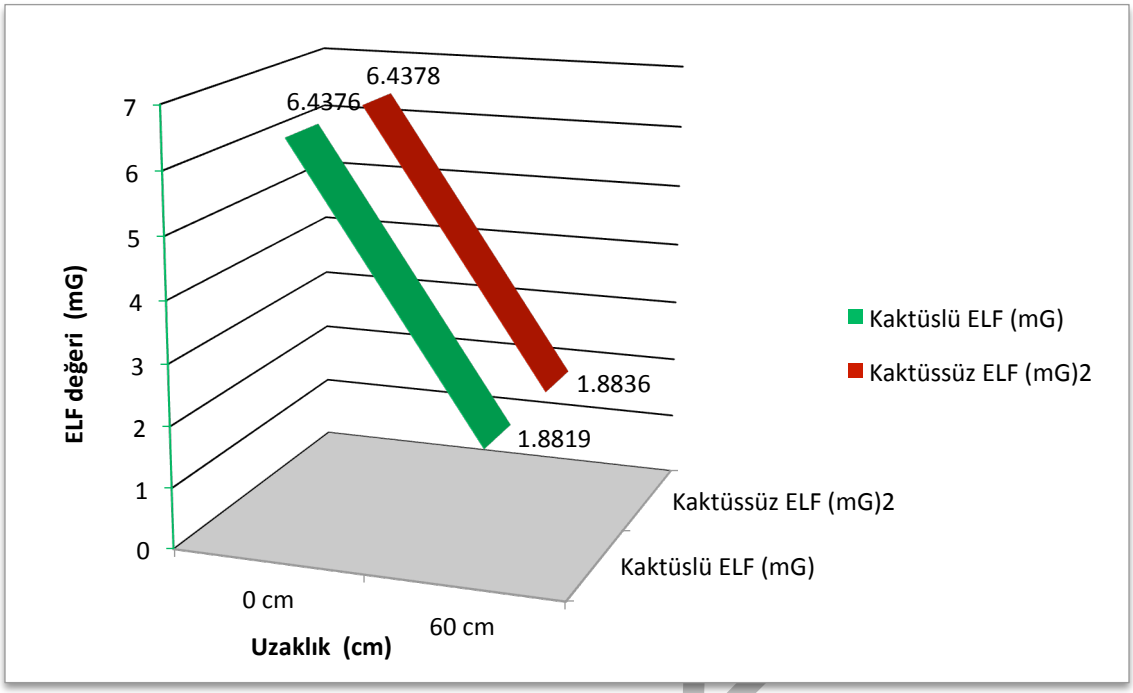
	0 cm	30 cm
Kaktüslü ELF (mG)	2.8156	2.5352
Kaktüssüz ELF (mG)	2.8157	2.5686

Şekil 2: LCD ekran önünde kaktüslü ve kaktüssüz yapılan ölçümün grafiksel gösterimi

Tüplü Ekran Önünde Yapılan Ölçüm

Yapılan ELF ölçümleri, kaktüslerin tüplü ekranın dört bir yanında (sağında, solunda, arkasında ve önünde) bulundurulmasıyla gerçekleştirilmiştir. Tüplü ekran önündeki ELF değerinin yüksek olduğu yapılan ölçümlerle belirlenmiş ve ekran önünde defalarca yapılan ölçümlerde birbirine yakın sonuçlar elde edilmiştir. Ortamda bulunan bu manyetik alanı, kaktüslerin minimize etmediği yapılan testler ile ortaya

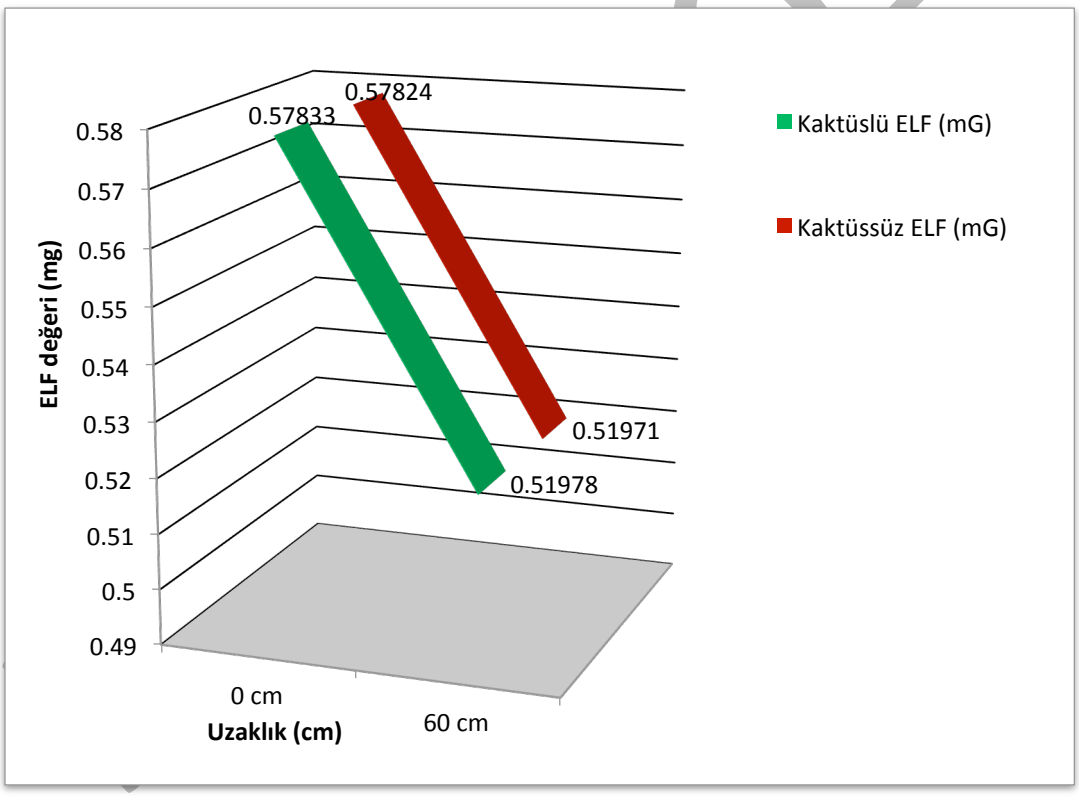
konmuştur. WHO'nun belirlediği standart insan sağlığı için 1 mG ve altındaki değerlerdir. Fakat, tüplü ekran başında yapılan ölçümler 1,9 mG ile 6,4 mG arasında frekansa bağlı olarak değiştiği gözlemlenmiştir. Şekil 3'te, yapılan ölçümlerden elde edilen sonuçlar gösterilmiştir.



Şekil 3: Tüplü ekran önünde yapılan ölçümün grafikle gösterimi

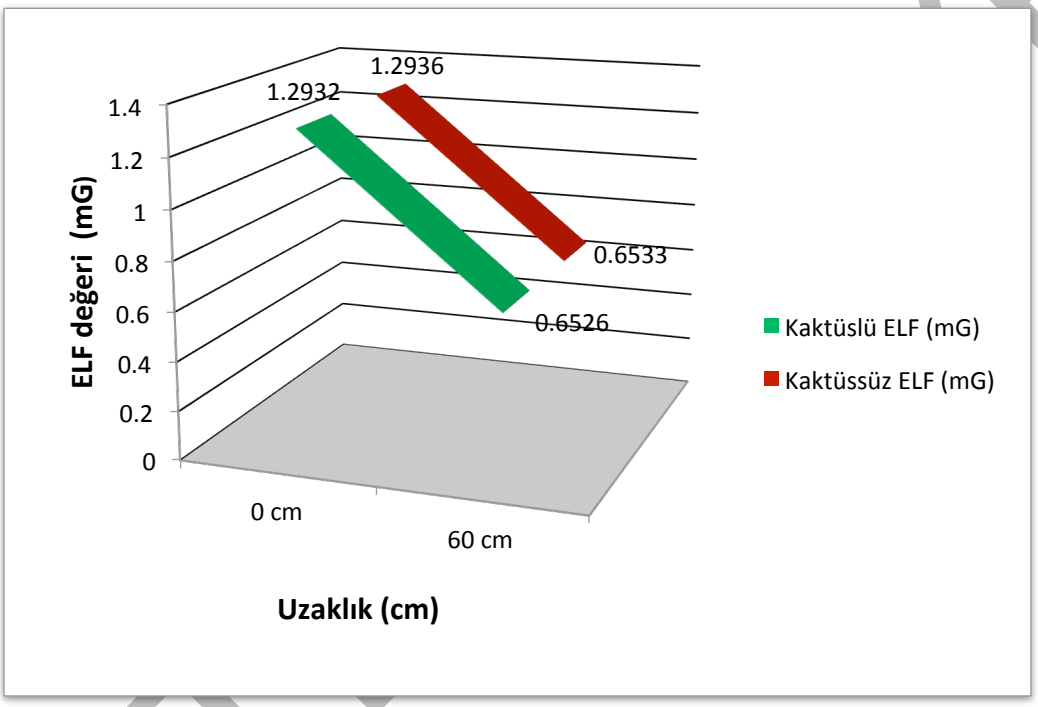
Aynı şekilde, farklı marka ve modeller üzerinde de çeşitli ölçümler yapılmıştır. Yapılan ölçümler sonucu, kaktüslerin manyetik alana herhangi bir etkisinin olmadığı gözlemlenmiştir. Farklı marka ve modellerden alınan örneklemlerin ölçümleri Resim 3-4'te ve elde edilen veriler ise Şekil 4-5'te verilmiştir. Ayrıca, her birisinin uzaklığa bağlı olarak ayrı ayrı ELF değerlerinin nasıl değiştiği de Tablo 3'te gösterilmiştir.

Resim 3: MAC ekran önünde yapılan ölçüm



Şekil 4: MAC ekran önünde yapılan ölçümün grafikle gösterimi

Resim 4: Dizüstü bilgisayar ekranı önünde yapılan ölçüm



Şekil 5: Dizüstü bilgisayar ekranı önünde yapılan ölçümün grafikle gösterimi

Ürün	Frekans (Hz)	Uzaklık (Cm)	Ölçüm Değerleri (Mg)
Tüplü Ekran	92	0	6,4376
	51	60	1,8819
LCD Ekran	52	0	1,3689
	53	60	0,59369
Mac Notebook	194	0	0,57824
	52	60	0,51971

Notebook	260	0	1,2932
	50	60	0,6526

Tablo 3: Çeşitli ekranların önünde yapılan ölçümlerin tablo ile gösterilmesi

Burada her iki ekran türü (LCD, Tüplü) için de dikkat çeken en önemli unsurun, manyetik alanın kaynak ve ölçüm cihazının arasındaki uzaklığın karesi ile ters orantılı olarak azaldığı ve özellikle tüplü ekranın LCD ekrandan çok daha fazla elektromanyetik alan oluşturduğudur.

Sonuç ve Öneriler

Çalışmada, yapılan ölçüm ve testler ile bilgisayar ekranlarının yaydığı elektromanyetik alanların kaktüs bitkisi ile minimize edilip edilmediği araştırılmıştır. Araştırma sonucu, LCD ekran önünde yapılan birçok ölçümde yaklaşık olarak birbirine yakın sonuçlara ulaşılmıştır. Tüplü ekran üzerinde yapılan ölçümlerde ise, ELF değerinin yüksek olduğu belirlenmiş ve ekran önünde defalarca yapılan ölçümlerde yine birbirine yakın sonuçlar elde edilmiştir. Aynı şekilde farklı marka ve modeller üzerinde de çeşitli ölçümler yapılmıştır. Yapılan ölçümlerin hiçbirisinde kaktüslerin manyetik alana herhangi bir etkisi gözlemlenmemiştir. Sonuç itibariyle, bilgisayar ekranlarının bulunduğu ortamlardaki manyetik alanı kaktüslerin minimize etmediği yapılan ölçümler sonucu ortaya çıkmış ve testler ile ispatlanmıştır. Ayrıca, manyetik alan oluşturan ekranlar ile ilgili şu önerilerin belirtilmesi ve uygulanması insan sağlığı açısından önemlidir:

Kullanılmayan ekranlar, ya kapalı tutulmalı ya da fişten çıkartılmalıdır. Cihazlar "Hazır durumda (Stand by)" konumunda kaldığı sürece elektromanyetik kirlilik yaratacaktır. Bilgisayar ekranı ile klavye arasına 1m kadar mesafe koyulmalı ve ekran filtresi kullanılmalıdır. Tüplü (CRT) TV ekranlarından (ön ve arkasından) en az 2 m uzakta bulunulmalıdır. Mümkünse LED, LCD ve plazma ekranlar tercih edilmelidir.

Yapılan çalışma, bilgisayar ekranlarının yaydığı manyetik alanların insan sağlığına verdiği zararlara dikkat çekmesi ve bilinenin aksine kaktüs bitkilerinin de sözkonusu zararları minimize etmediğini ortaya koyması açısından önem arz etmektedir.

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Borlu Aktif Belit Çimentolu Betonun Yüksek Sıcaklık Etkisi Altında Farklı Çimento Tipleriyle Karşılaştırılması

Ülviye Gülsüm HAŞILOĞLU ARAS, Abdulkadir Cüneyt AYDIN

Gaziantep Üniversitesi, Atatürk Üniversitesi,Türkiye
ugharas@gantep.edu.tr, acaydin@atauni.edu.tr

Özet: Bu çalışmada Borlu Aktif Belit (BAB), CEM I 42,5 ve CEM II 32,5 olmak üzere üç farklı tipte çimento kullanılarak aynı granülometrilere sahip agregalarla betonlar üretilmiştir. Üretilen üç farklı tipteki beton karışımlarının basınç dayanımları ve bu dayanımların 200-400-600 ^{0}C olarak belirlenen yüksek sıcaklıklardaki değişimi çimento tipine bağlı olarak elde edilmiştir. Ayrıca Ultrases (UPV) ve Schmidt çekici gibi tahribatsız yöntemlerle üç farklı betonun birbirleriyle kıyaslanarak analizleri yapılmıştır. Böylece ülkemizde var olan dünya çapında yüksek bulunma oranına sahip bor madeninin atığı olarak elde edilen kolemonit atığını değerlendirmek amaçlanmıştır.

Anahtar kelimeler: Bor, borlu aktif belit çimento, basınç dayanımı, yüksek sıcaklık.

Giriş

Betonun inşaat sektöründe kullanımı çok yaygındır. Literatürde çoğu çalışmanın ana bileşeni olarak kullanılır. Bilim dünyası betonun ana malzemesi olan çimentonun çeşitliliği üzerine birçok çalışma yapmıştır. Dünya bor yataklarının %72'lik rezervi ile birinci sırada yer alan ülkemizde de borlu aktif belit çimento hakkında araştırma yapmak kaçınılmazdır.(TS 13353)

Türk Standartları Enstitüsü 13353 (TS 13353) sayılı standardında geçen bor madeni Türkiye, ABD Çin ve Rusya'da bulunmakla beraber BAB çimentosu üretiminde kullanılan kolemanit minerali ($Ca_2B_6O_{11}5H_2O$) sadece Türkiye ve ABD'de bulunmaktadır.

BAB çimento klinkerinin aktif belit fazında ana bileşeni dikalsiyum silikattır. Bu yüzden BAB çimento klinkerinin Portland çimento klinkerinden ana farklılığı, BAB çimento alit faz yerine, su gerektiren aktif belit faza sahiptir (BOREN,2008).

BAB çimento hidratasyonu iki temel özelliğe vardır. Birincisi, kütle beton uygulamalarında düşük hidratasyon ısısına sahiptir. Yani, kütle beton uygulamalarında 7 günlük kür sonrası toplam hidratasyon ısısı 60cal/g'dan az olmalıdır. Bu değer BAB çimentosunda ise 50cal/g (< 60 cal/g)dır. Bu değer çok düşük ısı çimento sınıflandırmasının en yüksek değeri olan 52.5 cal/g'dan da daha azdır (BOREN,2008). Bu yüzden kütle beton yapıları için iyi bir seçenektir (Apaydın,2010, p.19). BAB çimentonun diğer temel özelliklerinden biri de normal Portland çimentosunun (OPC) kimyasal yapısının farklılığından kaynaklanan

ileri yaşlarda daha yüksek dayanıma sahip olmasıdır. OPC %55-65 C_3S,%15-25 C_2S fazdan oluşur. Diğer taraftan BAB çimentosunda C_3S fazı çok az bulunmakta veya hiç bulunmamaktadır. C_3S fazı hidratasyonda daha aktiftir. Ayrıca C_3S içeren çimentolar daha hızlı sertleşir ve dayanım kazanır. Yüksek dayanımlı çimentolarda ve özellikle de ilk dayanımı yüksek çimentolarda C_3S miktarı fazladır. Sertleşme sırasında çok ısı çıkarır, bu ise bir kusur olarak karşımıza çıkmaktadır. Yani BAB çimentonun dayanım kazanma hızı ilk 7 gün içinde yavaş, fakat 7 günden sonra OPC'den daha yüksektir.

BAB çimento üretiminde CO_2 emisyonu OPC'den daha azdır. Bu yüzden BAB çimentonun klinkerleşme sıcaklığı 1325 ^oC iken OPC'nin klinkerleşme sıcaklığı ise 1450 ^oC dir.2. Ulusal bildiriler kitabında (2008) da bahsedildiği gibi, bu durum enerji tüketiminin azalmasına ve bunun yanında CO_2 emisyonunun %25 azalmasına katkı sağlar.

Düşük boşluk oranına sahip olan Borlu aktif belit çimento daha az geçirgen ve daha yoğun bir yapıya sahiptir. Düşük geçirgenliği olan bir betonun, servis ömrü daha uzun olur ve çeşitli çevresel etkilere karşı durabilitesi de daha iyidir (Apaydın,2010).

Materyal ve Metot

Bu bölümde çalışmanın amacı doğrultusunda kullanılan malzemeler hakkında ve uygulanan metot hakkında bilgi verilmiştir. Çalışmada Erzurum ili sınırlarındaki Aşkale Çimentonun kum ocağında üretilen kırma taştan agregamız temin edilmiştir. Agrega kullanılmadan önce yıkanmıştır ve doygun kuru yüzeyli duruma getirmek suretiyle fırında 105ºC de kurutulup, kullanılmıştır. Betonu oluşturan agregaların tane dağılımı en büyük tane büyüklüğüne bağlı olarak TS 802 (1985a)'de belirtildiği gibi gösterilen ideal bölgeye düşecek şekilde seçilmiştir. Bu açıdan araştırmada agregalar ayarlanmış granülometri eğrisine uygun olarak kullanıldığından agregalar 2, 8 ve 16 mm'lik eleklerden elenmiş ve eleklerden elenerek elde edilen agregalar 0–2, 2–8 ve 8-16'lık tane sınıfları halinde sınıflandırılmıştır. Elenen bu malzemeler kirli suyu tamamen gidene kadar yıkanmıştır. Bu şekilde kullanıma hazır hale getirilmiştir. Bu çalışmada CEM I 42,5, CEM II 32,5 ve Borlu Aktif Belit Çimento olmak üzere üç farklı çimento türü kullanılmıştır. Çimentolardan CEM II 32,5 ve CEM I 42,5 Aşkale Çimento'dan temin edilmiştir. Borlu Aktif Belit Çimento ise Ankara' da bulanan Ulusal Bor Araştırma Enstitüsü' den (BOREN) temin edilmiştir. Çalışmada tahribatsız yöntem olarak 2 ayrı yöntem kullanılmıştır. Bunlar Ultrases hızı ölçümü ve Schmidt çekici deneyleridir. Ultrases hız ölçüm (UPV) cihazı, ultrasonik ses dalgaları üreterek, bu dalgaları numuneye gönderip, numunenin sonunda dalgaların alınmasına kadar geçen süreyi ölçmektedir. Ultrases hız ölçümü beton içinden geçirilen ultrasonik boyuna dalganın hızının ölçülmesi esasına dayanmaktadır (Arıoğlu,1986). Yüksek Ultrases hız ölçümü betonun daha sağlam ve daha yüksek dayanıklılığa ilişki kurulmasının yanında, betonun nem içeriğinin ve üretim detaylarına da bağlı olmasını da içerir (Abhijit,2012). Çalışmamızda yapılan bir diğer deney olan Schmidt çekici ise beton yüzey sertliğini ölçer. Tahribatsız bir yöntemdir ve sıçrama tekniği kullanılır. Sıçrama tekniği, Shore sıçrama tekniğine dayanmaktadır. Buradaki mantık bir cisim ne kadar sertse dayanımı da o kadar yüksektir şeklinde açıklanabilir. Schmidt çekici adı da verilen beton çekici yalnız gözeneksiz betonlar için uygundur. Ölçüm yapılacak yüzey temiz, düz ve kuru bir satıh olmalıdır. Bunun için beton yüzeyi boya, yağ, toz gibi maddelerden arındırılarak düzgün bir hale getirilmelidir. Temizleme işlemi çekiç ile birlikte verilen zımpara taşı ile yapılabilir. Hiçbir şekilde sıva üzerinden ölçüm alınmamalıdır (İlhan, 2000). Çalışmamızda ayrıca tahribatlı test türü olan basınç dayanımı testi de kullanılmıştır. Bu test ile eksenel basınç yükü etkisi altındaki betonun kırılmamak için gösterebileceği direnme kabiliyeti ölçülmüştür. Bütün bu deneylerin yapılış sıralaması aşağıda anlatılmıştır.

Bu araştırmada toplam 108 adet 10 x 20 cm boyutundaki silindir numune beton numunesi üretilmiş olup, bunların 27 tanesi kontrol grubu olarak kullanılmıştır. Çalışmada dökülen betonlardan kontrol grubu ayrılarak bu numunelere Ultrases hızı, Schmidt Çekici ve basınç dayanımı deneyleri uygulandı. Diğer

betonlar ise 200ºC, 400ºC ve 600ºC sıcaklıklarda üçer saat bekletildikten sonra oda sıcaklığında soğutuldu. Bu işlemden sonra elde edilen tüm numuneler yükleme hızı 2.5 kg/cm^2/s seçilmiş olan basınç dayanımı, Ultrases hızı ve Schmidt çekici ile ölçümleri yapılmıştır. Farklı yüksek ısılara (200ºC, 400ºC ve 600ºC) maruz bırakılan betonlardan elde edilen verilerin kıyaslaması kontrol grubu ile yapılmıştır.

Sonuçlar

Bu bölümde agrega ve beton deneylerinden elde edilen sonuçlar sunulmuştur. Bu başlık altında 3 farklı çimento tipinden üretilen numunelerin yangın öncesi ve sonrası basınç dayanımı, ultrases hızı ölçümü, birim ağırlık ve Schmidt çekici ölçümü, 7, 28 ve 90 günlük kür sürelerinde yapılmış ve kontrol numuneleri ile karşılaştırmak suretiyle elde edilen sonuçlar sunulmuştur.

Deneylerde kullanılan agreganın maksimum tane çapı 16 mm'dir. 8 mm ile 16 mm tane sınırları arası iri, 2-8 mm'nin mm tane sınırları arası orta, 2 mm altındaki agrega ince olarak seçilmiştir. Bu çalışmaya konu olan betonlarda %40; 0/2 tane sınırları arası agrega, %25; 2/8 tane sınırları arası agrega ve %35; 8/16 tane sınırları arası agrega oranları kullanılmıştır. Agrega oranları Tablo 1'de sunulmuştur. Agregalar için elek analizleri sonuçları da Tablo 2'de gösterildiği gibidir.

Tablo 1:Agrega Oranları

Agrega Cinsi	Özgül ağırlık (gr/cm^3)	Agrega karışım %'leri	% rutubet içeriği	Absrb.%'leri su emme
0/2	2,710	40	0	2,75
2/8	2,590	25	0	1,30
8/16	2,650	35	0	1,24

Tablo 2: Agregalar için Elek Analizi Sonuçları

TS 706/B'ye en uygun yaklaşıma göre								
Agrega Cinsi	Elekler							
	32mm	16mm	8mm	4mm	2mm	1mm	0.5mm	0.25mm
0/2	100	100	100	99	93	79	52	20
2/8	100	100	97	59	21	7	2	1
8/16	100	96	10	1	0	0	0	0

Çalışmada beton yapmak için çimento, karışım suyu ve agrega kullanılmıştır. Kimyasal katkı maddesi kullanılmamıştır. 1 m^3'ü oluşturan malzeme miktarları Tablo 3'de verilmiştir.

Tablo 3: Malzeme miktarları

Malzemeler	Hacim(L)	Özgül Ağırlık (gr/cm^3)	1 m^3 Betondaki miktar (Kg)
Çimento	114	3,080	350
Karışım Suyu	165	1,000	200
Hava	10	0,000	0
0/2	285	2,710	750
2/8	178	2,590	455
8/16	249	2,650	652

Çalışma kapsamında basınç mukavemetlerinin belirlenmesi amacı ile her bir beton türünden üretilen ve sırasıyla 7-28-90 gün suda kür uygulanan numunelerden her bir sıcaklık değeri için elde edilen basınç mukavemetleri ortalamaları Tablo 4'de verilmiştir.

Tablo 4: 7-28-90 Gün Suda Kür Edilen Betonlar için Ortalama Sıcaklık-Basınç Mukavemeti Değerleri ve 200-400-600 ^{0}C'ye Kadar Isıtılan Betonların İlk Basınç Dayanım Değerlerine göre %'lik Olarak Mukavemet Kayıp Değerleri

	BETON TİPLERİ	İLK DAYANIM (MPa)	YANGIN 200^{0}C (MPa)	YANGIN 400^{0}C (MPa)	YANGIN 600^{0}C (MPa)
7 gün	BAB	17,74	17,26 (%-2,71)	12,70 (%-28,41)	5,95 (%-66,46)
	CEM I 42,5	23,64	21,60 (%-8,63)	17,89 (%-24,32)	10,55 (%-55,37)
	CEM II 32,5	16,87	16,78 (%-0,53)	11,55 (%-31,54)	6,53 (%-61,29)
	BAB	26,41	21,58	19,49	10,34

28 gün			(%-18,29)	(%-26,20)	(%-60,85)
	CEM I 42,5	31,83	26,44 (%-16,93)	21,71 (%-31,79)	11,58 (%-63,62)
	CEM II 32,5	22,46	19,07 (%-15,09)	16,24 (%-27,69)	7,92 (%-64,74)
90 gün	BAB	39,61	29,07 (%-26,61)	24,37 (%-38,48)	11,35 (%-71,35)
	CEM I 42,5	31,03	21,36 (%-31,16)	22,94 (%-26,07)	12,79 (%-58,78)
	CEM II 32,5	33,36	24,66 (%-26,08)	14,86 (%-55,46)	8,25 (%-75,27)

7-28-90 gün süreyle suda kür uygulanan beton türlerine sırasıyla 200-400-600°C ısıtma işlemi tatbik edilmeden önce ve tatbik edildikten sonra betonların üzerine tahribatsız bir deney türü olan schmidt çekici ile yüzey sertlik testi uygulanmıştır. Schmidt çekici ile ilgili veriler Tablo 5'de verilmiştir.

Tablo 5. 7-28-90 gün suda kür edilen betonların sıcaklık-schmidt çekici ort. değerleri

	BETON TİPLERİ	SCHMİDT ÇEKİCİ İLK	SCHMİDT ÇEKİCİ YNGN 200 ^{0}C	SCHMİDT ÇEKİCİ YNGN 400 ^{0}C	SCHMİDT ÇEKİCİ YNGN 600 ^{0}C
7 gün	BAB	17,33	18,67	18,00	13,00
	CEM42,5	21,50	21,33	23,33	9,00
	CEM32,5	14,89	15,00	17,00	12,00
28 gün	BAB	19,17	21,00	17,00	12,00
	CEM42,5	21,00	24,00	19,00	17,33
	CEM32,5	16,83	18,67	17,33	14,00
90 gün	BAB	22,00	20,67	18,67	13,33
	CEM42,5	18,08	18,33	16,67	16,33
	CEM32,5	18,58	18,33	19,00	14,67

Hem 7 gün, hem 28 gün, hem de 90 gün süreyle suda kür uygulanan ve 600°C dereceye kadar ısıtılan her üç beton tipinde de Schmidt çekici değerleri, ısıtma öncesi Schmidt çekici değerlerine göre belirgin bir şekilde azalmıştır. 200°C dereceye kadar ısıtılan beton türlerinde, her üç kür grubu için de Schmidt çekici değerlerinde belirgin bir değişiklik olmadığı gözlemlenmiştir. 400°C dereceye kadar ısıtılan beton

türlerinde ise; 7 gün kür uygulanan grupta Schmidt çekici değerlerinde hafif bir artış, 28 gün ve 90 gün boyunca suda kür uygulanan gruplardaki beton tiplerinin Schmidt çekici değerlerinde ise belirgin olmayan bir düşüş olduğu tespit edilmiştir.

7-28-90 gün süreyle suda kür uygulanan beton türlerine sırasıyla 200-400-600 ^{0}C ısıtma işlemi tatbik edilmeden önce ve tatbik edildikten sonra betonların üzerine ultrases test cihazı ile test yapılmıştır. Ultrases test sonuçları Tablo 6'da verilmiştir.

Tablo 6. 7-28-90 gün suda kür edilen betonlar için ultrases ortalama değerleri

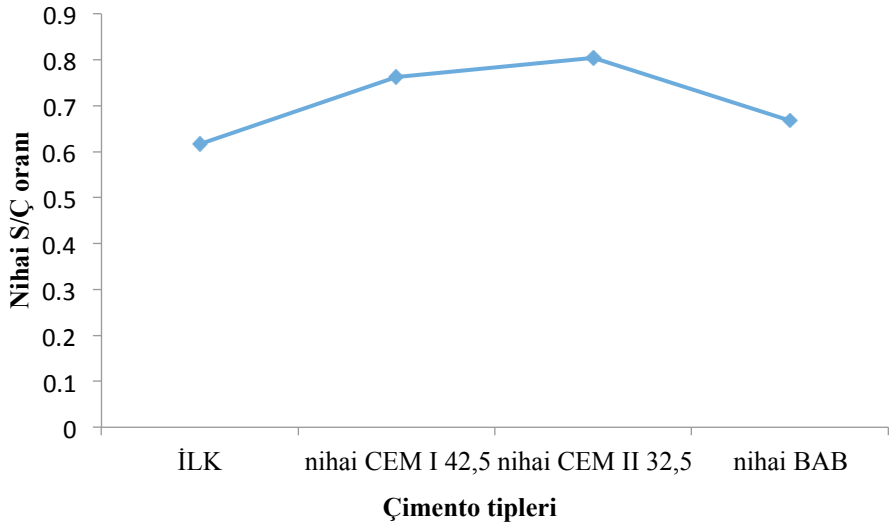
	BETON TİPLERİ	ULTRASES İLK (m/s)	ULTRASES YNGN 200 (m/s)	ULTRASES YNGN 400 (m/s)	ULTRASES YNGN 600 (m/s)
7 gün	BAB	3935,18	3613,00	2530,00	0,00
	CEM I 42,5	4161,89	3697,37	2701,47	1512,33
	CEM II 32,5	3864,24	3405,00	1904,00	0,00
28 gün	BAB	4471,75	4066,00	3041,67	1265,00
	CEM I 42,5	4218,88	3785,00	3190,00	1783,67
	CEM II 32,5	4228,33	3771,00	2663,33	1483,33
90 gün	BAB	4445,42	4242,00	3213,67	1533,00
	CEM I 42,5	4232,50	3739,33	2616,67	1352,00
	CEM II 32,5	4053,33	3796,67	3283,67	1773,67

Tartışma

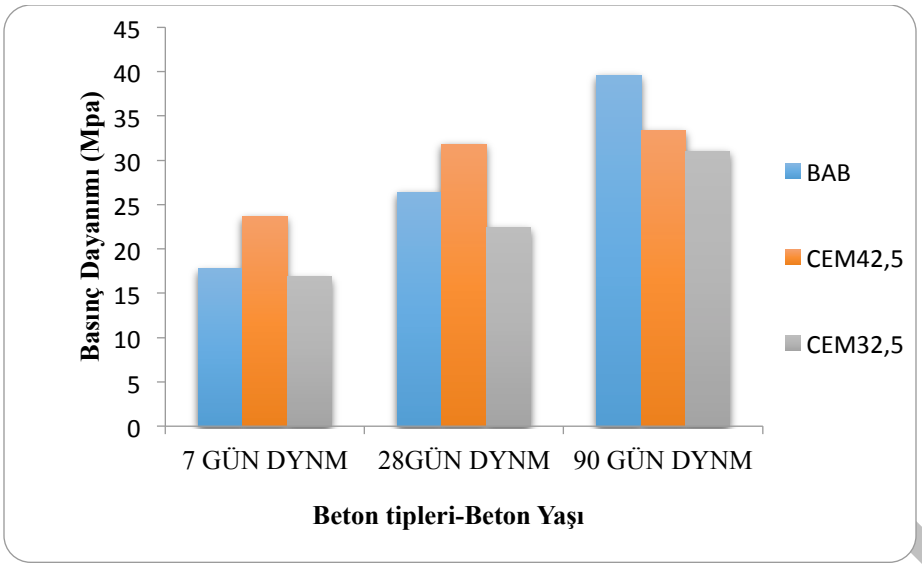
Üç farklı çimento içerikli beton numunelerine, Materyal ve Metot bölümünde anlatıldığı gibi basınç dayanımı deneyi uygulanmıştır. 7-28-90 gün suda kür uygulanan her bir beton grubundaki numuneler sırasıyla 200-400-600 ^{0}C sıcaklığa kadar ısıtılarak bu sıcaklıkta 3'er saat süreyle bekletilmiş ve daha sonra numuneler oda sıcaklığında soğumaya bırakılmıştır. Her bir beton grubundan 3'er numune ise hiçbir ısıl işleme tabi tutulmamış ve kontrol numunesi olarak basınç mukavemeti değerleri belirlenmiştir. Kontrol gruplarının 7 gün sonundaki ortalama basınç mukavemetleri BAB betonu için 17,74 MPa, CEM I 42,5 betonu için 23,64 MPa ve CEM II 32,5 betonu için ise 16,87 MPa olarak ölçülmüştür. 28 gün sonundaki ortalama basınç mukavemetleri BAB betonu için 26,41 MPa, CEM I 42,5 betonu için 31,83 MPa ve CEM II 32,5 betonu için ise 22,46 MPa olarak tespit edilmiştir. 90 gün sonundaki ortalama basınç mukavemet değerleri ise BAB betonu için 39,61 MPa, CEM I 42,5 betonu için 33,36 MPa ve CEM II 32,5 betonu için

ise 31,03 MPa olarak bulunmuştur. Basınç mukavemeti değerleri üçer numunenin aritmetik ortalaması alınmak suretiyle hesaplanmıştır. Çalışma kapsamında basınç mukavemetlerinin belirlenmesi amacı ile her bir beton türünden üretilen ve sırasıyla 7-28-90 gün suda kür uygulanan numunelerden her bir sıcaklık değeri için elde edilen basınç mukavemetleri ortalamaları Tablo 4'de verilmiş ve Şekil 2 Şekil 3, Şekil 4 ve Şekil 5' de grafik olarak sunulmuştur. Beton numunelerin basınç dayanımlarının standart olan değerlerden daha az çıkmasının sebebi olarak beton karışımına katkı maddesi eklenmediği için istenilen çökme değerini yakalayıp yeterli işlenebilirliği sağlayabilmek için ilave su katılmasının olduğu düşünülmüştür. Böylece su/çimento(S/Ç) oranı artmıştır. Fazla olan bu su ilerde buharlaşarak, beton içinde, çoğu kılcal olan, boşlukların oluşmasına neden olur (Bedirhanoğlu 2011).

Buna bağlı olarak basınç dayanımları daha az çıkmıştır. Şekil 1'da Nihai S/Ç oranına karşılık dayanım değerleri verilmiştir. Bu çimento tiplerinden en fazla su harcanan buna bağlı olarak da S/Ç oranı en fazla olan sırasıyla CEM II 32,5, CEM I 42,5 ve BAB çimentodur. Önceki kısımlarda da belirtildiği gibi BAB tipi çimentonun hidratasyon ısısı diğer beton tiplerine göre düşük olduğundan karışımlarda daha az su miktarı harcanmıştır.

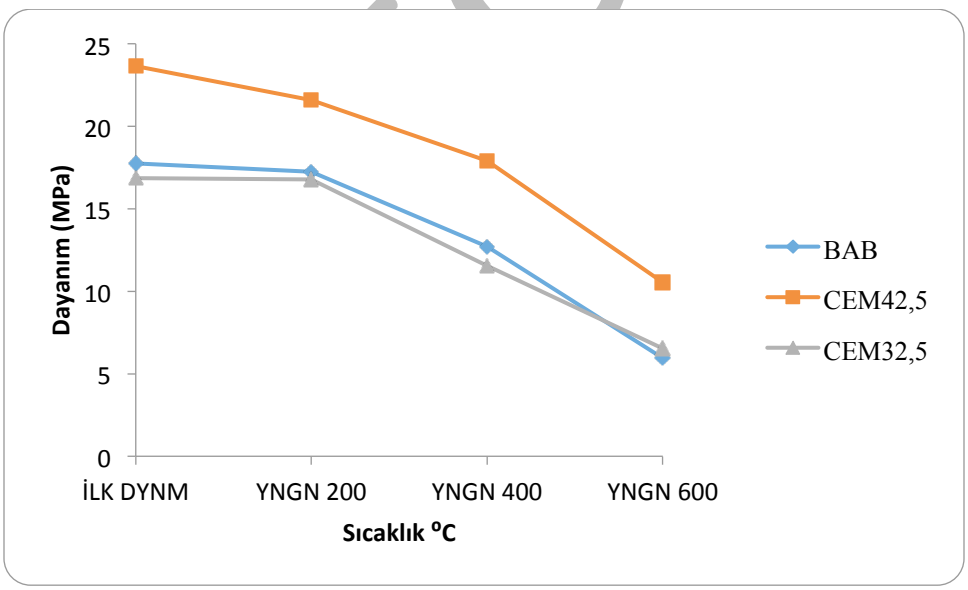


Şekil 1. Nihai S/Ç oranına karşı Dayanım Grafiği

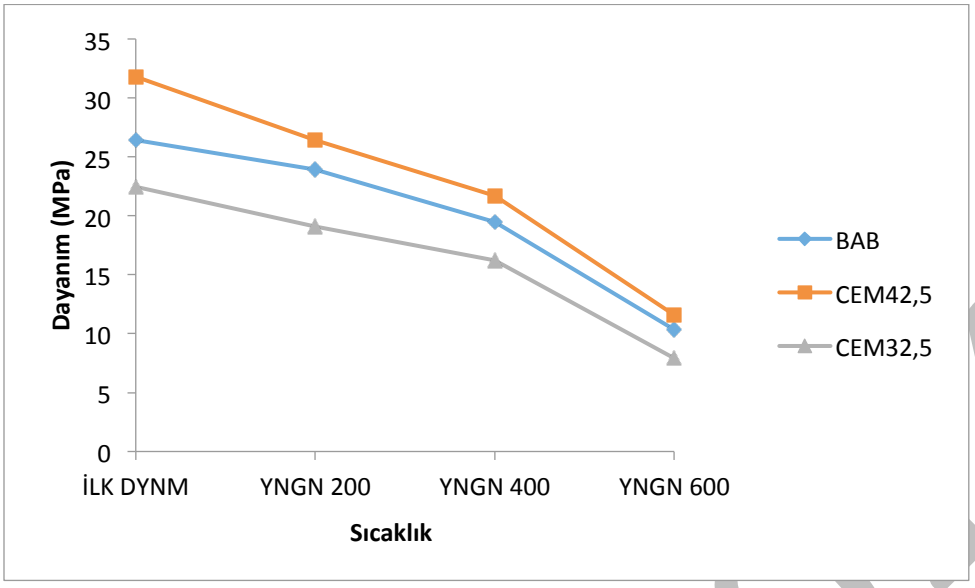


Şekil 2. 7-28-90 Gün Suda Kür Edilen Betonlar için Ortalama Basınç Mukavemet Değerleri

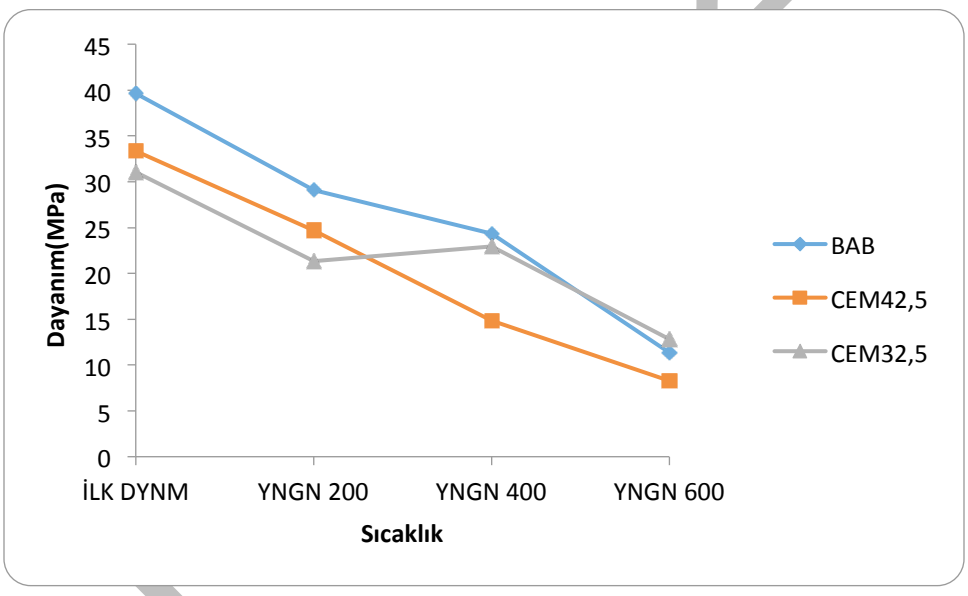
Şekil 2'de görüldüğü gibi BAB çimentolu betonun ilk dayanım değerleri diğer betonlara göre düşükken, ilerleyen yaşlarda beton dayanımı ikisini de geçmektedir. Suda uygulanan kür süresi uzadıkça her beton türü için mukavemetin arttığı ve en yüksek mukavemet değerlerinin 90 günlük numunelerde elde edildiği görülmektedir. En düşük mukavemet değerleri ise 7 gün suda kür uygulanan gruptaki betonlardan elde edilmiştir. 90 gün boyunca suda kür uygulanan numunelerden en yüksek ilk dayanıma 39,61 MPa ile BAB grubundaki betonların ulaştığı ve en düşük ilk dayanıma ise 18,87 MPa ile 7 gün suda kür uygulanan CEM II 32,5 grubundaki betonların ulaştığı tespit edilmiştir.



Şekil 3. 7 Gün Suda Kür Edilen Betonlar için Sıcaklık-Basınç Mukavemeti İlişkisi



Şekil 4. 28 Gün Suda Kür Edilen Betonlar için Sıcaklık-Basınç Mukavemeti İlişkisi



Şekil 5. 90 Gün Suda Kür Edilen Betonlar için Sıcaklık-Basınç Mukavemeti İlişkisi

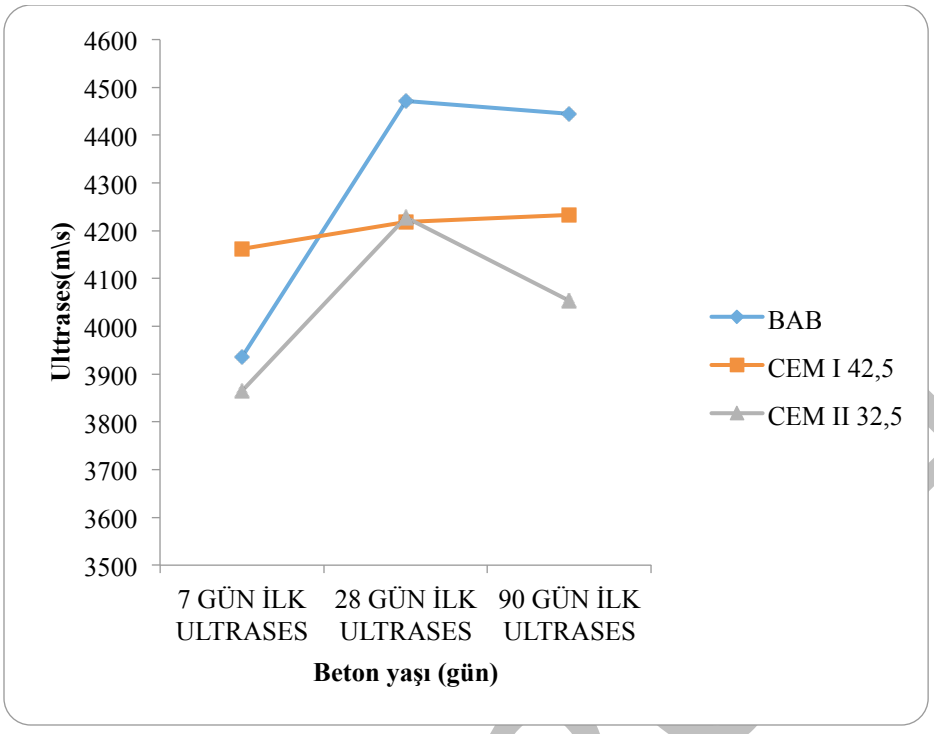
Şekil 3 ve Şekil 4 ile Çizelge 5 incelendiğinde genel olarak her beton türü için sıcaklığın artmasıyla birlikte basınç mukavemetlerinin azaldığı görülmektedir. Ancak 90 gün suda kür uygulanan CEM II 32,5 betonunda 400°C'ye kadar ısıtılan numunelerde basınç mukavemet değerinde ilk dayanım değerine göre azalma olmakla birlikte, 200°C'ye kadar ısıtılan beton numunelerinden daha yüksek basınç mukavemet değerine ulaştığı tespit edilmiştir. En fazla mukavemet kaybı bütün beton türleri için 600°C'de olmuştur.

Bu sıcaklık değerinde 7 gün suda bekletilmiş BAB betonundaki numunelerde ortalama %66,46; CEM I 42,5 betonundaki numunelerde %55,37 ve CEM II 32,5 betonundaki numunelerde ortalama %61,29 oranında mukavemet kaybı oluşmuştur. Bu oranlar aynı sıcaklık değerinde 28 gün suda bekletilmiş BAB, CEM I 42,5 ve CEM II 32,5 beton türleri için sırasıyla %60.85; %63,62 ve %64,74 dür. Bunların arasında en az mukavemet farkı BAB çimentolu betonda olmuştur. Mukavemet kaybı oranı aynı sıcaklık değerinde 90 gün suda bekletilmiş BAB, CEM I 42,5 ve CEM II 32,5 beton türleri için ise sırasıyla %71,35, %75,27 ve %58,78 dir. Chin-Tsung Liu (2009)'un çalışmasında farklı sıcaklık ve farklı bekletme sürelerini denemiştir. Sonuç olarak da bekletme süresi artıkça basınç dayanımlarında da düşme tespit etmiştir. Onun çalışmasında en fazla 120 dakika bekletilirken, bizim çalışmamızda 180 dakika bekletme süresi seçilmiştir. Buna göre mukavemet kaybının olması olağandır.

Yüksek sıcaklık etkilerinde kalan betonların dayanımlarının azalması; agregaların genleşmesi, çimentonun genleşmesi, beton boşluklarındaki ve çimento bileşimindeki suyun uzaklaşması gibi bir takım fiziksel ve kimyasal olaylarla açıklanabilir. Çimento hamurunun jel yapısını oluşturan kalsiyum silikat hidrat (CSH) katı öğeleri adsorbsiyon suyu vasıtasıyla birbirine bağlıdır. Jel adsorbe suyu ve CSH'ların içindeki hidrat suları kolaylıkla buharlaşmayan türdendir, ancak kılcal boşluklardaki su 100°C civarında buharlaşabilir. Bu durumda betondaki bağlayıcılık olarak görev yapan CSH jellerini yoğunluğu azalır ve mukavemetin ciddi şekilde düşmesine sebep olur. Agregaların yangın sırasındaki etkileri ısınma sürecinde belirmeye başlar. Çimento hamur fazından daha farklı bir termik genleşme katsayısına sahip olan agregalar bu faz içinde kayma gerilmeleri oluştururlar ve betonun çatlayarak sürekliliğini kaybetmesine neden olurlar. (Akman 1990).

7-28-90 gün süreyle suda kür uygulanan beton türlerine sırasıyla 200-400-600 ^{0}C ısıtma işlemi tatbik edilmeden önce ve tatbik edildikten sonra betonların üzerine ultrases test cihazı ile test yapılmıştır. Şekil 6'ya baktığımızda

Ultrases hıza göre beton kalitesinin derecelendirilmesi Tablo 7'de gösterilmektedir. Kür sürelerine göre Ultrases hız sonuçları Şekil 6 sunulmuştur.



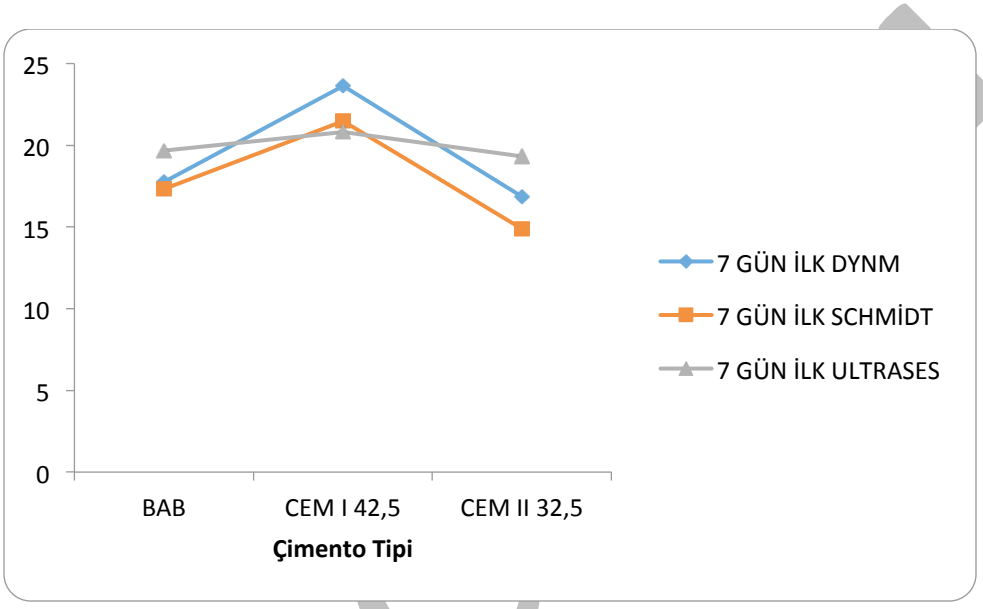
Şekil 6. 7-28-90 Gün Suda Kür Uygulanan Beton Türlerinin Isıtma Öncesi İlk Ultrases Bulguları

CEM II 32,5 ve BAB çimentolu betonlarda aynı doğrultuda bir görünüm vardır. Ama CEM I 42,5 Ultrases değerinde çok bir değişiklik olmamıştır. Şekil 6 incelendiğinde 28 günlük beton dayanımını kazandıktan sonra diğer çimento tiplerine göre BAB çimentosunun Ultrases değeri daha yüksektir. Tablo 7'yi göz önüne alarak yorumlarsak BAB çimentolu betonun beton kalitesi "çok iyi" kalitesine yakın "iyi "durumdadır. Diğer beton tipleri de beton kalitesi bakımından "iyi" sınıfına girmektedir. Bütün beton türleri için ısıtma öncesi mukavemet değerleri 7. günden 90. güne artarken, ultrases cihazı verilerinin BAB ve CEM II 32,5 türü beton numuneleri için 28. günden sonra düşüşe geçmesi ve bu düşüşün CEM II 32,5 türü beton numuneleri için daha belirgin olarak ortaya çıkması ilginç bir ayrıntı olarak dikkati çekmektedir. CEM II 42,5 türü beton numuneleri için ise 7. günden 90. güne kadar belirgin olmayan bir artış gözlenmektedir.

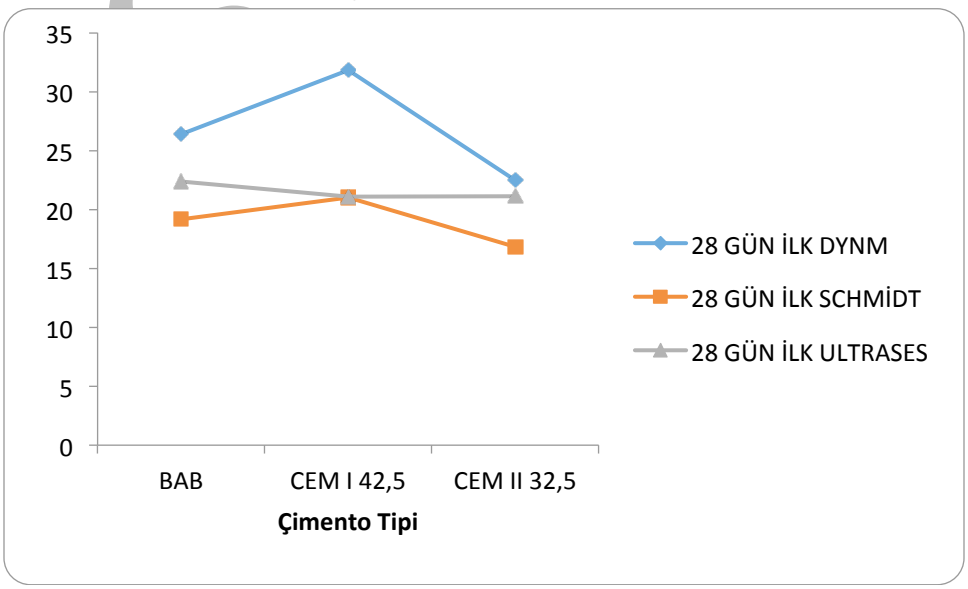
Tablo 7. Ultrases hıza göre beton kalitesinin derecelendirilmesi

Ultrases Hızı (m/s)	Beton Kalitesi
4500'den büyük	Çok iyi
3500–4500 arası	İyi
3000–3500 arası	Süpheli
2000–3000 arası	Zayıf
2000'den küçük	Çok zayıf

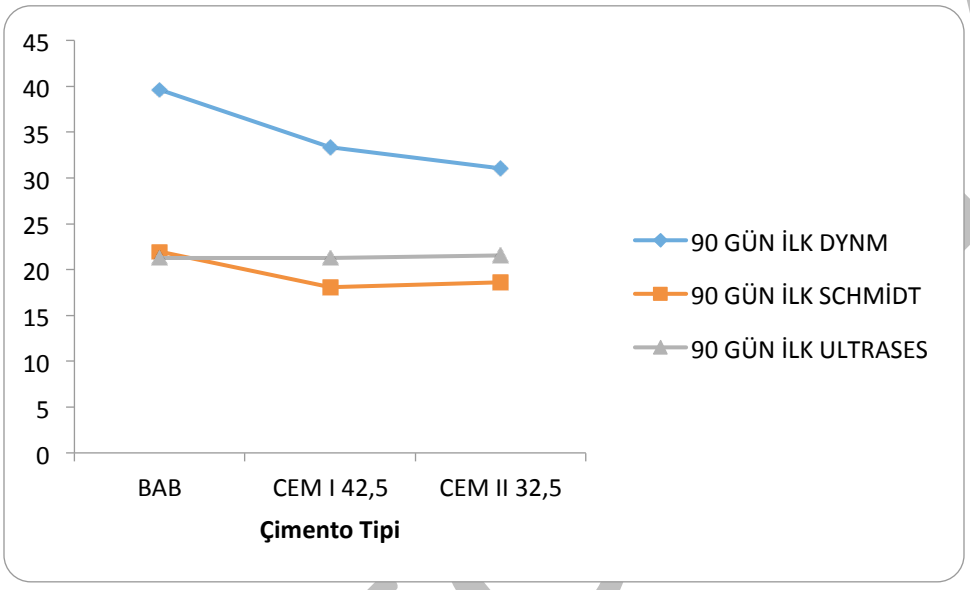
Yalnızca ultrases hız ölçümü ile beton dayanımının tespiti, ±%40'a varan hatalara sebep olabilmektedir(Öz,2006). Numunelerin diğer yöntemlerle birlikte (Schmidt sertlik yöntemi, basınç dayanımı yöntemi) değerlendirilmesi halinde bu oran çok daha aşağı düşebilir. Çalışmamızda beton dayanımlarının tespiti için ultrases hızın ölçümünün yanında, schmidt sertlik yöntemi ve basınç dayanımı yöntemi de kullanılmıştır. Ultrases hızın büyük olması genelde beton basınç dayanımının da yüksek olması manasına gelmektedir. Bu sadece kompasite ile ilişkili olmayıp beton bileşimi (çimento, agrega, beton nemi, katkı maddeleri) yapısı ve deney şartları gibi faktörlerine de bağlıdır(Bingöl,2008).
Şekil 7, Şekil 8 ve Şekil 9'da beton tipleri farklı yüksek sıcaklık etkisi sonrası (200-400-600°C) 7-28-90 günlük İlk Dayanım, Ultrases hız ve Schmidt Çekici sonuçları gösterilmiştir.



Şekil 7. 7 Günlük Isıtma Öncesi Beton Türlerine göre Dayanım, Schmidt Çekici ve Ultrases Verilerinin Karşılaştırması



Şekil 8. 28 Günlük Isıtma Öncesi Beton Türlerine göre Dayanım, Schmidt Çekici ve Ultrases Verilerinin Karşılaştırması



Şekil 9. 90 Günlük Isıtma Öncesi Beton Türlerine göre Dayanım, Schmidt Çekici ve Ultrases Verilerinin Karşılaştırması

Sonuç

BAB tipi çimentonun hidratasyon ısısı diğer beton tiplerine göre düşük olduğundan karışımlarda daha az su miktarı harcanmıştır.

BAB çimentolu betonun ilk dayanım değerleri diğer betonlara göre düşükken, ilerleyen yaşlarda beton dayanımı ikisini de geçmektedir.

Yangın etkisi tüm betonlarda basınç dayanımı, Ultrases hız ölçümü ve Schmidt Çekici ölçümleri sonucunda bir düşüş oluşturup betona zarar verdiği gözükmektedir.

Daha sonraki çalışmalarda kimyasal ve mineral katkı katılarak tahribatlı ve tahribatsız testler uygulanabilir.

Teşekkür

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Business in Sustainability – a European Perspective

Arnold Pabian, Felicjan Bylok, Piotr Tomski

Czestochowa University of Technology, Faculty of Management, Poland
arnold.p@wp.pl

Abstract: Modern business consumes most of the world's nonrenewable resources – it is to a considerable extent responsible for environmental pollution and contributes to deepening of some social pathologies. Increasing global ecological and social problems deteriorate the health of the Earth, threatening the existence of future generations. The response to these adverse trends is sustainable business - a new current, developing in the world in the field of sustainable science. In the paper the authors present their own model conception of business in sustainability. A special feature of this conception is moving sustainability from peripheries of business to its centre – replacement of unsustainable resources and activities with their sustainable equivalents. The authors also discuss the necessity for creation of such conceptions and barriers to their implementation in business practice. The ideas presented in the paper have been set in the realities of the European Union, which has significant achievements in sustainable development.

Key words: sustainable development, sustainable business, sustainable enterprise

Introduction

Business should keep up with changes taking place in the world. One of the most important changes of the global nature is the deteriorating health of our planet, which is the consequence of the accelerated pace of the civilization development. The development of mankind is accompanied by growing economic and social problems and in consequence a high degree of unsustainability confirmed by the indicators presented in the Living Planet Report 2012 (Switzerland 2013). For the most part it is business, and in particular manufacturing enterprises, that are responsible for this unsustainability. Concern for future generations changes priorities of business. Ecological and social objectives become as important as economic goals. High degree of unsustainability of the system of human development forces traditional business to transform into sustainable business. To make such a transformation possible, definite sustainable business conceptions and models are indispensable. Meanwhile, in this field mainly fragmentary solutions are to be found in the literature. Some authors deal with sustainable/sustainability management e.g. (Cohen, 2011), (Haugan, 2013), (Bossink, 2012). Other scholars concentrate on sustainable/sustainability marketing, e.g. (Belz, Peattie, 2010), (Leitner, 2010), (Martin, Schouten, 2012), (Kadirov, 2010). Another field of study is sustainable logistics and supply chain management, e.g. (Grant, 2013), (Morana, 2013), (Howard, 2014), (Lindgreen, 2013). The above examples do not exhaust all spheres of business to which sustainability principles are applied. Another shortcoming of the solutions presented in the literature is their focus only on selected business sectors or selected sphere of sustainability.

The paper demonstrates the necessity of search for complex solutions in sustainable business pointing out to some determinants of pursuance of such activity in the European Union. Furthermore, the authors' own model conception of business in sustainability has been presented, taking into account its most important components. An important characteristic of this conception is the transfer of sustainability from the peripheries of business to its centre – replacement of unsustainable resources and activities with their sustainable equivalents.

Background

Sustainable development efforts undertaken for many years have not improved significantly the health of our planet. Growing ecological and social threats are confirmed by the Living Planet Report 2012. An analysis of the data presented in the Report led to the following conclusion: „clearly, the current system of human development, based on increased consumption and a reliance on fossil fuels, combined with a growing human population and poor overall management and governance of natural resources, is unsustainable" (Living Planet Report 2012, p. 10). The degree of this unsustainability is well reflected by Table 1.

Table 1: State of the Earth's unsustainability

Areas	Indices
Biodiversity has declined globally	The global Living Planet Index declined by almost 30 per cent between 1970 and 2008. The global tropical index declined by 60 per cent during the same period. The global temperate index increased by 31 per cent – however this disguises huge historical losses prior to 1970. The global terrestrial, freshwater and marine indices all declined (freshwater index by 37 per cent) The tropical freshwater index declined by 70 per cent.
Human demands on the planet exceed supply	Humanity's Ecological Footprint exceeded the Earth's biocapacity by more than 50 per cent in 2008. The carbon footprint is a significant component of this ecological overshoot. Biocapacity per person decreased from 3,2 global hectares (gha) in 1961 to 1,8 gha per capita in 2008.
Many river basins experience water scarcity	Examining scarcity on a monthly basis reveals many river basins that seem to have sufficient supplies based on annual averages are actually overexploited, hampering critical ecosystem functions. 2,7 billion people around the world live in catchments that experience severe water scarcity for at least one month a year.

Source: (Living Planet Report 2012, p. 12)

The ever increasing unsustainability leads to surpassing of the tolerance limits of nature and uncontrolled growth of social problems, in consequence of which future generations will to a considerable extent be deprived of chances for development – as the Earth is an isolated system, powered from outside only by solar energy and in future this system will be unable to carry the burdens created by man (Pabian, 2013a, p. 3). Therefore, one of the greatest challenges for the present generation is to transform contemporary consumer societies into sustainable societies, based on sustainable production and consumption (Pabian, Bylok, Rajczyk, Rajczyk, 2012, pp. 299-300).

The European Union took up this challenge going down the road of sustainable development. The current strategy of sustainable development of the European Union is set forth in the document called Europe 2020. It was adopted by the European Council on 17th June, 2010. The Europe 2020 strategy is based on the following three priorities: smart growth, sustainable growth and inclusive growth. The basic instruments of implementation of the Europe 2020 strategy on the Member States' level are the so-called National Reform Programmes (Ministry of Economy, 2012, p. 53). Table 2 shows figures of the significant indicators related to this strategy and their targets.

Table 2: Indicators of the Europe 2020 strategy for smart, sustainable and inclusive growth

EU-28		**2005**	**2011**	**2012**	**Target**
Employment	Employment rate (percent of population aged 20-64)	67,9	68,5	68,4	75
EU-28		**2005**	**2010**	**2011**	**Target**
R&D	Gross domestic expenditure on R&D (percent of GDB)	1,82	2,00	2,02	3
EU-27		**2005**	**2010**	**2011**	**Target**
Climate change/energy	Greenhouse gas emissions (index 1990 = 100)	93	86	83	80
	Renewables in gross final energy consumption (%)	8,5	12,5	13,0	20
	Primary energy consumption (million tonnes of oil equivalent)	1703	1645	1583	1474
EU-27		**2005**	**2011**	**2012**	**Target**
Education	Early leavers from education and training (percent of population aged 18-24)	15,8	13,4	12,7	less than 10
	Tertiary educational attainment (percent of population aged 30-34)	28,0	34,6	35,8	40 or more than 40
EU-27		**2005**	**2011**	**2012**	**Target**
Poverty or social exclusion	People at risk of poverty or social exclusion (million)	123,9	119,8	124,4	95,7

Source: (Basic figures on the EU, Winter 2013/2014 edition)

As shown in Table 2, the European Union has adopted ambitious targets in respect of sustainable development and has been successful in this sphere. The successes are proved by positive values of most of the indicators in the years 2005 – 2012. The ambitious aims are reflected by the figures in the Target column, which the European Union intends to achieve by 2020.

Entrepreneurship can contribute to sustainable development to a much greater extent than they do now. "Produce better" is one of the most important recommendations given to entrepreneurs: significantly reduce inputs and waste in production systems, manage resources sustainably, scale-up renewable energy production (Living Planet Report 2012, p. 107).

Business in sustainability conception seeks to achieve not only economic but also social and ecological goals. Preferences with regard to these goals can be different. According to Poles, enterprises should support the following most important social and ecological goals (Mirońska, Zaborek, 2014, p. 37):

- fight against hunger and poverty – 61% responses,
- helping the chronically ill – 83%,
- helping animals – 53%,
- fight against social pathologies – 48%.

Results of the surveys show that taking social and ecological goals into consideration in business can be beneficial for an entrepreneur. Many consumers are willing to pay more for a product which supports such goals. The percentage of this type of consumers in the selected countries of the European Union is as follows: Germany – 35%, Italy – 34%, France – 30%, the Netherlands – 30%, Belgium – 29%, Great Britain – 28%, Poland – 13%. In some non-European countries this percentage is much higher e.g. China – 80%, India – 71%, U.S.A. – 39% (Mirońska, Zaborek, 2014, s. 35).

Business in sustainability conception fits into the framework of the European entrepreneurship, whose condition has been presented in Table 3.

Table 3: Condition of entrepreneurship in selected EU countries (%)

Description		Austria	France	Germany	Poland	Romania	Sweden	Hungary
Sectors in which businesses are set up	Mineral extraction	1,6	5,3	0,8	6,7	17,7	9,5	12,2
	Manufacturing	11,4	17,2	14,8	41,3	21,2	14,1	26,2
	B2B services	40,1	33,4	30,5	18,1	17,3	38,2	23,4
	B2C services	46,8	44,1	54,0	33,9	43,9	38,1	38,2
Fear of failure		43,5	46,7	49,0	58,7	45,1	38,9	45,9
Motives for starting a business	To improve standard of life	38,2	58,9	50,7	30,1	37,7	48,6	35,3
	Necessity	10,8	18,1	21,7	40,7	24,2	6,8	31,1
New businesses' growth aspirations	At least 5 new jobs within 5 years	13,0	25,5	25,9	29,8	48,6	16,6	33,5
	At least 10 new jobs and employment growth by at least 50% within 5 years	7,6	21,9	21,7	15,6	35,6	9,7	22,6

Source: (Global Entrepreneurship Monitor – Poland 2012, pp. 13-14, 24, 21-22, 25-26)

The structure of European entrepreneurship is dominated by production, B2B and B2C services, which are the economy sectors where business in sustainability should be implemented in the first place. Mineral extraction should be systematically reduced, and such materials and technological solutions should be sought that will make minerals unnecessary thus leading to cessation of mineral extraction e.g. by substituting traditional energy sources with energy from renewable sources. More than half of entrepreneurs in most of the countries presented in Table 3 are not afraid of failure in business. Such attitudes foster sustainable business projects. High aspirations of entrepreneurs have an influence on the rate of development of this type of projects.

Conception of the European business in sustainability

According to the authors of this paper, business in sustainability is an ordered set of actions and things, the functioning and output of which in the form of particular products and services are in conformity with the principles of sustainable development. The idea of business in sustainability has been show in Figure 1:

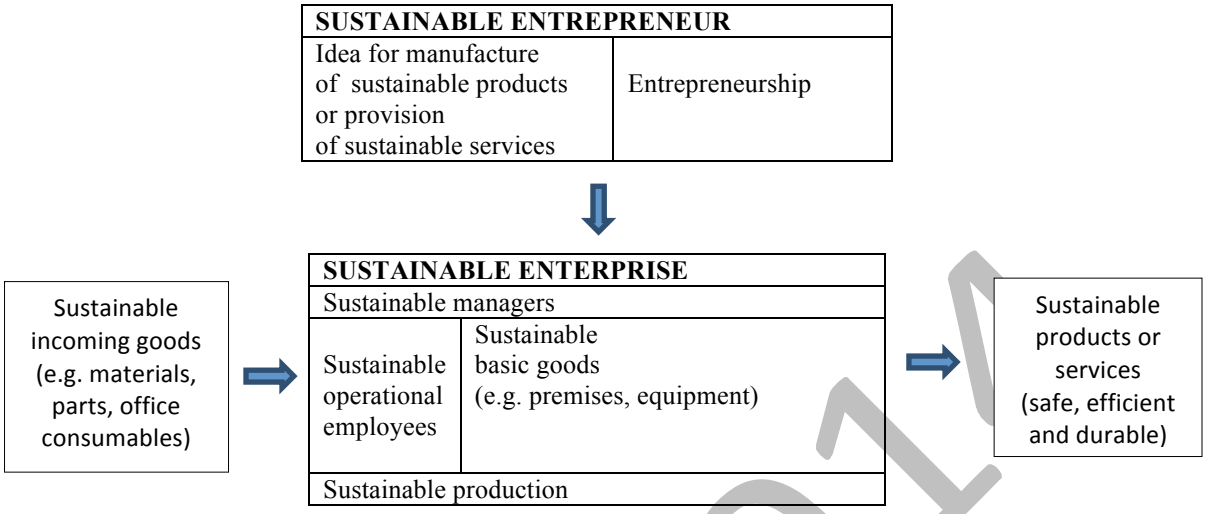

Figure 1: A concept of business in sustainability

In the suggested approach the starting point for business in sustainability is an idea for manufacture of sustainable products or provision of sustainable services. These products and services are people and environment friendly. Sustainable products are not only safe and efficient but also durable. Durability fosters protection of man's natural environment because it reduces demand for products, which results in reduction of their production volume and hence, also in reduction of factors having a negative impact on the environment, and caused by the said production.

People and organizations initiating sustainable business projects should understand and support the ideas of sustainable development. Their ecological and social sensitivity is reflected by the following characteristics (Cohen, 2011, pp. 1-19, pp. 132-158), (Pabian, Bylok, Kucęba, Zawada, 2013, p. 7):

- they want to take responsibility for the health of Earth,
- they act for the benefit of future generations, so that they are able not only to survive, but also to develop,
- they focus on future (also very distant),
- they make efforts to achieve economic, environmental and social goals,
- they value sustainability (also in production, consumption and sales) much more than economic growth,
- they control the environmental and human effects of their organisation,
- they minimise negative impact of their organisation on the planet,
- they develop products, services and technologies in line with the rules of sustainable development.

An idea for sustainable business itself is not enough. In order to execute the planned project it is necessary to create an appropriate action structure, gather the necessary resources and set everything in motion assuming the form of production of material goods or services. Hence, there is a need for entrepreneurship understood in the aspects of action as a high degree of activity, dynamism in action, pursuance of the adopted goals. Thanks to the entrepreneurship understood in this way the idea for sustainable business will be put in practice.

Sustainable business can be carried out within a newly established or already existing enterprise. As shown in Figure 1 a sustainable enterprise is an organization whose resources and operation have a sustainable character (contribute to sustainable development). Sustainable human resources and sustainable basic goods i.e. buildings, machinery, equipment, fittings and other tangible goods owned by the enterprise rank among the most important resources of a sustainable enterprise. Sustainable human resources are ecologically and socially sensitive employees of the organization, observing the principles of sustainable development in their work. Among them there are sustainable managers (top managers, middle level managers, supervisory managers) and sustainable operational employees. A characteristic feature of sustainable employees is their triple orientation – focus on their own needs as well as on social and ecological needs of the present and future generations.

Buildings and other enclosed structures owned by a sustainable enterprise have been designed, located

and erected according to the sustainable development principles. They are environment friendly and do not cause any social harm. Use of those buildings and structures requires consumption of small amount of energy coming from renewable sources. For example, solar collectors and solar cells convert solar radiation into heat used to heat water and rooms (solar thermal energy – STE) and into electric current (photovoltaics). Machinery, equipment and other appliances located within this infrastructure, used in the operation of the enterprise, also have pro-ecological and pro-social character.

Operation of an enterprise requires incoming goods, including raw materials, materials, components, office supplies and other products. A sustainable enterprise procures and introduces into its system only such basic and incoming goods which have sustainability features.

The essence of sustainable operation and its results will be illustrated with an example of a sustainable manufacturing activity. It is based on production of safe, efficient and durable products, manufactured in the processes of clean production. A characteristic feature of clean production is elimination of harmful gases, liquids, solid substances and radiation from technological processes and limitation of wastage of energy, heat, water, raw materials and other factors of production. It is advisable that clean production should be carried out by all enterprises which form the production chain of the particular product, also by manufacturers of materials, components and sub-assemblies.

An important determinant of success of sustainable business projects is sustainable business management. In the approach proposed by these writers it assumes the form of sustainable/sustainability management. S. Cohen in his book published in 2011 in the U.S.A. states: „sustainability management is in its infancy […]. It today will not be able to predict its pace, shape or trajectory" (Cohen, 2011, p. 146). According to that Author "sustainability management is the practice of economic production and consumption that minimizes environmental impact and maximizes resource conservation and reuse […] At the heart of sustainability management is a concern for the future" (Cohen, 2011, p. 2). B. Bossink defines sustainable management in the aspect of eco-innovations „as the development of new initiatives in an organization to sustain, improve and renew the environmental, social and societal quality of its business processes and the products and services these business processes produce" (Bossink 2012, p. 1). A. Pabian perceives sustainable management with regard to its functions. He defines sustainable management as planning, organizing, leading and controlling resulting in establishment, operation and development of a sustainable organization, that is an entity contributing to the balance of intergenerational needs (Pabian, 2013a, p. 5).

The following question arises: is it necessary to introduce sustainable management in an enterprise if all resources subject to this management are sustainable? It is necessary to do so because sustainable resources can also be managed in unsustainable way e.g. by treating the employees unethically, by managing sustainable equipment inappropriately.

Discussion

Scholars being aware of the global ecological and social threats rather agree that sustainable development should be continued, also through changes in the sphere of business as it is business that consumes most of the world's nonrenewable resources. There is no agreement, however, as to the strategy of sustainable development. Proponents of the ideas of Thomas Malthus advocate restraint and economical resource management. Supporters of Robert Solow believe that a global disaster can be prevented by technology and innovations (Martin, Kemper, 2012, p. 48-56). In the opinion of the authors of this paper, the technical and technological progress is much slower than the rate of environment destruction and natural resource depletion. It is probable that the Earth will be destroyed before man is able to create technical and technological methods to prevent the destruction. The authors of this paper believe that business should use both T. Malthus's and R. Solow's approach. It would involve both economical utilization of available resources and seeking innovative solutions to counteract ecological and social problems.

Another controversial issue is related to the search for and presentation of the sustainable business conceptions, which in the present conditions and with the existing state of social awareness cannot be fully implemented in practice (such is the nature of the conception presented in Figure 1). These writers believe that it is necessary to look for and present such model solutions – they are benchmarks (target statuses) which the contemporary business should aim at. Every step on the way to their implementation in practice

means progress in sustainable development and thus contribution to balancing intergenerational needs.

Another debatable problem is the issue of the major barriers to implementation of the presented conception of business in sustainability. This conception requires many sacrifices, including abandonment of the growth of production, consumption, sales and profits. Such sacrifices do not lie in the nature of enterprises or in the nature of entrepreneurs and managers in charge. Motivation to use sustainable management is also weakened by the fact that man does not perceive and does not understand many adverse phenomena occurring on the Earth and cannot control their progress. What is more, enterprises operate in the countries having different attitudes to sustainable development, which is the consequence of economic, political and cultural differences (Pabian, Pabian, 2012, p. 8). A major barrier to involvement in sustainable business are also high costs of its implementation in enterprises. Will, therefore, sustainable business ever become common and universal on a global scale? According to these writers, it is hardly probable.

Conclusions

We are currently pretty sure that planetary critical thresholds have already been crossed, we only do not know, to what extent (Rogall, 2010, p. 145). In these circumstances, global action towards sustainable development must be accelerated. All organisations operating in the world, including states and their associations, an example of which is the European Union, should contribute to improve the health of our planet by using all endeavours aimed at achieving sustainability objectives with respect both to the Earth, its environment, and all products created by man. The European Union is implementing the strategy for sustainable development, the effect of which is the document Europe 2020 and positive sustainability indicators. The European consumerist community will be gradually transformed into a sustainable society based on pro-environmental and pro-social approach in manufacturing and consumerism (Pabian, Bylok, Kucęba, Zawada, 2013, p.7).

Business in sustainability is still in the initial phase of its development. This development should be continued by moving the principles of sustainability from the peripheries of business to its centre. It is expressed in the gradual replacement of unsustainable resources and actions necessary in business with their sustainable equivalents.

Transformation of traditional business pursuing economic goals into sustainable business geared also towards achievement of ecological and social goals is a very difficult task. It requires primarily a change of attitudes and behaviours both of entrepreneurs and consumers, which can be achieved by raising and educating the present and future generations of manufacturers, sellers and buyers in the spirit of sustainable development (Pabian, 2013b). It is also important to induce pro-ecological and pro-social behaviours through legislation and widespread campaigns promoting the principles of sustainable development in the society. (Pabian, 2013c, s. 12-17).

Business in sustainability is a new challenge for contemporary entrepreneurs. Future generations will judge whether this challenge has been taken up by them and to what extent it contributed to balancing of intergenerational needs. Let us remember that "we don't inherit the earth from our ancestors; we borrow it from our children" (Emery, 2012, p. XI).

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Categorial Participant of Slovak Semantic Sentence Structure. Sentences of Existence

Peter Gregorík

University of St. Cyril and Methodius in Trnava, Slovakia
peter.gregorik@ucm.sk

Abstract: We focus on semantic participants of Slovak Language. These participants are known also as thematic roles, semantic roles or theta roles. In every sentence there are some participants needed for correct syntactic meaning. Our hypothesis is based on premise that one of these participants is categorial and this participant opens the position or positions for other participants. In our opinion categorial participant is fundamental semantic element within specific language micro-situations (existence, possession, information transfer, moving etc.) and every micro-situation has only one such participant. Non-categorial (general) participants can occur within more micro-situations. The paper describes methods for specifying categorial participants. As a model structure we describe elementary sentence structure of existence.

Key words: linguistics, syntax, semantic structure, thematic role, participant, existence

Introduction

Our premise is that sentence as a basic unit of communication is a realization of conventional semantic and syntactic scheme. This scheme is correlative to units, or participants, of specified language micro-situation. For example, micro-situation when somebody informs someone about something needs these participants: somebody who informs (agent); somebody who receives information (recipient); and information. Of course, language is not able to describe the whole micro-situation based on extra-linguistic context. It describes it selectively. The central position by creating any sentence within a micro-situation has a predicator. It is a mediator which correlates particular participants of specific micro-situation. The ability of predicator to open functional positions we call intentional ability, and the configuration of participants - the aggregate of functional positions of a predicator – we call intention field. We use this terms as Grepl and Karlík have it (1998). In our conception participant is a functional position of predicator. As Grepl and Karlík (1998) say participants of semantic sentence structure may be characterized as a specific positions that correspond to "members" or relevant "circumstances" of standardized situations. The roles of participants are for example agent, patient, recipient, initiator, possessor, locus, direction etc. The number of these roles vary from one linguist to another. Ch. Fillmore (1969) has eight "deep cases": agent, counter-agent, object, result, instrument, source, goal and experiencer. W. L. Chafe (1970) has only two roles: agent a patient. E. Tibenská (1996) has these subject participants: processor, actor, initiator, causator and realisator. She writes also about object participants (1998): patient, result, recipient, relant, sociative and inherent. Grepl and Karlík (1998) divide participants into two groups: 1. substantial – that are divided into physical objects (agent, causator, processor, carrier, possessor, expirient, recipient, beneficient, patient, stimulus, instrument and vehicle), and locus participants (locus, directiv and origative); and 2. situational participants (information, instruction, impulse and purpose). J. Nižníková (2001) writes about 64 semantic participants.

This brief survey into problematics of semantic roles shows that there are different approaches and methods used for describing them. Our conception is based on needs and requirements of specific language micro-situations in which we assume some standardized syntactic and semantic participants. The most important is semantic function of them, e.g. the semantic role they have within elementary sentence structures. The conception of Czech linguists P. Karlík and M. Grepl (1998) is the methodological base for our research. We modify this conception in the way that of used methods. We use methods of verb specific description and method of semantic (or thematic) roles. The first one is used for defining of basic situational scheme within a particular language micro-situation. For example we use it for abstracting of general extra-linguistic meanings in the sentences with verba dicendi and we got structures like somebody says something or somebody speaks with someone. In the next step we abstract semantic roles source, theme, information or sociativ.

On one hand the language is a complicated phenomenon but on the other hand no special skill is needed for using it. Language – in its systemic complexity – changes into easy tool of communication. Interconnection between extra-linguistic complexity and linguistic abstraction is the base for analyses of semantic structure of Slovak sentences.

In the past structure of Slovak sentences was described mostly as a formal structure based on morphological attributes of words. For example typical Slovak sentence structure with subject in nominative case, verbum finitum as a predicate and object in accusative case has the formalized structure (N means noun):

$$\mathbf{N_N - VF - N_A}$$

There are many examples for this type: Otec číta noviny. Peter spozoroval včely. Žofia zbožňuje palacinky. Voda obsahuje kyslík. On nenávidí mňa. (Father reads a newspaper. Peter beholds bees. Žofia likes pancakes. Water contains oxygen. He hates me.) In all of these sentences the grammar structure is the same but their semantic structure is clearly different – there is an action, a perception, a description, an emotion. We think that only a description of grammar structure of sentence is not enough for typology of sentences. The same grammar structure may correspond to different semantic structures. On the other different grammar structures may have the same semantic structure. As an example there is a passivization of sentences. By this process object from active sentence becomes subject in passive sentence, and subject from active sentence is not present in passive sentence or it changes into an adverbial:

Active sentence: Zahraniční robotníci stavajú dom. (Foreign workers build this house.)

Passive sentence where subject from active sentence changes into adverbial: Dom je stavaný robotníkmi zo zahraničia. (The house is built by foreign workers.)

Passive sentence where subject from active sentence is not present: Dom sa stavia. (The house is built.).

In these sentences there is a change in grammar positions of its parts but these parts keep its semantic positions – house is still generated substance and workers are still the agent of the action. Of course, sometimes it is not necessary to express the agent in the surface structure of the sentence and it can be omitted. Grammar position and semantic positions are two independent structures. As Grepl and Karlík (1998) have it: syntactic (grammar) positions and their forms in grammar structure do not uniquely correspond to any semantic roles (functions).

In this paper we used semantic sentence structure as the basis for sentence description. Language micro-situations are the base for our semantic-role model. In our conception language micro-situations are abstractions based on defining basic semantic participants within elementary sentence structures. Grepl and Karlík (1998) have nine elementary sentence structures: identity, existence, possession, location, quantity, correlation and process. J. Nižníková (2001) has eleven model groups based on the lexical meaning of corresponding verbs. We define elementary sentence structures as the most general categories that are

transferred for extra-linguistic reality into language. They can be imagined as topics abstracted from common language use. Within elementary sentence structures we define particular language micro-situations that are less general and within one elementary sentence structure there can be more language micro-situations. Micro-situations can be identified by specific configuration of semantic roles. Within one elementary sentence structure there is always one or more categorial participant(s) that cannot occur within other elementary sentence structure. We can say that language micro-situations are modifications of the same basic elementary sentence structure. This modifications are made by non-categorial participants that can occur in more elementary sentence structures. Within particular language micro-situations we define their semantic and grammatical structure, and its lexical or stylistic varieties. We allocated eight basic elementary sentence structures: existence, state, characteristic, location, possession, attitude, information and action. In this paper we describe elementary sentence structure **existence**.

Process of communication is bordered within non-linguistic reality. Elementary sentence structures and language micro-situation as their specifications are only segments of this reality. Of course, this segment is always simplified and reduced – language is no table to describe all details and relations of depicted reality. For that reason it is necessary to abstract semantic and grammatical elements when describing sentence structures.

If we want to define elementary sentence structure **information transfer**, it is necessary to asbtract which semantic elements can occur within this structure and which must occur. Elements that must occur are categorial, other participants are non-categorial. In this elementary sentence structure the participant **information** must be always present, even if there is not subject as in this Slovak single-element sentence:

Hovorí sa, že každý raz nájde svoje šťastie. (It is said that once everyone will find his happiness.)

Other participants that can occur are non-cathegorial; e. g. **agens**:

Ľudia hovoria, že každý raz nájde svoje šťastie. (**People** say that once everyone will find his happiness.)

Sentence can be completed also with non-categorial participant **recipient**:

Peter hovorí **Pavlovi**, že každý raz nájde svoje šťastie. (Peter talks to **Pavol** that once everyone will find his happiness.)

Also non-categorial participant **aspect** can occur in some sentences:

Peter hovorí Pavlovi **o ich spoločnej kamarátke Katke**, že si raz určite nájde svoje šťastie. (Peter talks to Pavol **about their friend Katka** that once she will find his happiness.)

Complex semantic structure has the form:

agens – predicator – information – recipient – theme

Not only semantic structures but also their grammatical realization are important. For language praxis it is important to know which grammar forms are used for realizations of particular semantic participant. For example, agent in this kind of structures can be realized by morphologically different but semantic equal forms: **Vrátnik** nás informoval/**na vrátnici** nás informovali/**od vrátnika** sme dostali informáciu. (**The gate-keeper** informed us/**at the gate** we were informed/we got information **from the gate-keeper**).

Elementary sentence structure existence

The meaning of the word existence is probably intuitively clear to everyone but i tis not so easy to define it. In the most general meaning we can say that existence is being, presence within some time and space dimension. Existence refers not only to human beings, animals or things but also to abstract nouns. For expression of existence there is relatively only small group of predicators because it is specific type of language micro-situation with quite a stabile structure. As the predicator the most frequent is the verb byť (to be). Other verbs are for example existovať (to exist), jestvovať (to exist), uskutočniť sa (to take place),

prebehnúť (to take place), vyskytnúť sa (to appear). The intention field of these predicators is also limited. They need one categorial participant – nositeľ existencie (existence experiencer) which can be completed by one non-categorial participant.

The basic scheme of this elementary sentence structure is:

somebody/something – exist/does not exist/arises/vanishes

Semantic structure has the form:

$\text{Experiencer}_{\text{existence}}$ – existence – (benefactor/tempus/locus/aspect/causation)

Grammatical structure has the form:

$$\mathbf{N_{N/A/G} - VF - (N_D/pre\ N_A\ /ADV_{loc/temp/asp/cauz}/prepN}$$

Characteristics of particular participants:

a) $\text{Experiencer}_{\text{existence}}$ (Exp_{exi}) is the categorical participant of this elementary structure. It is not an active participant. It is expressed by non-fiction and fiction persons, animals, material things but also abstract terms. They have in common that in sentence is shown that they exist/do not exist/arise/vanishes. Formally they can be expressed by:

- nominative case: **Yeti** je a **Lochneská príšera** nie je? Musia byť aj iné **svety** podobné Zemi.(Yeti exists and Loch Ness monster does not exist. There must be also other worlds like Earth.)

- partitive genitive case: Veľa **nádeje** už nám nezostalo. **Ľudí** je ako maku. (There is not much hope left. There are so many people.)

- accusative case: Máš **známky**, ktoré si nikdy nekúpiš. Máte **otázky**, na ktoré nikdy nenájdete odpoveď. (There are stamps that you will never buy. There are questions that you will never answer.)

b) $\text{Experiencer}_{\text{existence/change}}$ (Exp_{exi}) is a participant that occurs in sentence that express arising or vanishing of something. Like **$\text{Experiencer}_{\text{existence}}$** it is semantic passive participant but there is a difference. There is a mutative change by **$\text{Experiencer}_{\text{existence/change}}$**. It starts or discontinues existing. Formally it can be expressed by:

- **nominative case**: Susedovi vykapali všetky **sliepky**. **Zem** vznikla približne pred 4,5 miliardou rokov. Vzplanul spravodlivý **hnev** utláčaných. (All neighbour´s **chickens** have died. **Earth** arose approximately 4.5 billion years ago. Righteous **anger** of oppressed people has arisen.)

- **partitive genitive**: Rodí sa viac **dievčat** ako chlapcov. Postupne sa vytvorilo niekoľko **koncepcií**. (More **girls** than boys are being born. Several **conceptions** were created progressively.

c) Benefactor (be) is, in Eva Tibenska´s terminology (2012), third-plan participant. As she says, benefactor can occur in sentence to make its meaning complex, and to change sentence perspective from objective to subjective. Its use is not a stylistic device. Benefactor expresses the aspect, e.g. in regard of who/what the expressed existence applies. It can be expressed by:

- dative case: Veľa nádeje už **Ivanovi** nezostalo. Možností **vám** existuje habadej. (There is not much hope left for **Ivan**. There exist a lot of possibilities **for you**.)

- nominative case: **Ivan** nemá veľa nádeje na úspech. (**Vy**) Máte habadej možností. (**Ivan** has not many chances to success. **You** have a lot of possibilities.

- accusative case + preposition pre (for): Veľa nádeje už **pre nás** neexistuje. Jestvuje **pre Vás** habadej možností. (There is not much hope **for us**. there exist a lot of possibilities **for you**.)

In intention field grammar form $\mathbf{N_N}$ corresponds to $\mathbf{Experiencer_{existence}}$. Predicator is mostly expressed by the verb byť (to be) in its existence meaning. The verb byť can have several meanings in Slovak language and can be found in three different language micro-situation:

(1) Existence: Strašidlá **sú**. (Monsters **exist.**)

(2) Location: Strašidlá **sú** v sklade.(Monsters **are** in the deposit.)

(3) Characteristics or state: Strašidlá **sú** hrôzostrašné, deti **sú** vystrašené. (Monsters **are** creepy, and children **are** scared.)

In the third meaning there is not the autosemantic form of the verb byť. It is only a copula verb. Predicator with this verb consists of the form of the verb byť and autosemantic form of a noun, adjective, pronoun or numeral.

(1) Verb byť (to be) in the meaning: to exist from ontological point of view. In this function the verb byť expresses existence regardless of any external circumstances. It can be identified as something or someone that simply exist or does not exist. From the lexical point of view i tis an autosemantic verb that can be replaced by synonymic verbs like existovať, jestvovať (both mean to exist). From syntactic point of view it is autosyntagmatic word that fulfills role typical for autosyntagmatic verbs in the sentence – the role of predicate.

Examples: Mimozemšťania **nie sú**. Musia **byť** i iné svety. Myslím, teda **som**. Niečo **je** a niečo **nie je**. (Extra-terrestrials **does not exist**. There must **be** also other worlds. I think, therefore I **am**. Something **exists** and something **does not**.)

(2) Verb byť expressing location: to occur in or to have origin in. In this function there is nota n ontological aspect. The necessary component of this meaning is adverbial of place. Of course there is no rection between the verb and adverbial, despite of this adverbial is obligatory component of sentence. From lexical point of view i tis an autosemantic word that can be replaced by synonymous verbs like nachádzať sa (to occur), žiť (to live somewhere), vyskytovať sa (to occur)... From syntactic point of view it is an autosyntagmatic word. Predicator byť (to be) together with adverbial of time (tempus) expresses existence – but not ontological but located somewhere.

Syn **je/žije** už dvadsať rokov **v USA**. Mama **je/nachádza** sa **v záhrade**. Komáre **sú/sa vyskytujú** najmä **pri vode**. Kniha **je/nachádza sa na stole**. Štefan **je/pochádza z Novohradu**. (My son **has been/lived in USA** for twenty years. Mother **is in the garden**. Mosquitoes **occur** mostly **by the water**. The book **is on the table**. Štefan **comes from Novohrad**.)

(3) The verb to be as synsemantic word. It is a copula that serves only as a carrier of grammatical categories. Its meaning must be completed be autosemantic word – noun, adjective, pronoun, numeral, participle or adverb. From lexical point of view i tis a synsemantic word without any lexical meaning. From syntactic point of view i tis a synsyntagmatic word that is never an independent constituent of sentence but always occurs together with autosemantic constituent.

Examples: Žofia **je učiteľka**. Peter **bol nervózny**. Starí ľudia **sú** už **takí**. Alonso **bude prvý**. (Žofia **is a teacher**. Peter **was nervous**. Old people **are like that**. Alonso **will be the first.**)

We take existence similar to M. Grepl and P. Karlík (1998) who distinguish three possible states of existence: something/someone exists/does not exists, something/someone arises, and something/someone causes that something/someone arises/vanishes. In our conception their third state of existence belongs to other elementary sentence structure because it is an action that causes something. J. Nižníková (2001)

divides sentence models with verbs of existence into three groups: verbs of existence, verbs of arising, and verbs of vanishing.

1. Language microsituation "somebody/something exists/does not exists"

From semantic point of view there are two components in this microsituation: **Exp_{exi}** and predicator of existence. **Exp_{exi}** can be expressed by anything that exists in factual or abstract meaning, in fiction or non-fiction world. As the participant there can be human beings, animals, things or abstract terms.

Existence can be expressed in two ways:

a) as **absolute existence**, i. e. generally without reference to any circumstances:

> Vlkolaci nie sú. Duša je. Veľký tresk možno prebehol. (Werewolves does not exist. Soul exists. Big Bang maybe really was.)

In this way it is only a statement without an adverbial. It expresses only existence or non-existence of some entity. For this reason there is only one participant $Exp_{exi,}$ and this participant is categorical. Predicator does not open any other obligatory position for more semantic participants.

> Semantic structure has the form: **$Exp_{exi,}$ - existence**

J. Nižníková (2001) more closely specifies the participant as processual existence experiencer. We think that our term existence experiencer is appropriate enough. In our opinion the existence from ontological point of view does not express any process.

Grammar structure has the form: **N_N – VF**

Within type a) we distinguish two groups of existence:

a1) existence that refers to the whole class of entities:

> Mimozemšťania sú, ale škriatkovia nie sú. Hlupáci boli, sú a budú. Spravodlivosť neexistuje. (Extra-terrestrials exist but dwarfs do not. The dumbs existed, exist and will exist. Justice does not exist.)

Often there are experiencers whose/which existence is doubtful. It can be beings, places or events of supernatural origin. Experiencer can be in both plural and singular form but when it is abstract word, it is mostly in singular form.

a2) existence that refers to specific entity:

> Myslím, teda som. Boh je. Peklo nie je. Veľký tresk sa uskutočnil. Existujú dva druhy iónov – anióny a katióny. (I think, therefore I am. God exists. Hell does not exist. Big Bang occured. There are two groups of ions – anions and kations.)

Within this group there is always concretized reference to experiencer of existence, not to the whole class. Mostly it is one specific person, place or event so it has singular form. Predicator has plural form only if there are more kinds of experiencer (as in the last example.)

There is a specific subgroup with sentences in which existence associates with occurrence of an attribute of experiencer. Attribute can have the form of subordinate clause or it can be simple concordant or

non-concordant attribute. In these sentences there is mostly existence based on real world and within it their validity is closely specified:

Sú ľudia, ktorým nikdy nevyhovieš. Boli aj nevysvetlené prípady. Existuje aj svet bez závisti. Neexistuje nápoj, ktorý by nevedel namiešať. (There are people who you cannot satisfy. There were also unsolved cases. Also world without an envy exist. There is not a kind of drink that he cannot mix.)

Semantic structure of such sentences is modified with attribute: **(Exp_{exi} + attribute) – existence**

Verb byť can be often replaced by the verb mať (to have) in this kind of sentences. This replacement is accompanied with change in grammar structure. To the subject position there goes formal construction sentence constituent ty, vy (you) or there is an object as a formal sentence constituent in dative case.

Formal subject: Máš ľudí, s ktorými sa nikdy nedohodneš. Máte prípady, keď sa nedá nič robiť. (You have people with whom you cannot make a deal. You have cases when you are no table to do anything.)

Formal object: Existujú ti ľudia, s ktorými sa nikdy nedohodneš. Sú vám prípady, keď sa nedá nič robiť. (There exist people (in regard of you) with whom you cannot make a deal. There are cases (in regard of you) when you are no table to do anything.)

Similar examples occurs when there is non-obligatory dative object in sentences like Sú **ti** krajiny, kde zjedia nechutné potvory. (There are countries (in regard of you) where they would eat tasteless beast.) Formally it looks like sentence constituent but it has no semantic function and it is used only to emphasize the content of sentence. We can say that it has a function similar to particula. This non-obligatory object does not occur only within existence sentences but also in other types of elementary sentence structures; for example by expression of state: Ten **Vám** bol hladný. (He was so (in regard of you) hungry), or action Ani **ti** mi nenavarila. (She (in regard of you) did not cook for me.) In all of such sentences it has only expressive function and this kind of sentence is limited to colloquial style. Considering functional sentence perspective the experiencer is rheme of the sentence and for that reason it is always positioned behind the non-obligator dative object which functions as a theme. According to Slovak word-order rules in neutral sentences theme is always at the beginning of the sentence and rheme follows it.

b) Existence in relative meaning. By this meaning we understand an existence that is obligatory related to some circumstance. It can be time, place or aspect. In this sentence existence is always limited and is not valid generally but only partially.

Examples of existence sentences with particular circumstances:

- **Tempus (temp)**: Jery ešte **v 10. storočí** boli. Prvá svetová vojna zúrila **v rokoch 1914 – 1918**. Ničivý mor sa vyskytol **medzi rokmi 1348 a 1350**. Vojny sú už **odpradávna**. (Jers still existed **in 10th century**. WW1 raged **in 1914-1948**. Terrible plague occurred **between 1348 and 1350**. Wars have existed **since the oldest time**.)

- **Locus (loc)**: Život **niekde vo vesmíre** musí existovať. Taký zákon je len **v Číne**. (Life must exist **somewhere in the space**. Such a low exists only **in China**.)

- **Aspect (asp)**: Pravda existuje len **v rozprávkach.** Plány jestvujú zatiaľ len **v jeho hlave**. Taká fonéma **v slovenčine** nie je. (The truth exists only **in fairy tales**. The plans exist only **in his head** yet. There is not such a phoneme **in Slovak language**.)

Validity/non-validity is expressed only in regard of mentioned circumstances in these sentences. J. Nižníková (2001) uses term statuál nositeľ existencie (statual existence experiencer) for **Exp_{exi}**. We think that it is not necessary to distinguish processual and statual existence experiencer. I tis always passive, non-processual element that is obligatory related with circumstance in some sentences.

Semantic structure has the form: **Exp_{exi} - existence – tempus/locus/aspect**

Grammar structure has the form: **$N_{N/G}$ – VF –N_D/pre N_A /$ADV_{loc/temp/asp}$/prepN**

The most typical grammar form for **Exp_{exi}** is nominative case, but also genitive, as a partitive case, can occur. Partitive genitive is limited to quantitative or negative usage. For his usage in existence sentences stylistically marked negation form niet/nieto is typical:

Na svete **niet pravdy**. **Niet** iného **východiska**. Ďalšej **šance** už **nieto**. (There is **no truth** in the world. There is **no** other **solution**. There is **no** more **chance.**)

Genitive case could be replaced by nominative in these sentences:

Na svete **nie je pravda**. **Nie je** iné **východisko**. Ďalšia **šanca** už **nie je**. (There is **no truth** in the world. There is **no** other **solution**. There is **no** more **chance.**)

Sentences like **Peter tu už nie je**. Odišiel domov. (**Peter is not present here**. He went home.) are not existence sentences. They are sentences of location because they refer to position of entity and not to its existence in ontological meaning.

Specific type of sentences are sentences like: Nie je **čo** čítať. Je na **čo** sa pozerať. Nebolo **koho** voliť. Niet **komu** veriť. Niet **s kým** chatovať. (There is nothing to read. There was nobody to get our vote. There is nobody to trust. There is nobody to chat.)

Their particularity is in the fact that existence is related to experiencer that is expressed by a form of personal or relative pronoun (čo, koho, komu, s kým...) The infinitive of the verb expresses the circumstance in regard of which the existence is valid or not.

In some sentences infinitive can be replaced by verbal noun: Niet nič/ničoho na čítanie. Nie je nikto/nikoho na chatovanie. (There is nothing to read/for reading. There is nobody to chat/for chatting.)

2. Language micro-situation „someone/something arises/vanishes“

In the previous language micro-situation the existence of something/someone was expressed, i. e. pure existence in ontological meaning. In this micro-situation is expressed the fact, that someone or something starts/continues/discontinue the existence. It is important to distinguish between existence meaning and action meaning. In sentences like Výrobok vznikol v továrni. Pytliaci vybili chránené druhy zvierat. (The product was made in factory. Jack lighters killed off protected animals.) There is depicted that something started to be and discontinue to be but it was caused by conscious planning – it was an action. In the existence sentences the agent is not present. The first example (Výrobok vznikol v továrni.) is deagentive sentence but in its deep structure agent is present - somebody had to make it. In the second sentence (Pytliaci vybili chránené druhy zvierat.) there is an active substance that operates the action. This participant is called agent and is never present in existence sentences.

Predicators that express arising or vanishing of existence have mutational character, i. e. in their meaning shift from one phase of existence into other phase is present. It does not mean that they have processual character. Process needs some active background.

Verbs like vznikať, narodiť sa, zanikať, zomrieť, stratiť sa, vytrácať sa etc. (to arise, to be born, to die, to vanish, to get lost) serve as predicators in this meaning.

Examples for arising of existence: Ja sa nikdy nenarodilo a nerodí, rodí sa iba telo. Vznikla celá spleť komplikovaných problémov. V ostatnom čase vzplanul záujem o vyhotovovanie rodinných erbov. Presne v tej chvíli prišiel na svet nový človiečik. Na prelome storočí sa zrodil nový literárny smer – romantizmus. (Ego is never born, only body is born. A net of complicated problems has arisen. In recent time interest in family crests has flamed out. Just in that moment a next little human being was born. At the turn of the century new literary movement arose – romanticism.)
Examples for vanishing of existence: Mnohé rastlinné a živočíšne druhy sa postupne vytrácajú. Absolútna viera v pozitivizmus sa v tej dobe vytratila. Bohužiaľ, zomrel a už ho niet. Mamuty vyhynuli v období pred 13 000 a 11 500 rokmi – okrem reliktného stavu mamutov srstnatých. Hokejová eufória rýchlo utíchla. (Many kinds of plants and animals die out gradually. The absolute believe in positivism vanished in that times. Unfortunately, he died and he lives never more. Mammoths died out 13 000 – 11 500 years ago – except wooly mammoth. Ice-hockey euphoria calmed down very quickly.)

Within this micro-situation we distinguish two subtypes. It is similar to previous micro-situation:

a) absolute change,

b) relative change.

a) Absolute change of existence express that there are no surrounding circumstances needed for arising or vanishing of existence: Neustále vznikajú nové choroby. Čo sa zrodí, musí zaniknúť. Niektoré druhy už vyhynuli, iné sa podarilo zachrániť. Celá násada pstruhov vykapala. Rímska ríša zanikla. (New illnesses arise every day. What was born, must also die. Some kind died out already but some were saved. The whole stock of trout conked out. The Roman Empire vanished.)

Semantic structure has the form: **Exp_{exi} – change of existence**

Grammar structure has the form: **N_N – VF**

b) Realtive change always needs some obligatory circumstances of place, time or cause. Here are some examples for particular circumstances:

- **time (temp)**: Svet vznikol **pred dávnymi vekmi**. Postmoderna nastúpila **v druhej polovici 20. storočia**. Slovenský štát vznikol **v roku 1939**. Narodil som sa **v septembri**. (The world begun **billions of years ago**. Postmoderna arose **in 2nd half of 20th century**. The Slovak State came into existence **in 1939**. I was born **in September**.)

- **place (loc)**: Jeden náš známy sa narodil **v sanitke**. Naturalizmus vznikol **vo Francúzsku**. (One of our relatives was born **in ambulance car**. Naturalism started i**n France.**)

- **cause (caus)**: Kultúrne spolky väčšinou zanikajú **pre nedostatok financií**. Africké deti často zomierajú **pre zlú potravu** a **nedostatočnú zdravotnú starostlivosť**. (Cultural organization vanishes **due to lack of money**. African children often die **due to bad nourishment and health care.**

Semantic structure has the form:

Exp_{exi} – change of existence – temp/loc/caus

Grammar structure has the form:

N_N – VF – N_D /$ADV_{loc/temp/caus}$/prepN

Results:

In the table there is a summary of semantic and grammatical specifications of elementary sentence structure **existence.**

Expression of existence			
1. somebody/something exist/does not exist	a) absolute meaning	- existence applies to the whole class (Strašidlá nie sú. Hlupáci boli, sú a budú.) - existence applies to particular entities (Boh je. Peklo nie je?)	**SS: Exp_{exi}** – existence **GS:** N_N – VF
	b) relative meaning	- time (Jery ešte **v 10. storočí** boli.) - place (Taký zákon je len **v Číne**.) - aspect (Taká fonéma **v slovenčine** nie je.)	**SS: Exp_{exi}** – existence – temp/loc/asp **GS:** N_N – VF –N_D/ pre N_A /$ADV_{loc/temp/asp}$
2. somebody/something arises/vanishes	a) absolute meaning	Neustále vznikajú nové choroby.	**SS: Exp_{exi}** – existence change **GS:** N_N – VF
	b) relative meaning	- time (Slovenský štát vznikol **v roku 1939**.) - place (Naturalizmus vznikol **vo Francúzsku**..) - cause (Kultúrne spolky väčšinou zanikajú **pre nedostatok financií**.)	**SS: Exp_{exi}** – existence change– temp/loc/caus **GŠ:** N_N – VF –N_D/ pre N_A /$ADV_{loc/temp/caus}$

List of abbreviations:

$ADV_{loc/temp/asp/caus}$ – adverbial of place/time/aspect/cause

Exp_{exi} – experiencer of existence

GS – grammatical structure

N_A – noun in accusative case

N_D – noun in dative case

N_G – noun in genitive case

N_N – noun in nominative case

prepN – any preposition + noun

pre N_A – preposition pre (for) + noun in accusative case

SS – semantic structure

VF – verbum finitum

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Co-creation of Innovation Using the Potential of Web 2.0 Tools

Dorota Jelonek, Elżbieta Wysłocka

Czestochowa University of Technology, Faculty of Management, Poland
jelonek@zim.pcz.pl, wyslocka@zim.pcz.pl

Abstract: In the paper there are discussed the opportunities for using Web 2.0 tools as communication solutions and platforms of cooperation with the client in the field of co-creation of innovation. There are presented the changes of the concept in the area of innovation, from closed to open innovation, and particularly the models emphasizing the role of users in creating innovation. There is also discussed the evolution of the solutions of communication with the client with the consideration of Web 2.0. The presented results of the author's own research show the activity of young people as co-creators of on-line innovation, identify the most frequently used channels of communication and, above all, present the evaluation of the application of Web 2.0 tools in the field of cooperation with the client.

Key words: co-creation, innovation co-creation, Web 2.0,

Introduction

The concept of involving customers into the process of creating the innovation gains more and more supporters (Prahalad, Ramaswamy, 2004), (Full, 2010), (Howe, 2008). We observe deep changes in the interaction between the consumer and the company in co-creating not only the innovation but widely understood value co-creating. Prahalad (2004) distinguished four fundamental elements of the process of co-
creating: dialogue, access, risk assessment and transparency defined as DART concept. The purpose of the study is to determine which Web 2.0 tools have the biggest influence on customer co-creation innovation process.

In the paper there are presented the changes in the perception of the concept of creating innovation from the model of closed innovation to the latest concepts in the framework of the model of open innovation. Subsequently, there is defined the concept of cooperation with the client and the space of the Internet as the platform of the development of these processes. The aim of the paper is to verify the following hypotheses:

H1: Young clients eagerly get involved in the process of co-creation of on-line innovation and take the role of consultants, innovators and people testing new products and services.

H2: Web 2.0 is the environment favorable for cooperation and co-creation but it is not fully utilized by companies for co-creating innovation with the client.

New paradigms, such as Open Innovation (Chesbrough, 2003) and Web 2.0 (O'Reilly, 2004) promote a more proactive role of customers in the innovation area. Companies should see customers as co-creators of products and hence value. Products should be designed in ways that allow users to design all by themselves, remix, and share.

In literature there are many concepts that shows other most crucial aspects of co-creation and a number of existing methods for involving users, such as:

- Virtual community (Rheingold 2000),
- Crowdsourcing (Howe 2006; Howe 2008; Kozinets et. al., 2008),
- User Co-Creation (Prahalad and Ramaswamy 2003),
- Collective Intelligence (Glenn 2009),
- Open Innovations (Chesbrough 2003; Jelonek 2012),

- User-Driven Innovations (Rosted 2005; De Moor et. al., 2010),
- Consumer Involvement (Muncy and Hunt 1984),
- Lead User (Von Hippel, 2005),
- User Centred Design (Von Hippel, 2005)
- User Created Content (O'Reilly, 1998)
- and others

Information about customer preferences and personalization have always been a key factor for success in any business. Electronic commerce, partially in conjunction with flexible manufacturing, now provides the opportunity to obtain the information necessary for personalization from customers all over the world at low cost and, specifically in the case of digital products, to tailor general-purpose goods or services to the specific needs of each customer - "mass customization" (Bandulet and Morasch 2005).

The Internet is the environment which is favorable for the development of cooperation with the client. The development of the Internet refers, above all, to new communication solutions used in the relationships - business- customer (B2C), customer – business (C2B), customer – customer (C2C) and business- business (B2B).

The term Web 2.0, as proposed by T. O'Reily (2005), has been adopted in a variety of studies aimed at offering perspectives on the Web developments (Fuchs, 2010), (Song, 2010). With the development of Web 2.0, the role of prosumption and creative behaviors of customers is increasing. Ritzer and Jrgensons (2012) demonstrated that prosumption has become a significant characteristic of Web 2.0. At present, business and application developers are suggesting that there will be a new era of the Web: Web 3.0. This will be defined by a new online environment, which will integrate users' generated data to create new meaning. In contrast to Web 2.0, which is understood as being based on users' participation, Web 3.0 will be based on users' cooperation (Fuchs et al. 2010). Websites built upon Web 2.0 allow users to co-create the contents by enabling them to publish, comment on or evaluate the contents. The main characteristics of Web 2.0 (Kuszyn, 2008) are:

- network effect – joining by new users
- the long tail – increasing the sales of the product
- user contributed value – contribution of users positively influencing the value of the website
- remixability – possibility of integration of other websites and services
- co-creation – co-creating website by users
- decentralization – use of the website or its part by users with no participation of the owner
- emergent systems – administration of parts of the website by users

Co-creating innovation with the client – the organizational aspect

Consumers are considered a valuable source of innovation such as the generation, design, refinement, and testing of ideas and new product concepts. Consumers take on the role of co-creators. Prahalad and Ramaswamy (2004) describe that co-creation is about joint creation of value by the company and the customer. It is not the firm trying to please the customer (Prahalad, Ramaswamy 2004). They wrote also that, co-creation is […] creating an experience environment in which consumers can have active dialogue and co-construct personalized experiences; product may be the same […] but customers can construct different experiences (Prahalad, Ramaswamy 2004). Customer become a new sources of competence, consisting of the knowledge and skills they possess. They are ready to learn, experiment and engage in dialogue with the firm, cooperation, co-creation of innovation.

In the realization of successful co-creation it is proper to take into account two determinants which will positively influence on the process of co-creating innovations with the customer:

1. The recognition of motives of customers who are inclined to co-creating the innovation using Web 2.0 tools.
2. The consider of conceptual model designer –user collaboration

Against the background of many opportunities to maintain the relationship with clients, in the first position, more and more frequently, there are listed social media, in which more and more managers see the target groups of their clients. According to the report (From social…2011) 65% of managers participating in the research perceive social media as the promising source of profit providing that the cooperation activities undertaken by them are compliant with clients' expectations. Unfortunately, as the research showed there are significant gaps between what businesses think consumers care about and what consumers say they want from their social media interactions with companies (see Figure 1). 5 reasons in the assessment of

which there occurred the largest discrepancies in both groups of respondents were market with grey color. The respondents, as the two main reasons of their activity on profiles of organizations in social media, listed an opportunity to get discounts (61% of indications) and to make purchases (55% of indications). The same reasons, in the opinion of managers, were found in the last and the second-to-last place of all the 12 specified reasons of the participation in social media.

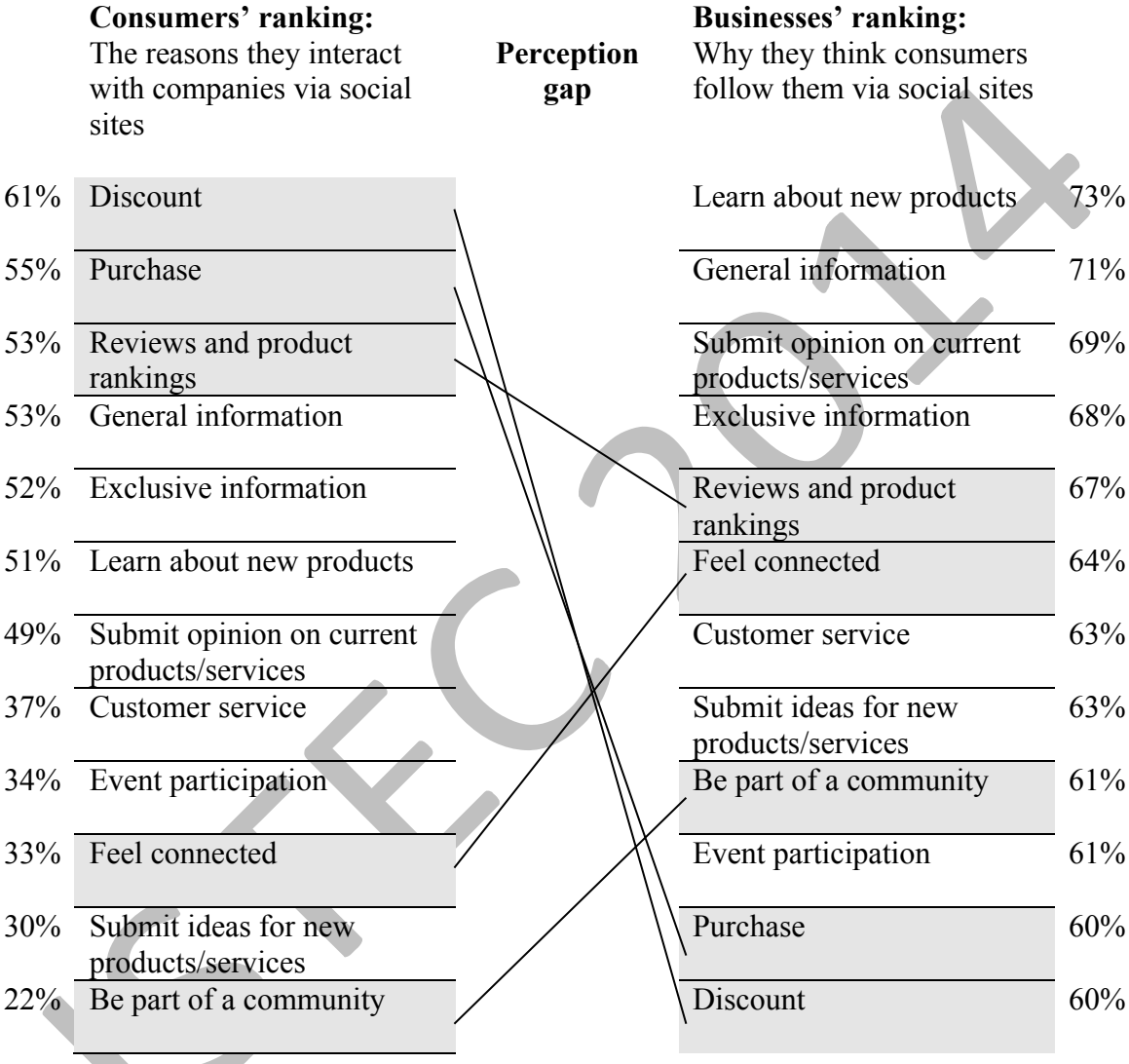

Figure 1. The reasons for which it is advisable to maintain the relationship with organizations using social media from the point of view of clients and managers.
Source: From social media to social CRM. IBM Global Business Services Executive Report, Copyright IBM Corporation 2011, s.11.

The effective support for managers, which will allow to minimize the detected discrepancies in the perception of clients' behavior and lack of understanding of their needs, is the information provided by the systems of Customer Relationship Management (CRM) or e-CRM network systems and the latest propositions - social CRM or CRM 2.0.

Customer - company cooperation requires new effective methods and models of collaboration. Awa and Eze (2010) reviewed methods of customer collaboration and proposed the model designer – user collaboration. Traditional approach displayed the model of "design for customer", proposed model

demonstrates an extension of "design with and design by user". The conceptual model designer –user collaboration was presented in Figure 2.

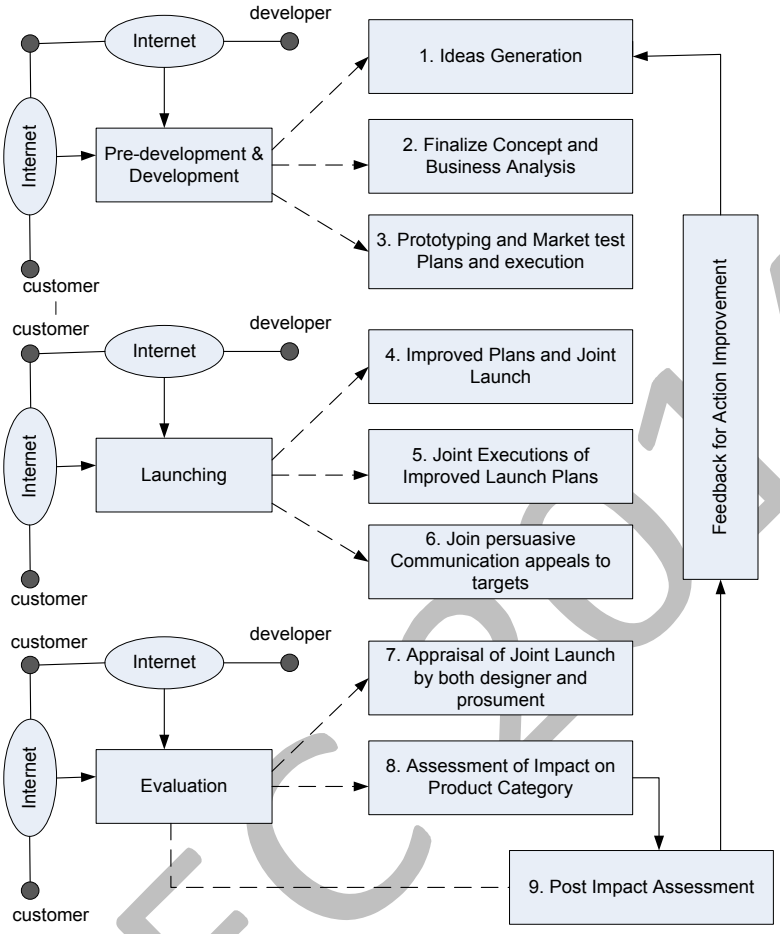

Figure 2. Conceptual model designer –user collaboration
Source: (Awa, Eze 2010)

The model shows four phases: pre-development and development, launching, evaluation, and feedback of customer collaboration. The pre-development and development exercises span such activities as idea generation, concept finalization and business analysis, prototyping and market test plans and execution. Then the generated information are evaluated. The launching phase covers such activities as improved plans and joint launch, joint execution of improved launch plans and joint development of persuasive communication appeals. The evaluation phase involves a joint objective comparison of actual results against ideal standards in order to trace impact discrepancies on product category to a source. Actions are continually reworked from the results of joint evaluation and feedback exercises in order to further the competitive balance of management decision (Awa and Eze, 2010). This model seems very useful for companies witch plan collaborate with customers.

Materials and Method

The survey was conducted in January 2014 on a group of 198 of students of the full-time studies of the Faculty of Management of Czestochowa University of Technology. The study used an electronic form on the website. The form included 18 questions directed towards the achievement of a few research objectives. The purpose of the research was, among others, to identify the behavior of the respondents as clients on the Internet. It has been established that in the group under research, the traditional clients who

do not make purchases on the Internet constitute 5%, the clients who occasionally do the shopping on the Internet amount to 40%, e-clients constitute 27% and prosumers - 28% (Jelonek, 2014). On the basis of the research results, it has also been indicated that personalization is an important determinant of the success of activities directed towards cooperation with the client, performed in the space of the Internet (Jelonek 2014).

Moreover, the further research objectives referred to:

Objective 1: Identification of the respondents' activity in the area of innovative actions
Objective 2: Establishing what communication channels are used by the respondents
Objective 3: Evaluation of the extent of use of Web 2.0 tools in the customer – company cooperation
Objective 4: Evaluation of the possibilities of using Web 3.0 tools in the customer – company cooperation

The results obtained in the course of the research serving the purpose of the achievement of the above objectives are presented in the following part.

Results

In the research there participated: 124 women (63%) and 73 men (37%). The respondents were aged 23-25. It was established that in the analyzed group 93% of the respondents have free access to the Internet, 5% - the limited access, 1% - very limited access and 1% of those questioned indicated the response "no access". The respondents are characterized by "high" (34%) and "sufficient" (57%) abilities of using the Internet resources and utilizing the available Internet services. Only 6% of those questioned admitted that "they sometimes use the help of others", 2% of the students "often use the help of others" and 2% of the students "cannot use the Internet to make purchases".

The listing of the responses to the question: "Have you ever taken activities on the Internet, in which you were: a purchaser of products or services, a brand promoter, a client who reveals advantages and disadvantages of a product/service, an innovator submitting an idea, a client testing a new product/service or a consultant?" are presented in Table 1. The responses were given by 55 respondents and it was possible to indicate a few answers.

Table 1. The clients' activities in the area of innovative actions

No	Propositions of the responses to the question: "Have you ever taken activities on the Internet, in which you were:	% of indications
1.	A client submitting an idea of a new product/service, or essential improvement, modification, development of the existing products or services	9%
2.	A client testing a new product or service	52%
3.	A client – consultant	40%
	Total:	100%

Source: The author's own study based on the research results

The students cooperating with companies in the field of broadly understood innovation were asked for the answers to the further questions. Each of 55 respondents were able to indicate a few responses. The listing of the answers to the question "What channels of communication with the company were used by the respondents?" is presented in Table 2.

Table 2. Channels of communication with the company used by the respondents

No	**Propositions of the responses to the question "What channels of communication with the company did you use?":**	**% of indications**
1.	Telephone	98%
2.	Text message	86%
3.	e-mail	99%
4.	A form on a website	85%
5.	Blog on a company website	45%

6.	Chat on a website	57%
7.	Video chat and Skype	58%
8.	Social website	62%
9.	Platform of reporting ideas created on a website by the company	4%
10.	Platform of cooperation in a real mode	0%

Source: The author's own study based on the research results

The respondents' answers to the question concerning what enterprises ought to improve in contacts with clients are presented Table 3.

Table 3. What enterprises ought to improve in contacts with clients

	What requires improvement on the side of companies	%
1.	Social media	32%
2.	Skype	26%
3.	Introduction of virtual assistants, avatars	35%
4.	Better contact via text message and telephone	25%
5.	Multimedia	30%
6.	Better contact with a consultant	26%
7.	Others	3%

Source: The author's own study based on the research results

For clients contacting the company it is important that the range of available communication tools is wide, fully accessible and effective. The most popular ones are traditional channels of contact, e.g. a phone, and from among the traditional Internet communication tools - e-mail. In the first case, communication in a synchronic mode, guaranteeing fast and efficient contact is important to the client. In the other case, the client consciously decides on the choice of the channel of asynchronous communication and accepts the postponement of interaction with the company. From among Web 2.0 tools the respondents use: forms on websites, social websites, video chats and Skype, chat on a website, blog on a company website and, to a small extent, platforms of submitting ideas, created on a website by the company. In the evaluation of effectiveness of communication, relatively high assessment was given to a form on a website. A chat on a website and video chats and Skype were rated low with respect to the "speed" and in the evaluation there was taken into consideration long waiting time and often lack of activity even at the time of designated consultation. Social websites were given low rating of effectiveness and rapidity. Platforms of submitting ideas created on a website or platforms of cooperation in a real mode obtained the highest percentage of indications in the "average" rating since the respondents had their own experience of such cooperation. Thus, there is such low rating of effectiveness of platforms in the aspects – "very comfortable", "very fast" or "very effective".

The research results showed that 92% of the respondents use a lot of communication channels, which means that they utilize at least 6 out of 10 listed communication channels. There are no preferences as for the choice of the communication channel depending on the gender.

The respondents paid attention to the need for combining the contact with consultants with other communication channels when asked about the elements of the contact with the client which need to be improved by enterprises. Clients would also long for more modern methods of contact handling avatars, social media and multimedia.

Discussion

Enterprises, more and more frequently, perceive their client not only in the role of a purchaser but, by establishing cooperation with the client, strengthening the relationship with them, they want the client to appear in the following roles:

- A promoter of products, services or a brand,
- An expert, specialist or consultant,

- A person testing new products and services,
- An innovator.

The results obtained in the research allowed to positively verify the hypothesis that young clients eagerly get involved in the process of co-creation of on-line innovation and take roles of consultants, innovators and people testing new products and services.

Theoretical considerations on the possibilities of Web 2.0 and the results of the survey also confirmed the validity of the hypothesis that Web 2.0 is the environment which is favorable for cooperation and co-creation but which is not fully utilized by companies for co-creating innovation with the client. Clients will eagerly take the role of a consultant or an expert, but in the environment which is a natural and comfortable communication platform to them, which Web 2.0 is.

Summing up, companies treat Web 2.0 and social media more frequently as a tool of casual communication than a tool of long-lasting relationship. In the near future there must be an important change in the perception of social media and their use in the activity of the company since the new generation of employees and, simultaneously, clients enter the labor market. For young people Facebook or Twitter are not only another technological curiosity but a natural channel of exchange of information.

In the research it has also been confirmed that for young clients the appearance of a wide range of communication channels is important because 60% of clients asked a question or submitted a proposal while using one communication channel and in the further communication they searched for solutions utilizing other channels.

Conclusions

The recognition of the motives clients are driven by, while taking other roles than the role of the purchaser of products and services, is of the key importance in creating the basis for the effective cooperation with the client. Another step is the identification of clients' needs not only as for the offer of products and services but also their preferences as for the used tools of communication with the enterprise. While planning the designer - user cooperation, it is advisable to utilize the presented concept model (figure 2) and to develop the communication layer with tools preferred by clients of the company.

The most professional solution in communication with innovation founders are cooperation platforms created on platforms of companies or as independent portals. Well-known platforms include: "Dell Idea Storm" or " My Starbucks idea", and among Polish brands, e.g. "Bank pomysłów" (Bank of Ideas) BZ WBK. Unfortunately, only 4% of the respondents at least once logged in on the platform of submitting ideas and took an activity, e.g. submitting an idea, commenting or voting on the presented ideas.

Companies will need to be more flexible and creative in defining the way they interact with customers. Furthermore, companies will need to become more sophisticated in their open innovation approaches and in a relationship-dominated world, companies will need to focus more on the role of employee engagement in innovation. The winners will be those company who are able to link strategy, innovation, product, customer experience and employee engagement, all in a landscape of shifting sectoral boundaries, new bases of competition and Web 2.0 tools.

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Comfort and structural (FEA) analysis on light weighted car seat design optimized with EPP material

[1]İbrahim Bahadır Çelik, [1]Bahadır Atmaca, [2]Ergün Nart

1Toyota Boshoku Turkey Co., 1st Organized Industrial Zone PK 190, 54580,Arifiye, Sakarya, Turkey,
E-mail: bahadir.celik@toyota-boshokutr.com, bahadir.atamaca@toyota-boshokutr.com

2Sakarya University, Faculty of Technology, Dept. of Mechatronics Engineering, Esentepe Campus, 54187, Sakarya, Turkey,
E-mail: enart@sakarya.edu.tr

Abstract: In this paper, comfort and strength performance of conventional and lightweight seat design which is developed by using EPP (expanded poly propylene) material is investigated by using FEA (finite elements analysis) method. The main goal is to contribute to reducing CO_2 emissions on passenger cars by providing weight reduction on car seats. To accomplish that, a special designed part made of EPP material, which has lower density and higher strength performance in compliance with PU (Polyurethane), is embedded in original car seats made of PU material, and the resulting composite material reinforces the structure and gives the similar performance compared to PU design, and in the meantime supporting metal frame's weight inside car seats is also reduced. In parallel with design optimization, a comparative analysis of strength and comfort performances between conventional seat design and lightweight seat design is studied correspondingly. Highly nonlinear contact analyses are performed with the dummy named "Manikin" (human model) to analyze comfort performance by looking at the pressure distribution on surface of seats. The results indicate that after design optimization by using new material technology, nearly same comfort and strength performance are achieved and weight of the car seats can be reduced remarkably.

Key words: Weight reduction on car seats, EPP material, Comparative comfort and strength analyses, FEA method

Introduction

Reducing fuel consumption and CO_2 emissions on passenger cars is a subject of intensive research in automobile industry for better environment. One way of achieving this goal is to provide weight reduction on car bodies. Because the heaviest interior element among all others is car seat sets, ongoing research on weight reduction usually starts with car seats by using new engineering materials and optimization techniques. However, utilizing new engineering materials in designs is in need of verifications in terms of passengers' comfort and strength performance. In industry, these are usually done by series of tests after the prototypes are produced.

In 2012, the total global sales in the sector of automotive became 86.5 million by increasing 5%. In the same year, the most of total sales happened to be 68.3 million in automobile market (Reports,2012). Due to the intense use of automobiles, total consumption of fuel and CO_2 emission increased dramatically. Therefore, automobile industry seeks alternative energy sources due to devastating greenhouse gas effect for the environment, and starts decreasing the use of fossil fuel energy with standardization in fuel consumption because of new rules and regulations. According to the CAFÉ reports, the target fuel CO_2 emission complied by passenger car and vans manufactured in 2025 is shown in Figure 1. (NHTSA, 2012).

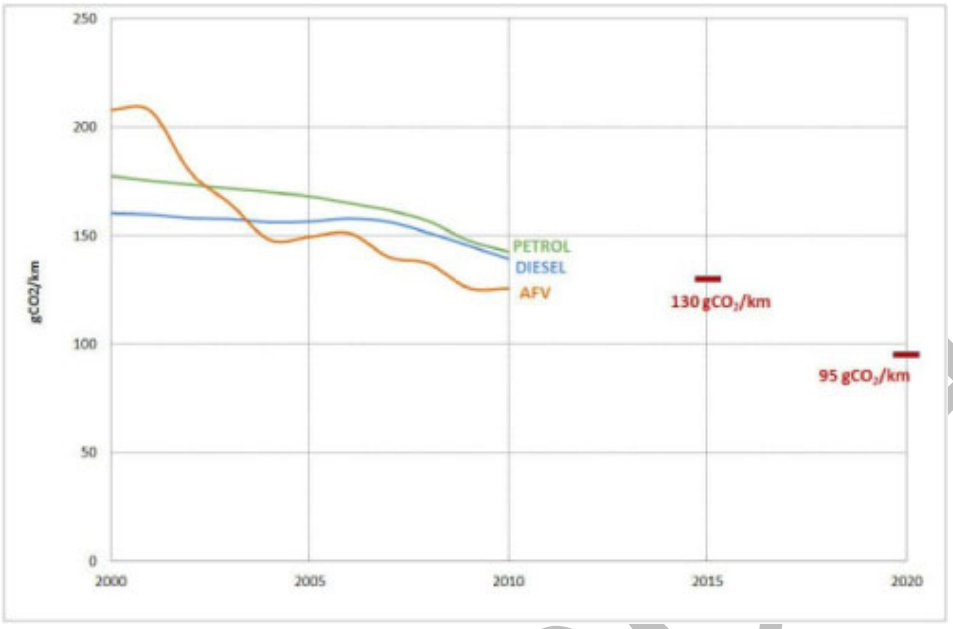


Figure 1: The target fuel CO2 emission by EU

In EU, it is aimed to have at least 130gr CO_2/km emission in accordance with the new rules for passenger cars (European Parliament and of the Council Regulation, 2009). As a general rule, the modification to have 100kg weight reduction provides approximately 0.005lt/km fuel cut. It is also corresponds to 10gr/km CO_2 emission. 1kg weight reducing for cars, which the required emission rate cannot be complied, costs roughly 10€. Therefore, with the help of reducing weight, developing new engines and transmissions, alternative fuels and other advancements, engineers are optimistic to reach the expected CO2 emission goals (Eureka Project-Lightweight Seatbacks, 2013).

The work on reducing weight to decrease the CO2 emission is usually performed by replacing the traditional engineering materials with the high-tech materials that provide both lightness and strength, and analyzing the design to eliminate the unnecessary materials usage. When the literature is curiously searched, it is easily seen that there is little work comparative research between traditional and new seat designs with respect to comfort and strength performances. In one of them, Grujicic et al study finite element models of a passenger-vehicle occupant's seat and of a dummy and used in the investigation of human/seat interactions and seating comfort. On the other hand, Siefert et al, work on a seat model in which static and dynamic properties of the structure are defined. Authors evaluate static comfort which is mainly determined by the seat pressure distribution. However optimization type of research works cannot be found easily in literature. Therefore, in this research, it is aimed to reduce % 22 of weights on car back seats by replacing PU with EPP material. To achieve that goal, finite element method is extensively used in both comparative works and design optimizations.

Materials and Method

The procedure of weight reduction consists of three stages. In the first stage alternative material is selected and corresponding properties are determined. In our case, EPP is a material that fulfills most of the expectations. Meantime, in conventional seat design, PU foam and DIN 17223-B-type spiral high-carbon steel materials are widely used. On the other hand, selected EPP material has % 25 lower densities and better strength performance compared to PU material; therefore it is also expected to reduce steel wire

material usage in the design optimization. In the second stage, various finite element analyses (FEA) are performed. In the modeling part of the FEA, AM50 (Adult Male 50) human model (manikin) is used to simulate the effect of passenger effect as a loading (SAE, Society of Automotive Engineers). Manikin is particularly placed on a car seat according to hip-point, heel-point and torso angle (Figure 2).

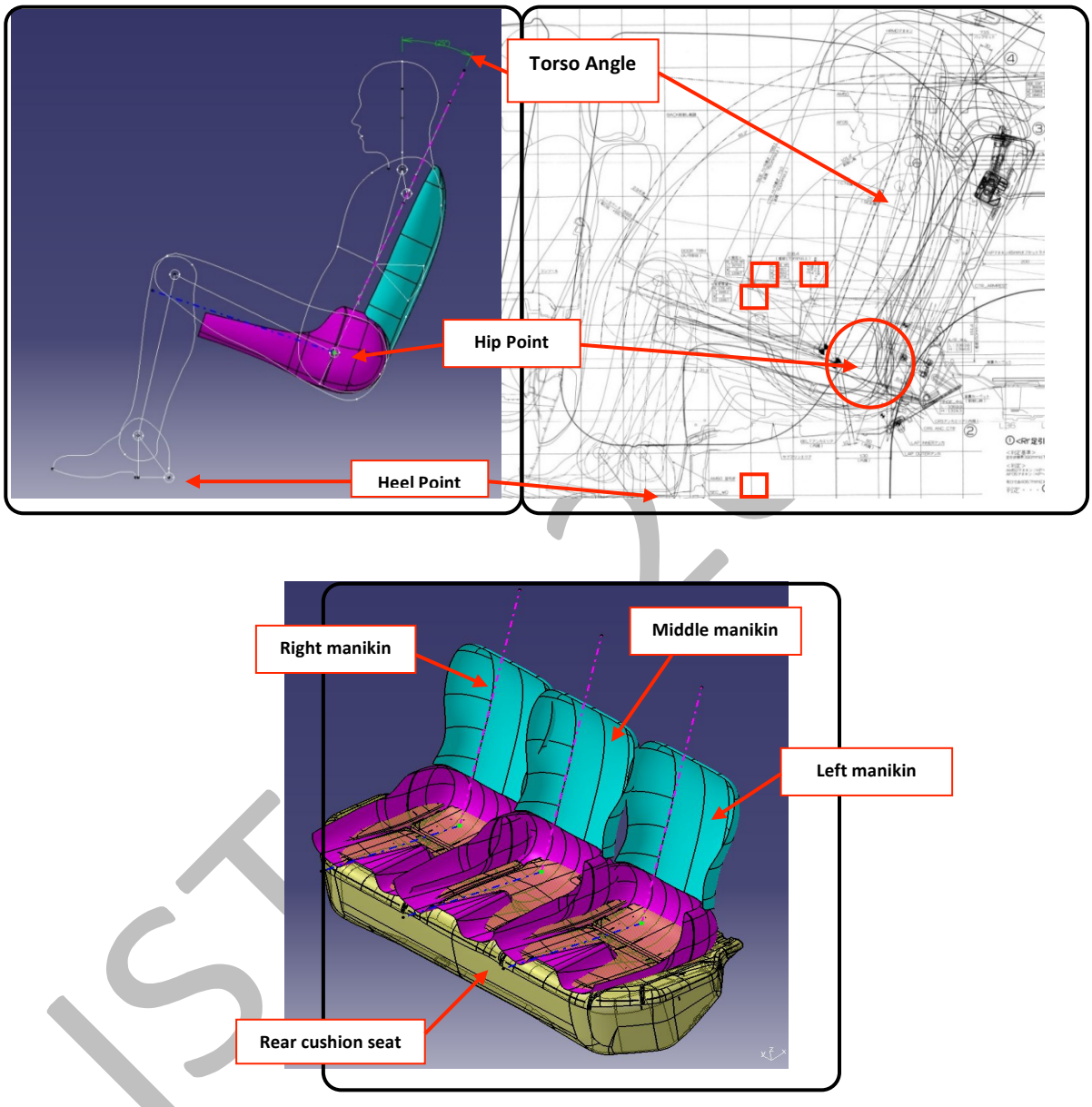


Figure 2: CAD model of AM50 dummies and their positions on the car back seat

Also new wire frame is design to be embedded in the EPP part (Figure 3). Therefore, the usage of steel wire can be reduced. Furthermore upper surface of the EPP part is designed by considering the manikin shape which directly affects the passenger comfort. Then, whole design of parts is completed in CATIA V5 CAD environment and transferred to finite element software (Figure 3).

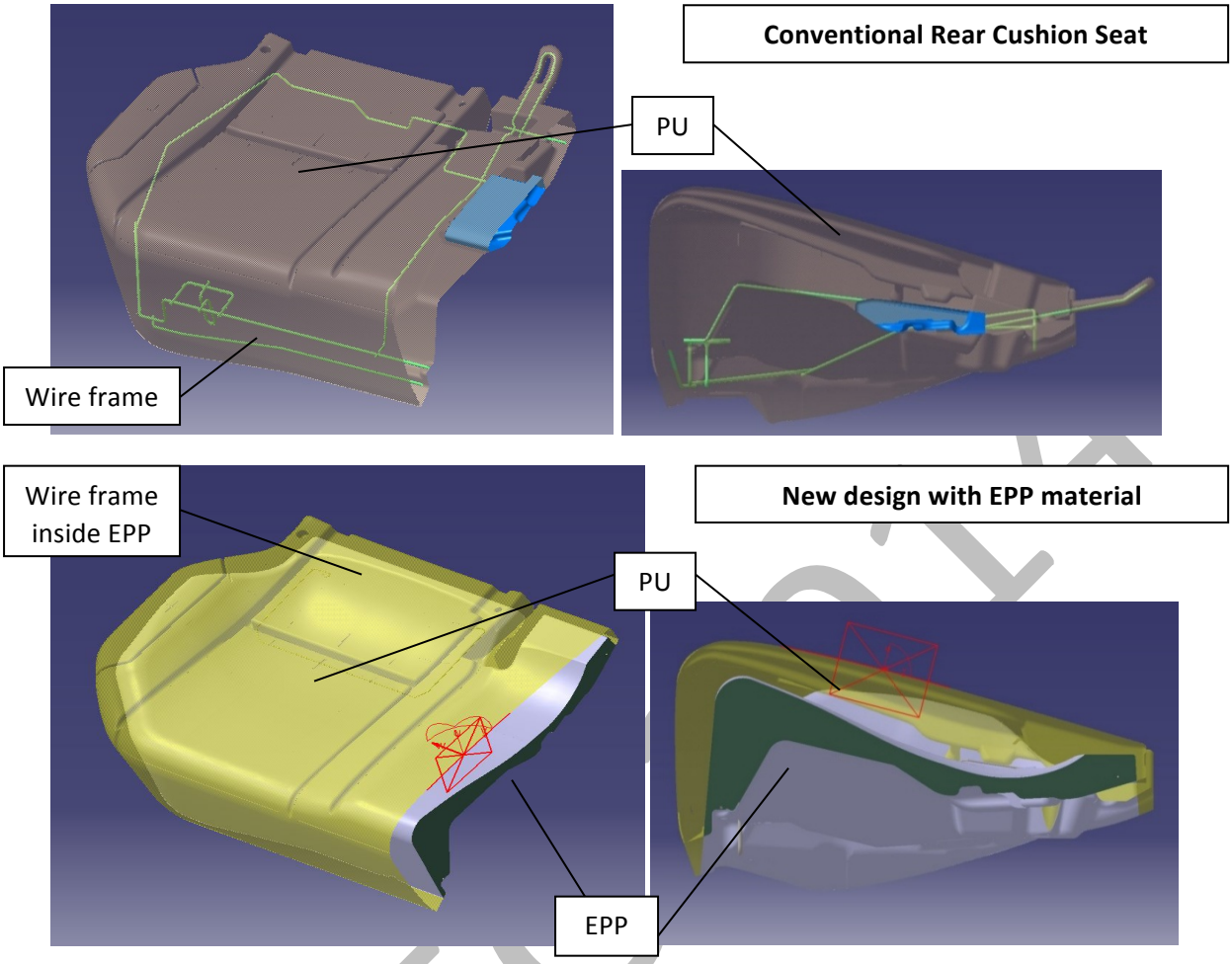
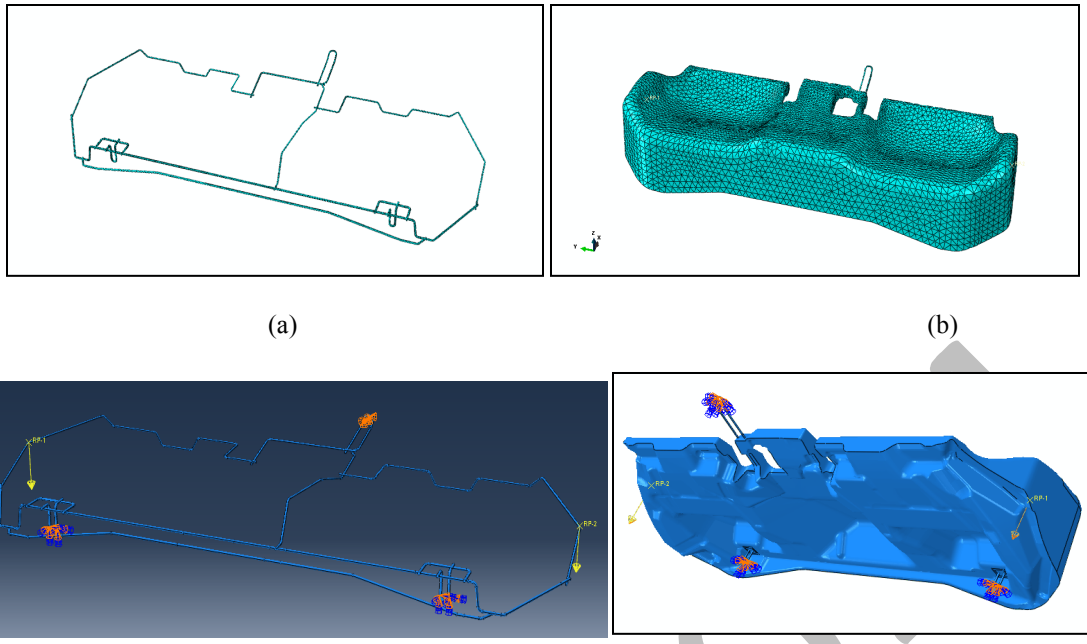


Figure 3: Current design and new design sections

After that, the models are meshed with tetrahedron elements due to the complex geometries. Meantime, tensile test results of EPP and PU materials are evaluated by finite element software, and hyper-elastic Marlow model is selected and assigned to EPP and PU parts. For the new composite design, embedded constraint between EPP and embedded wire frame, and non-linear contact between dummy and PU part are defined Both models are fixed from the same 3 fixation points of wire frame to car floor and corresponding boundary conditions are defined. Finally, loads are defined by applying 77 kg force (standard weight value of the AM50 Manikin) at the center of the gravity of dummy and body forces of the parts (Figure 4).

In the third stage, having finished the analyses for comparative strength and comfort analysis between current design and new design of rear seat cushion, comparative strength analysis is studied between composite structure of EPP + wire frame, which is developed in the new design, and the current wire frame, which reinforces whole strength in current design.

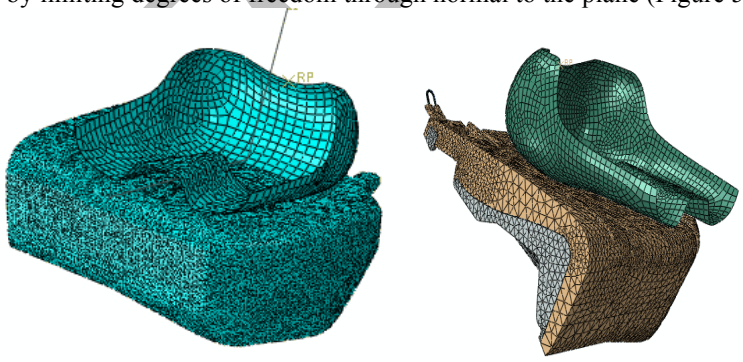


(a) (b)

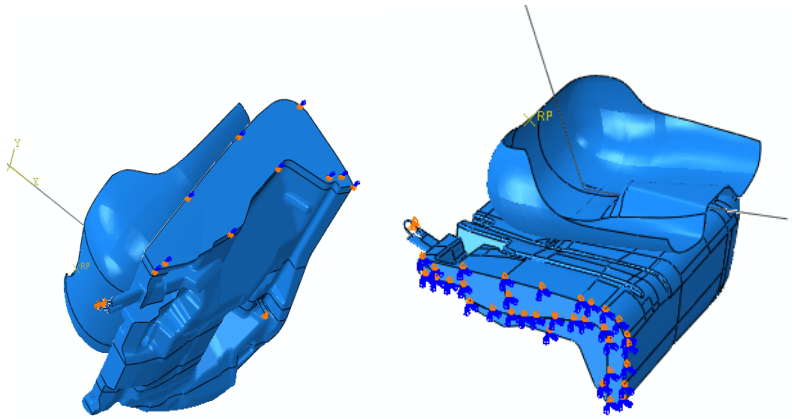
(c) (d)

Figure 4: (a). Mesh system of current design (b) Mesh system of new design (c) Boundary and loading conditions of current design (d) Boundary and loading conditions of new design

To simulate the seating condition of a human, comfort analysis is performed by applying contact condition between manikin and PU surface. But both models are almost symmetrical, for the sake of comparison, half of the rear cushion seat is used to avoid unnecessary calculation. As a result symmetrical plane is applied as boundary condition by limiting degrees of freedom through normal to the plane (Figure 5).



(a) (b)

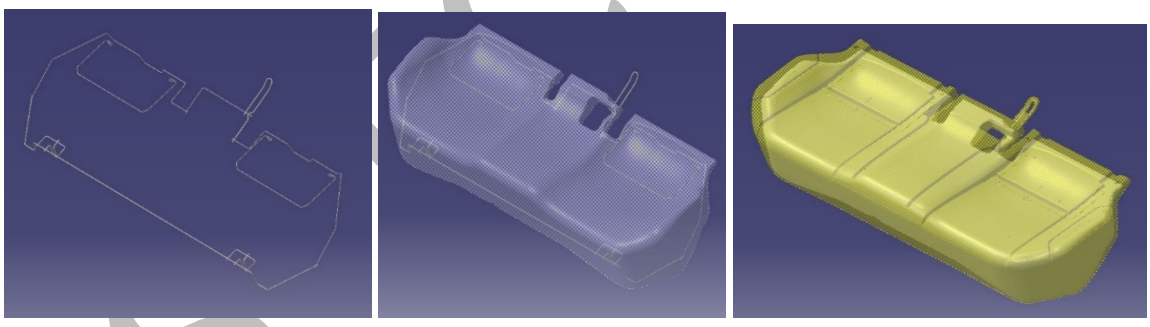


(c) (d)

Figure 5: (a). Mesh system of current design (b) Mesh system of new design
(c) Boundary and loading conditions of current design (d) Boundary and loading conditions of new design

Results

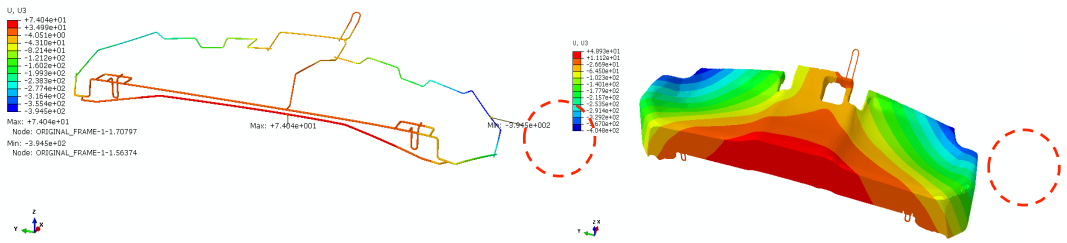
Before the changes take place, the weight of traditional rear seat cushion is 4320g. According to the results of analyses, it is seen that %40 volume of PU material is replaced by EPP material in the new design. Due to %25 density difference between these materials, 350g weight reduction is provided. In addition, usage of steel wire is reduced 65%. Therefore, total weight of the rear seat cushion is reduced about % 22 compared to current designs, and the weight obtained for the new design reaches to 3372g total. (Figure 6).



(a) (b) (c)

Figure 6: (a). Light weighted wire frame (b) EPP and embedded wire frame (c). New rear cushion design with EPP

Based on results of the strength analysis, both maximum strength generated in the current wire frame and maximum stresses for the EPP + wire frame composite structure in the new design is elastic. Maximum displacements for both configurations are almost same (Figure 7).

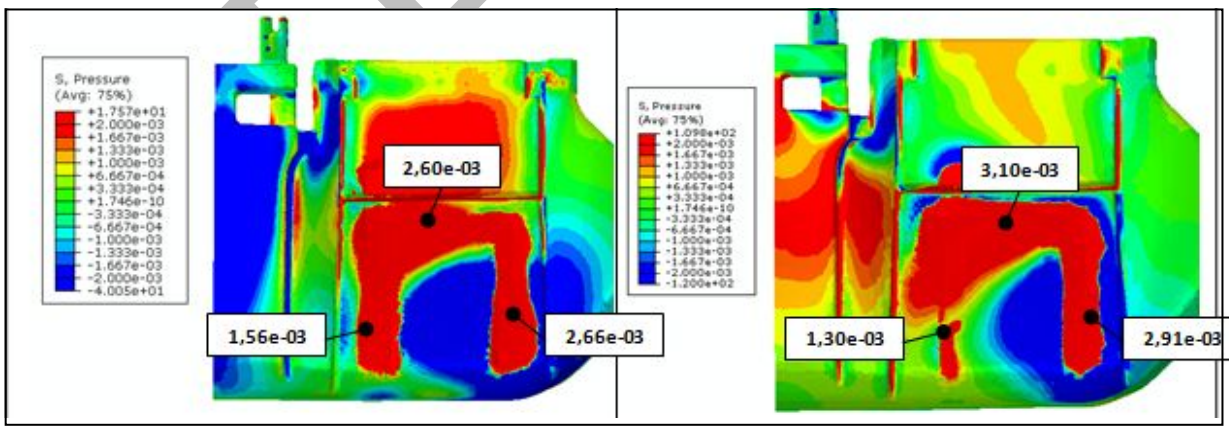


(a) (b)

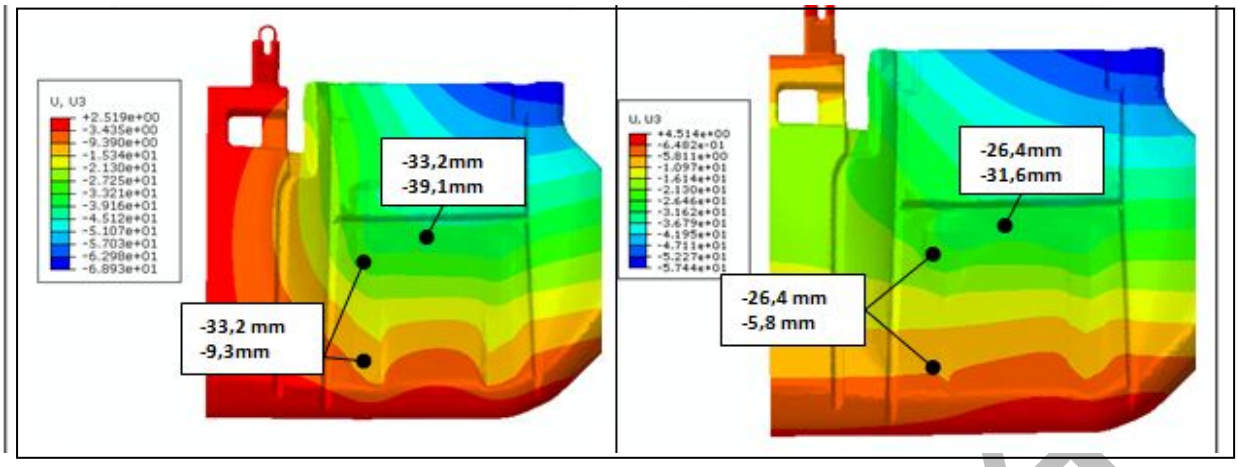
	Current wire frame	New wire frame embedded in EPP
Maximum Displacement [mm]	(c) -394	(d) -404

Figure 7: Displacement distributions (a) on current wire frame (b) on EPP and embedded wire frame

For comfort analysis, pressure distributions on the upper surfaces of the both models are investigated. In the current model, average pressure values obtained as 2.66-03 MPa under the area of left leg, 2.60 MPa-03 on the hip area and 1.56-03 Mpa under the area of right leg. The average value of displacement on the legs are in the range of 33.2 to 9.3 mm and through (-) direction, for the hip area, displacement is obtained from 33.2 to 39.1 mm, also through (-) direction. In the new design, average value of pressure distribution is 2.91-03 Mpa on the left leg area, 3.10 MPa-03 on the hip area, 1,30-03 Mpa on the right leg area. The average value of displacement on the area of legs is through (-) direction and in the range of 26.4 to 5.8 mm, for the hip region it is through (-) direction and obtained between 26.4 - 31.6 mm (Figure 8).



(a) (b)



(c) (d)

	Manikin Contact Area	Current Design	New Design
Maximum Stress [Mpa]	Left leg	(a) 2,66e-03	(b) 2,91e-03
	Hip	(a) 2,60e-03	(b) 3,10e-03
	Right leg	(a) 1,56e-03	(b) 1,30e-03
Maximum Strain [mm]	Hip	(a) -33,2 -39,1	(b) -26,4 -31,6
	Legs	(a) -33,2 -9,3	(b) -26,4 -5,8

Figure 8: The average value of displacement on the area of legs

Discussion

It is obvious that any reduction attempt by reducing wire frame usage in seat design causes reduced strength performance accordingly. In this study, this situation is compensated by developing a new EPP + wire frame composite structure. EPP is a new engineering material and has 25% lower density in comparison with PU. In the optimization part of the solution, the weight of traditional rear cushion seat is reduced about % 22 from the value of 4320g to 3372g. The weight of steel wire frame is decreased by % 65 by supporting the seat structure with EPP material, and the intended target for weight reduction of % 22 is reached.

Results of the analysis shows that strain/stress values of the EPP + wire frame composite structure appears to be around +/- % 2.5 compared to the current wire frame strain/stress performance. Regarding to these results, the new design, EPP + wire frame structure, is as stiff as the current wire frame.

In the process, it is also aimed to achieve same comfort performances between current and optimized seat design in maximum level. As a result of comparative comfort performance analyses, pressure distributions

on the upper surfaces of the models shows that comfort performance of the new seat appears to be around -%17 / +%19 compared to current seat design. Even these results are not so close to each other, a small reduction on comfort performance is expected because of usage of such a rigid EPP material. Since the primary objective of the study is to reduce weight by 22%, the convergence of comfort performance is in the acceptable level. Considering all these results of comparative analyses, EPP material usage is optimized and % 22 of weight reduction is provided on rear cushion seat (Table 1).

Table 1: A comparison table between targets and results of design optimization

	TARGET	**RESULT**
Design optimization	%22 Weight reduction	%22 Weight reduction
1. Comparative Strength Analysis	Current wire frame vs. EPP+wire frame	**Stress** Difference: +%2,5 **Strain** Difference: -%2,5
2. Comparative Comfort Analysis	Current seat vs. New seat	**Pressure Distribution** Difference: between -%17 / +%19 **Displacement** Difference: between -%19 / -%20

Conclusions

Weight reduction studies in cars are extremely important in terms of the reduction of CO2 emissions. Weight reduction on car seat sets is also an important part of these studies. But the challenge is to have a stabile comfort and strength performance of existing seat while weight is reduced, and do it at the design stage to avoid high prototype costs. Based on this study, the following recommendations and conclusions can be drawn;

1-Weight reduction studies are usually made for the front seat sets. In this study, weight reduction is studied for conventional rear cushion seat, and % 22 of weight reduction is obtained by using a new material which is EPP.

2- Pressure distributions based comfort analyses are usually studied for front seat sets. While reducing the weight highly nonlinear FEA analyses made for design optimization and strength/comfort performance is maintained.

3- Strength/comfort ratio of traditional seat is reached by that of optimized designs in strength/comfort performance analyses.

4- For further studies, finite element models can be detailed by applying car floor restrictions and vibration loads acting on the occupant while driving conditions.

Acknowledgements

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Comparative effects of two moulting hormone agonists in Ephestia kuehniella: pupal development and reproductive capacity after treatment of males.

MESKACHE Rania & SOLTANI-MAZOUNI Nadia

Laboratory of Applied Animal Biology Faculty of Sciences, Department of Biology University Badji Mokhtar of Annaba 23000-Annaba, Algeria
Email:meskache_saida@yahoo.fr

Abstract: Insect growth regulators (IGRs) are known to be selective insecticides with low ecotoxicological risks. These products have a great potential for use as chemical preventive controls in the stored product industry, especially against lepidopteran pests. Dibenzohyldrazine (RH-5849) and Halofénozide (RH-0345) are a new class of insect growth regulateur, (IGRs) These are the selective insecticides with low ecotoxicological risks. These products have a great potential for use as chemical preventive controls in the stored product industry, especially against lepidopteran pests. .The non steroidal ecdysteroid agonist, were tested in vivo by topical application on pupal development and reproductive capacity**.** of the mediterraneen flour moth Ephestia kuehniella Zeller (Lepidoptera : Pyralidae), a important pest in stored products worlwide. the present study compared the activity of two ecdysteroid agonists (RH-5849 and RH-0345).These two insecticides were administred topiclly to the emergenge of male pupae of a 0 days in experimental condtitions (T° 27°C ; Humidity 80%) at a concentration corresponding to their respective LD_{50} (0,05 µg and5,10 µg) for RH-5849 and RH-0345. These compounds were diluted in acetone and 2µl are applied.The results show that the Dibenzohyldrazine (RH-5849) seems to affect the duration of pupal development. However, the RH-0345 does not have any effect. Moreover, the tested ecdysteroid agonists also affected the number of eggs/female and the egg viability when untreated females were paired with adult males emerged from treated pupae.

Key words. Insecta ; Ephestia kuehniella ; Dibenzohyldrazine ; Halofenozide; pupal development **;** reproductive capacity**,** Males

Copper-Zinc-Lead lloys, Common Defects Through Production Stages and Remedy Methods

Ahmed M. M. El-Bahloul[1], M. Samuel[1], Abdulsalam A. Fadhil[2]

[1]Production Engineering and Mechanical Design Department, University of Mansoura, Egypt.
2Chief Technology Officer in Al-Shaheed State Company, Iraq &Ph.D. Student in Production Engineering and Mechanical Design Department, University of Mansoura, Egypt.

Abstract: Two types of leaded brass alloys (CuZn40Pb2 and CuZn39Pb3) as extruded rods, which use to produce pressurized gas valves were produced by a vertical semi-continuous casting, hot extrusion, cold drawing, hot forging and machining processes. The effect of lead element on machinability of these alloys was explained. The common defects of the mentioned leaded brass rods, the causes and its remedies were explained. Many defects during productions stages of leaded brass rods were occurred, such as cavities, non-metallic contaminates, lead clustering, surface cracks and zinc segregation into foundry process. In addition, surface crack, hot tearing and back defect through hot extrusion, chevron and chemical composition cracks into cold drawing with hot bursts and lap during hot forging were appeared. The machining process and in-service processes were also involved some other defects. All these defects were occurred due to no care during manufacturing process stages and using improper technological parameters and bad casting product design. To remedying the above-mentioned defects, the proper and improving technological parameters with optimal product design must be used. The current technical review of all types of defects in leaded brass alloys, have been found that, these defects can be appear and increasing in sub-sequence applications and in-service stages.

Keywords: Leaded Brass, Casting, Extrusion, Hot forging, Processing Defects.

Introduction

Copper and its alloys, such as bronze, brass, are the materials which are widely used in friction parts of machines, as bearing liners, bushings, etc. Properties such as high strength and ductility, fatigue strength, wear resistance, etc. are necessary for these materials. Obtaining such properties is possible by creating sub-microcrystalline and nanocrystalline structures in the materials (Sadykov, 1999).

Principle of brass bars manufacture from the viewpoint of forming lies in the following technological scheme.

Melted brass is poured into billets of circular cross-section with diameter (D). Brass billets are hot extruded to the required cross-section of a circle, square, hexagon and profile. After removal of surface oxides the brass extruded rods are cold drawn (calibrated) to the required dimension (PERNIS, 2011).

There are two broad categories of brass rods, as far as their end-use and final product fabrication technique, the forging/stamping rods and the machining rods. Machinable brasses are produced by hot extrusion and drawing and serve as raw material for the production of various products ranging from decoration to mechanical and electrical engineering. The production of the final parts is realized by high-speed machining (turning) of feed stock material, for maximum productivity, using automatic and CNC machining centers. Lead precipitated in a fine and homogeneous distribution, serves as a chip-breaking constituent, minimizing the friction at the tool/work piece interface and impairing the chip ductility, increasing, therefore, the machinability of the material and extending the cutting tool life (Toulfatzis, 2011). Lead (Pb) content and Pb particle dispersion played an important role in the machining capability of the material. Pb remained insoluble to the α or β phase and it was distributed along the present (or former) grain boundaries. As the Pb particle distribution became finer (less than 5 μm) and more homogeneous, the chip-breaking action during cutting processes became stronger, and therefore the machinability was enhanced (Pantazopoulos, 2002).

Leaded brass rods are widely used in applications varying from decoration and architecture to electrical/electronic and structural systems. Such components, for example, screws, nuts, bolts, and fittings, are produced mainly by automatic turning operations (Pantazopoulos, 2008). The content varies Pb between 2.5 and 3.5 %, which allows for machining processes at high speed with good surface (Mannheim, 2009). The solubility of lead in copper alloys is very low and for that reason it is found in microstructure as dispersed globules all over the material. It acts as a lubricant decreasing the friction coefficient between the tool and the material, creating discontinuities that promote the chip fragmentation, reducing the cutting force and the tool wear rate (Vilarinho, 2005). Different alloying elements enhancing the machinability are usually added to brass. The most important element in this context is lead, improving the machinability with regard to excellent chip breakage, low tool wear and high applicable cutting parameters. These aspects can be explained by two basic phenomena. First of all, solubility of lead in brass is very low and lead segregates in the entire microstructure, particularly at the grain boundaries. Hence, shear strength is significantly reduced, resulting in very good chip breakage. Secondly, lead exhibits a low melting temperature. During cutting, a thin, semi-fluid lead film reduces friction, cutting forces (Nobel,2014).

Materials and Methods

The methodology adopted to carry out this work involved wide studying of copper-zinc-lead alloys with two types (CuZn40Pb2 and CuZn39Pb3) as extruded rods which use to produce pressurized gas valves by hot forging, trimming and then machining process. The production sequences of leaded brass rods generally involves the manufacturing stages:- Vertical semi-continuous casting → Hot extrusion → Surface cleaning (pickling) → Cold drawing → Straightening → Stress relieving → Hot forging → Trimming & cleaning and Machining.

The study involved introduction about copper alloys especially leaded brass alloys and explain with discussion the common defects during production stages for two types of these alloys with its remedy methods. The study involved also some conclusions in finally.

The Common Defects of Leaded Brass Rods and it's Remedy

Foundry Process Defects

There are many types of defects appear into leaded brass billet casting such as:-

• **Surface defects: -** For certain products, such as those will have no machining after casting the surface finish is important and mould surface texture is reflected in that of the casting surface. For any blemishes or high and low spots will be carried over onto the product (Wilby, 2012). These defects can be avoided by adjust proper pouring temperature, repairing or replace the linear of casting mould and using oil lubricant for mould (Rajkolhe, 2014).

• **Zinc segregation: -** This can appear on the surface of billets in the case of insufficient the technological parameters and cooling of brass in chill-mould (PERNIS, 2011).

(Fig. 1) shows surface zinc segregates. These defects can be remedied by optimal casting parameters, repairing the cooling system of casting mould and adjusting the quality and cooling rate water.

• **Surface blackness cracks and lead clustering: -** The shortage and insufficient secondary cooling water lead to defects and surface cracks within the product. If the secondary cooling of the billet is not homogenous (non-uniform), this results the cracks, lead clustering and distortion of the billet (Hameed, 2014). **(Fig. 2)** shows lead clustering on brass rod surface. These defects can be avoided by controlling on technological casting parameters especially, cooling rate water and casting speed.

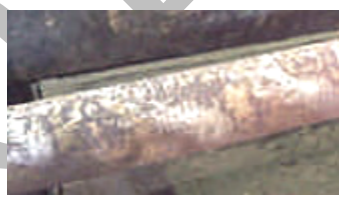

Fig. 1. Zinc segregates on brass CuZn40Pb2 billet (PERNIS, 2011). Fig. 2. Lead clustering on leaded brass billet surface

•**Cavities and Porosity**: - These defects can be cause surface or internal cracks and/or voids that ultimately lead to failures during the metal forming operations. Careful selection of casting speed and cooling rate are viable techniques to control and minimize the solidification shrinkage and the associated porosity (Pantazopoulos, 2003). **(Fig. 3)** shows some porosity defects on section of leaded brass billet.

• **Non-metallic contamination: -** Slag or fragments of melting furnace refractory might be allowed to enter the melt charge during the pouring. Foreign attachments and extraneous materials get into billet where they become hard and follow into the extrusion process. The consequence of this is illustrated in **(Fig. 4)** (PERNIS, 2011). High, localized impurity levels may lead to cracks and discontinuities after extrusion and drawing. The necessary corrective action to avoid this set of defects is to establish the lowest possible impurity limits and to determine the chemical composition of the incoming raw material and/or the ingots from the casting process (Pantazopoulos, 2003). These defects can be remedied by pouring from the bottom of tundish and cleaning the molten metal from slag and dross (PERNIS, 2011).

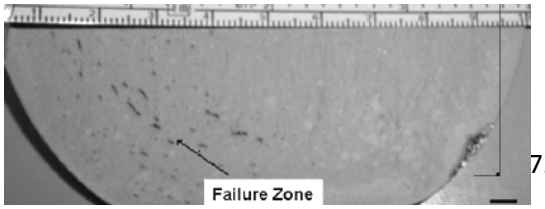

Fig. 3. Porosities and small cracks on brass billet (Mannheim, 2009). **Fig. 4. Surface crack on extruded brass bar (PERNIS, 2011).**

Extrusion Defects: -

There are many types of defects occurring through extrusion process, but the common defects are:-

• **Surface cracks: -** The cracks may be small fine or transversal cracking, surface defects of brass bars are influenced by improper geometry of extrusion equipment. **(Fig. 5)** shows transversally deformed brass CuZn40Pb2 bar. This deformation was caused by the geometry of extrusion die which was manufactured with slightly twisted positions. If extrusion tools (die, the holder of die) is not sufficiently preheated up to required temperature, it can lead to the occurrence of cracks at the beginning of the extrusion process (PERNIS, 2011). The most important of technological parameters of extrusion processes; such as extrusion ratio, extrusion speed (ram speed), the temperature of extrusion and suitable preheating of forming tools extrusion ratio and extrusion speed effected to appear some surface defects especially, when extrusion ratio increase and the temperature of extrusion tools decrease (PERNIS, 2011).

• **Hot tearing or hot cracking: -** Hot-shortness failures appear as surface cracks or delaminations along the length of the extrusion. Hot shortness results from overheating because the temperature of the extrusion is increased by billet container friction. This increase in temperature raises the metal temperature to the point where localized regions of segregation may melt or become hot short (Rajkolhe, 2014). Surface/subsurface cracking and tearing with intergranular form can be generated by longitudinal tensile stresses developed as the extruded rod passes through the die. The most common reason is a combination of high extrusion speed or pre-extrusion rod temperature, while similar phenomenon could have occurred at lower temperatures due to stick-slip processes at the die land (Pantazopoulos, 2008). **(Fig. 6)** shows hot tearing defect on face of section for extruded lead brass rod which produced by Al-Shaheed state company, Iraq\Anbar. Although hot tearing is most often considered as a phenomenon linked to the inadequate compensation of solidification shrinkage by melt flow in the presence of thermal stress, there are more factors that could be involved in the formation of cracks at super solidus temperature (Mannheim, 2009). The factors that affect the hot tearing defects are a very high extrusion temperature, low extrusion ratio and a very low extrusion ram speed. To avoid this effect and prevent hot tearing the temperature of billet could be lowered and the extrusion ram increased (Mannheim, 2009).

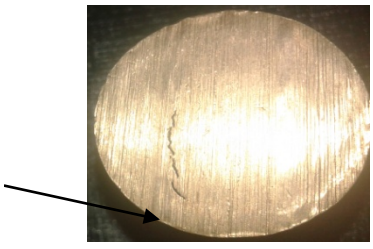

Fig. 5. Distortion of extruded hexagonal bar from brass CuZn40Pb2 (PERNIS, 2011). **Fig. 6. Hot tearing in extruded brass rod**

• **Back defect (internal piping): -** Which generally appears as a hole at the end of the extruded rod, results from a combination of the metal flow pattern and the introduction of surface oxides into the interior of the rod. Increased billet-container friction, an effect that frequently occurs in direct extrusion processes, gives rise to a non-uniform metal flow pattern, which is the main cause of the internal pipe formation (back defect) (Rajkolhe, 2014). In direct extrusion, if the extrusion ratio is too low, particularly with brass, the acceleration of the center of the billet can be so severe that cavities can occur toward the end of the section (**Fig. 7**), and due to the flow pattern of extrusion piping defects occurs (**Fig. 8)**. Their formation in the section can be prevented only by limiting the billet length and leaving a sufficiently long discard (Bauser, 2006). Removing a certain length form the end of the extruded rod can minimize the effects of this type of defect and the removing of the skin of the billet (scalping) during extrusion process also minimize this defect (Rajkolhe, 2014). In addition, the length of the billet is limited to reduce the risk of the piping defect. As a general rule the billet should not be longer than 2.5 to 3 times the diameter (Bauser, 2006).

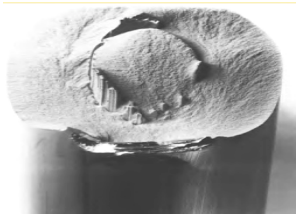

Fig. 7. Extrusion defect (piping) in leaded brass rod (Bauser, 2006). **Fig. 8. End cavities in section of leaded brass rod (Bauser, 2006).**

Cold Drawing Defects: -

The types of defects associated with cold drawing failure of leaded brass rods include the following:-

• **Chevron or internal cracking: -** Chevron crack is a result of excessive die-material friction and/or too large a reduction in area during drawing. Appropriate die lubrication and controlling the rod reduction to between 10 and 15% may eliminate this defect (Rajkolhe, 2014). **(Fig. 9)** shows style of chevron crack appears in drawing rod.

• **Chemical composition defects: -** Melting charge for melting and casting of brass CuZn40Pb2 billets is made from the company's own material which bought from external sources. The company's own material has the ensured chemical composition. However, this can not be said about the material bought from external sources, where is always the risk of unsuitable impurities. The most dangerous impurity is antimony. Some standards allow antimony as impurity up to 0, 02 wt. %. Technological problems appear with cold drawing of such bars. The consequences of antimony presence in brass CuZn40Pb2 bars are demonstrated in **(Fig. 10**). It is a circular bar which was cold drawn and contained 0,018 wt. % Sb (Rajkolhe, 2014).

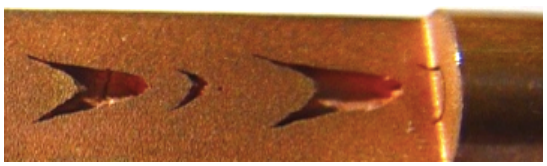

Fig. 9. Chevron crack defects in drawn rod (NORASETHASOPON, 2011). **Fig. 10. Cracks on brass CuZn40Pb2 bar contains 0,018 wt. % of antimony (Rajkolhe, 2014).**

Hot Forging Defects

The main types of hot forging/ stamping defects are:

• Hot bursts:-

• Hot forging laps or discontinuities: - The principal actions to minimize such these defects include (Rajkolhe, 2014):-

- First, and most importantly, review the processing stages and parameters with regard to the desired plastic deformation. These parameters include the alloy selected, the dimensions and geometry of the part produced, billet size, process temperature, strain rate, lubrication, die parameters, and other fabrication variables.

- Carefully adjust the preheating temperature. Excessive heating promotes hot tearing, and inadequate heating may lead to cracks due to insufficient ductility.

- Increase the alloy purity, and minimize alloy additions that may lead to hot shortness.

- Reduce friction through control of lubrication.

- Improve the die design to reduce sharp edges.

• Surface cracking: - Cause-Excessive working on the surface and too low temperature. Remedy by increase the work temperature (Rathi, 2014).

• Cracking at the flash: - This crack penetrates into the interior after flash is trimmed off. Cause due to very thin flash. Increasing flash thickness, relocating the flash to a less critical region of the forging, hot trimming and stress relieving (Rathi, 2014).

• Cold shut (Fold):- Two surfaces of metal fold against each other without welding completely. Cause due to sharp corner (less fillet), excessive chilling and high friction. Remedy by increase fillet radius on the die (Rathi, 2014).

Machining Defects: -

When a good machining behaviour is required, lead is added (until 3%). The benefits conferred by the presence of lead has been appreciated for many years to facilitate chip fracture, reduce cutting forces, increase the machining rate and productivity, reduce tool wear and enhance surface finish (Garcia, 2010).

The chip shape obtained during machining is a very important factor of a material because it describes the possibility of using automatic machining processes. To do so it is necessary that the chip will be easy to remove and will not wind up on cutting tool what could influence the surface quality and tool life. To fulfill all these demands the chip has to be segmented. Lead is added to brasses and other copper alloys to force chip segmentation (Kondracki, 2003).

Fig. 11. Hot crack propagation in machined leaded brass **Fig. 12. Jaws marking and cracks in lead brass**

There are some defects and problems involved or appeared in machining process of leaded brass castings, such as hot crack propagation, lathe jaws marks and thin surface deflection of brass specimens as show in **(Fig. 11)** and **(Fig. 12)**.

In-Service Defects

• **Environmentally induced failures: -** Such as fatigue, stress-corrosion cracking (SCC), and dezincification corrosion. These defects are generally a result of specific combinations of environmental and applied and/or residual stresses. To minimize the risk of SCC occurrence, a stress-relief annealing should be employed after the final manufacturing stage (Rajkolhe, 2014).

• **Cold-deformation failures or defects**: - Caused by the severe room temperature plastic deformation that may accompany component production. These failures are expected in cases where the alloy formability is exceeded during cold working. Better materials selection (chemical composition, temper) and process design are the main corrective actions to avoid such failures (Rajkolhe, 2014).

• **Hot-deformation failures or defects: -** These failures include hot bursts and laps, which can be prevented by limiting the intrinsic and extrinsic impurities and by careful control of process parameters (temperature, heating duration, billet dimensions, die design, and lubrication) (Rajkolhe, 2014).

Conclusions

• Several types of defects that occur in leaded brass rods during production process stages, especially through casting, hot extrusion, cold drawing and hot forging processes.

• Most of these defects occur due to improper technological parameters and product die designs adopted through the production processes.

• Some of these defects can be appear in last activities of production but, the causes of occurring are due to previous process.

• The proper and improving technological parameters can be used to remedy most of leaded brass rods defects. In addition, quality control and quality assurance practices must be used.

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Çimento Bağlayıcılı Odun Lifli Kompozitlerde Mikronize Kalsit Kullanımının Fiziksel Özellikler ve Yüzey Performansına Etkisi

Serkan SUBAŞI, Mehmet EMİROĞLU, Ahmet BEYCİOĞLU, Bekir ÇOMAK

Düzce Üniversitesi, Teknoloji Fak. Düzce-Türkiye

subasi.serkan@gmail.com

Abstract: Bu çalışmada, iki farklı odun lifi ile üretilen çimento bağlayıcılı odun lifli kompozitlerde mikronize kalsit kullanımının fiziksel özellikler ve yüzey performansına etkisi araştırılmıştır. Çalışmada lifli kompozitlerin üretiminde, CEM I 42.5 R tipi çimento, Gürgen (Carpinus betulus) ve Doğu Ladini (Picea orientalis) odun lifleri ve mikronize kalsit kullanılmıştır. Kompozit karışımları 0.2, 0.3 ve 0.4 lif/çimento oranına sahip olacak şekilde hazırlanmıştır. Hazırlanan referans karışımlara yüzey performansının artırılması amacıyla çimento ağırlığınca %5 ve %10 oranlarında mikronize kalsit ilave edilmiştir. 70x70x12 mm boyutlarında hazırlanan çimentolu odun lifli levhalarda yoğunluk, yüzey sertlik, vida tutma ve aşınma deneyleri yapılmıştır. Ayrıca optik mikroskopla yüzey görüntüeri alınmış ve profilometre ile yüzey pürüzlülük analizleri yapılmıştır.

Sonuç olarak ladin ve gürgen liflerinin çimentolu odun lifli kompozit üretiminde kullanılabileceği tespit edilmiştir. Ayrıca çimentolu Odun Lifli Levhalarda mikronize kalsit kullanılarak yüzey performans özelliklerinde iyileşmeler sağlanabileceği görülmüştür.

Keywords : Kalsit, Cimento, Odun Lifli Levha, Yuzey Performansi

Developing a Method to Accurately Estimate the Electricity Cost of Grid-Connected Solar PV in Doha

Ahmad Zahedi

College of Science, Technology and Engineering, James Cook University, Australia
Ahmad.zahedi@jcu.edu.au

Abstract: Solar photovoltaic electricity is more expensive compared with conventional electricity at retail level. As a result, general public members do not find the solar PV electricity an attractive option to use for generating a portion of their electricity need. To promote PV electricity utilization and to make it more attractive, Governments of some countries like Germany, Japan, USA, Australia, and etc. have introduced solar PV incentive programs. Most of grid-connected photovoltaic (PV) systems on residential or commercial buildings in these countries are installed by individuals interested in generating part of their electricity emission-free. For some of these people the economics of the PV electricity is likely to be of secondary importance, while majority of them would like to see financial return to become interested to use PV electricity. The objective of this paper is to present the results of a study conducted on the economic aspects of solar PV to estimate the electricity price of grid-connected rooftop PV system under climate conditions and geographical location of Doha, to see if the use of PV electricity is attractive and affordable by residential customers. The results of this study will help to determining an appropriate feed-in tariff for solar PV electricity in Doha.

Keywords- Economic aspect; electricity; solar photovoltaic

Introduction

Worldwide, power sector provides 18,000 terawatt-hours of electric energy every year, around 40% of world's total energy use. In doing this it produces more than 10 giga-tonnes of carbon dioxide every year, the largest sector contribution of humanity's fossil-fuel derived emissions (Gilbert, 2004).

Obviously, the easiest way to cut the carbon released by electricity generation is to increase efficiency of electric appliances and electric systems. But there are limits to such gains, and there is the familiar paradox that greater energy efficiency can lead to greater energy consumption. Thus, the response to reduce emissions released by electricity generation and reduction of climate change must involve a move to de-carbonizing power sector and using carbon-free sources of electricity. This requires serious thinking about the extensive use of new and renewable energy sources and technologies such as solar and wind.

Solar Energy

Solar energy is a vast and largely untapped resource. The World Energy Council estimates the earth's surface, on average, has the potential to capture around 5.4 GJ (1.5 MWh) of solar energy every year. Solar energy accounted for 0.1% of the world's total primary energy consumption in 2007, although its use has increased significantly in recent years (Global wind energy outlook 2011).

By end of 2012 the cumulative installed capacity of solar PV system exceeded 102000 MW in IEA member countries alone (Chin Ichi Inage, 2010). This was about 1400 MW at the end of 2000. This has

been shown in Figure 1. According to this Figure, installation of solar PV system has been growing at an annual average of more than 25% since 2000.

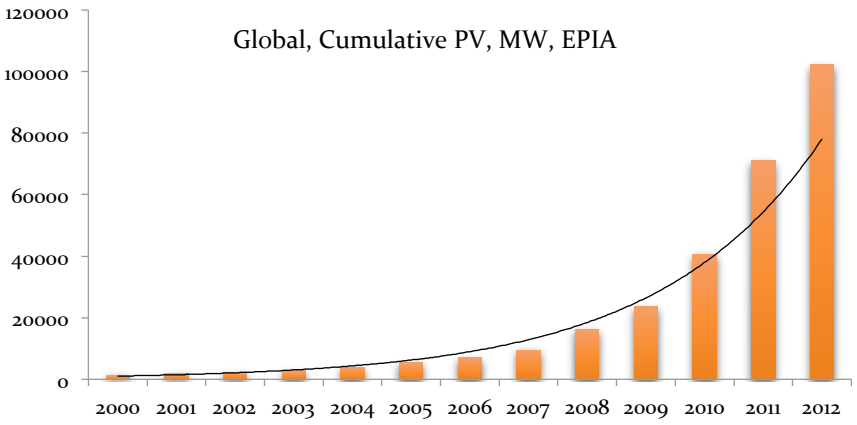

Figure 1 Cumulative PV Capacity MW

Solar PV technology converts sunlight directly into electricity using photovoltaic phenomena. PV systems can be installed on rooftops, integrated into building designs, or scaled up to megawatt scale power plants. PV systems can also be used in conjunction with concentrating mirrors or lenses for large scale centralised power.

The amount of solar energy incident on the world's land area far exceeds total world energy demand. Solar energy thus has the potential to make a major contribution to the world's energy needs. However, large scale solar energy production is currently limited by its high capital cost.

The cost issues related to solar energy has always been a major negative point for solar energy in general and solar photovoltaic in particular. Increasing manufacturing capacity has led to remarkable reduction in cost of solar PV electricity, but the PV electricity production cost is still far above the electricity price from conventional energy technologies.

This price difference is very high particularly in those countries, where price of electricity from conventional power plants is relatively low. Government policies investment costs and risks are projected to be the main factors underpinning future growth in world solar energy use (Global wind energy outlook, 2011).

Solar energy, although expensive but it has the potential to play a crucial role in the world's energy supply, now and in the future (Renewable Energy World, 2013, and Heydt, 2010). The last five years has been a period when PV energy changed from being a small-scale contributor to energy supply to being a more substantial one, and the next five years look like being a period when the technology could have an even more substantial impact.

Cost calculations show that even in sunniest place it is impossible for PV to be able to compete with conventional electricity without reasonable government subsidies or reasonable fee-in tariff.

Solar radiation is intermittent because of daily and seasonal variations. However, the correlation between solar radiation and daytime peak electricity demand means that solar energy has the potential to provide electricity during peak demand times. Photovoltaic systems are well suited to off-grid electricity generation applications, and where costs of electricity generation from other sources are high (such as in remote communities). Relatively high capital costs and risks remain the primary limitation to more widespread use of solar energy. Government climate change policies, and research, development and demonstration (RD&D) by both the public and private sectors will be critical in the future commercialisation of large scale solar energy systems for electricity generation.

Solar Exposure in Doha

The potential for using solar energy at a given location depends largely on the solar radiation, the proximity to electricity load centres, and the availability of suitable sites. The annual solar resource varies considerably around the world. These variations depend on several factors, including proximity to the equator, cloud cover, and other atmospheric effects.

The amount of solar power available per unit area, which is known as irradiance or radiant flux density, varies with latitude, longitude, elevation and season of the year in addition to time in a particular day. Sun radiation data used in this study are the data valid for latitude and longitude of Doha. Latitude of Doha is 25.28^{o} N, and longitude of Doha is 51.52^{o} E. This has been shown in Figure 2. The amount of sun radiation received in Doha is between 14.44 MJ/m^2 in August to 23.44 MJ/m^2 in March with the annual average of 19.66 MJ/m^2 [3]. This has been shown in the Table 1. It is important to mention that unlike high latitude regions the seasonal sunlight hour changes are not significant. This means, Doha receives the sun radiation relatively uniform throughout the whole year.

Figure 2 map of Qatar

Table 1: Monthly Averaged Radiation Incident On An Equator-Pointed Tilted Surface (kWh/m^2/day) of Doha

Tilt:25^{o}	Jan	Feb	Mar	Apr	May	Jun
kWh/m^2	4.17	4.99	5.19	5.68	6.32	6.51
MJ/m^2	15.01	17.96	18.68	20.45	22.75	23.44
Jul	Aug	Sep	Oct	Nov	Dec	Ave.
6.28	6.23	6.05	5.57	4.55	4.01	5.46
22.61	22.43	21.78	20.05	16.38	14.44	19.66

Solar PV Production Estimation

The sun data for Doha, which were provided by NASA, give the average daily solar exposure for each month and the year. Typical values for daily global solar exposure range between 14 MJ/m^2 and 23 MJ/m^2 (mega-joules per square meter per day). For high latitudes of Doha, the values are usually highest in clear sun conditions during June, July, and August and lowest during November, December, and January. This has been shown in Figure 3.

Cost calculation of grid-connected solar PV electricity in Doha as the main objective of this paper for the purpose of determining the actual production cost of PV electricity. The results of this calculation gives idea about what the reasonable feed-in tariff for Doha would be. These results have been presented in the Figures 4 to 9 for different assumptions in installation cost. Figures 4, 5, and 6 show the solar PV production cost for 3 different installation costs (for example) from $12,00, $1,000 and $800 installation cost for a 1 kW PV system for mortgage rate of 5%, while Figures 7, 8, and 9 show the solar PV production costs for different installation costs $12,00, $1,000 and $800 for a one kW PV system for mortgage rate of 3%.

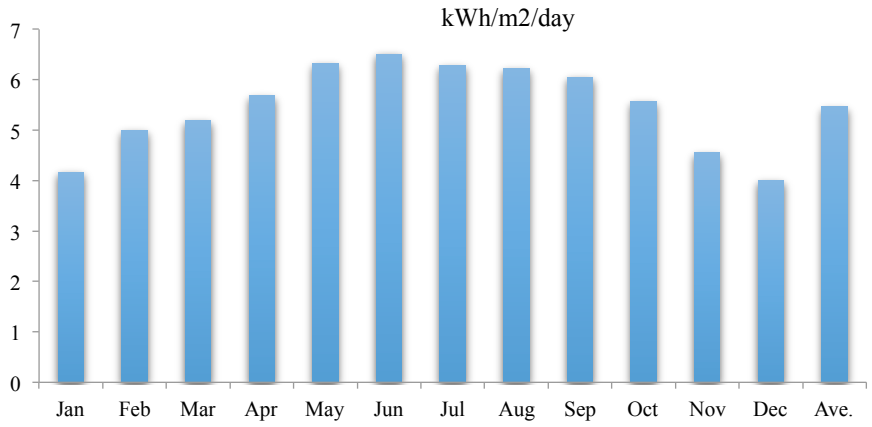

Figure 3 variations in daily solar energy availability

Time value of money has been considered in this study, assuming Inflation rate: 3%, Discount rate: 4%, Mortgage rate: 5% and 3% (it is assumed that fund to install PV system is borrowed from a bank).

Table 2 shows the information and data used to estimate the electricity production cost of solar PV in Doha for different capital upfront costs.

As solar PV power generation is investment capital intensive, so the mortgage rate, at which the money is borrowed from a financial institute, has significant effect on solar PV electricity production cost. For this reason simulation results show for 2 different mortgage rates namely 5% and 3%.

Table 2: data used to estimate the electricity production cost of solar PV in Doha

Inflation rate	3
Discount rate	4
Mortgage rate	5 & 3
Size in kW	1
Life time (Year)	20
X factor	0.99
Pa Present worth factor for operation cost	18.27
Pa1 Present worth factor for maintenance	18.1
O&M($/kWh)	0.02
O&M($/System/year)	169.8
O&M for life time	3074
Performance ratio	0.85

Following Figures (Figures 4-6) are simulation results for the case of mortgage rate 5%.

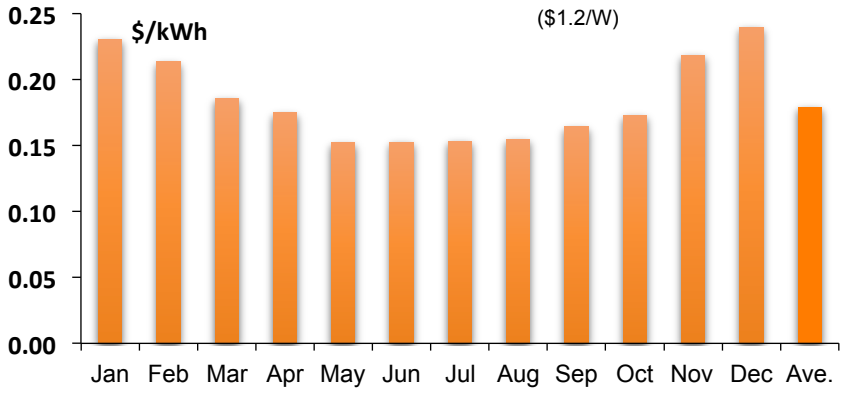

Figure 4: PV Electricity cost, $1200/kW, mortgage: 5%

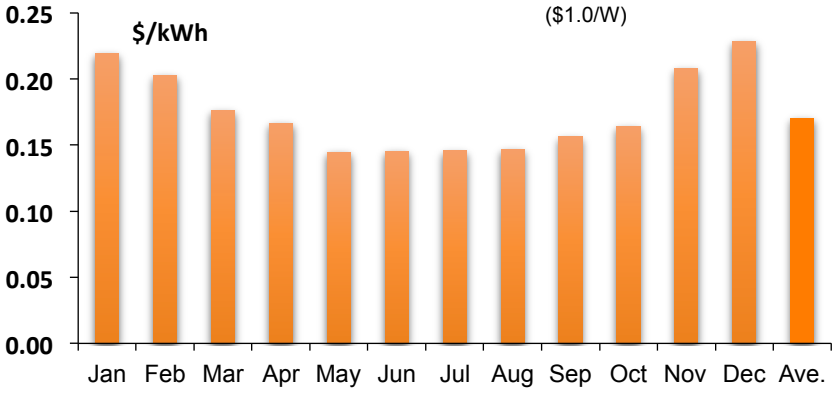

Figure 5: PV Electricity cost, $1000/kW, mortgage: 5%

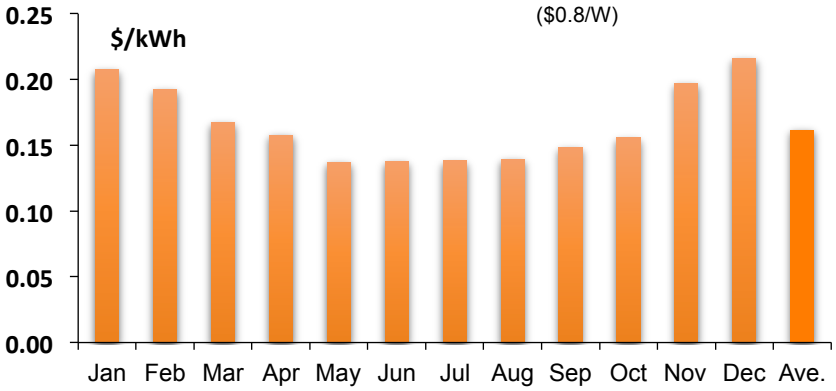

Figure 6: PV Electricity cost, $800/kW, mortgage: 5%

Following Figures (Figures 7-9) are simulation results for the case of mortgage rate 3%

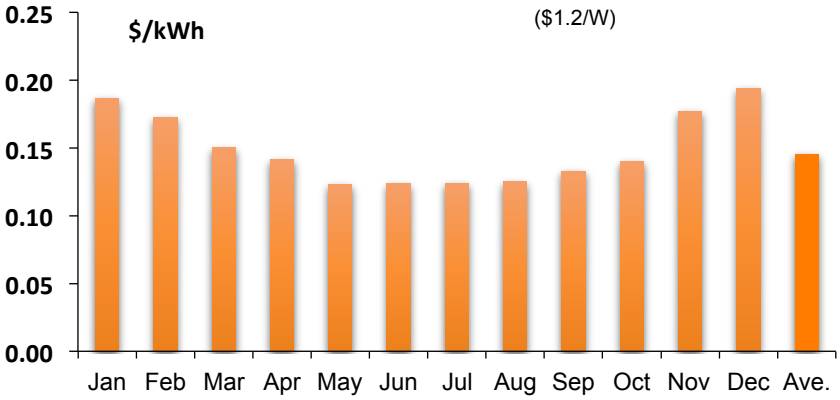

Figure 7: PV Electricity cost, $1200/kW, mortgage: 3%

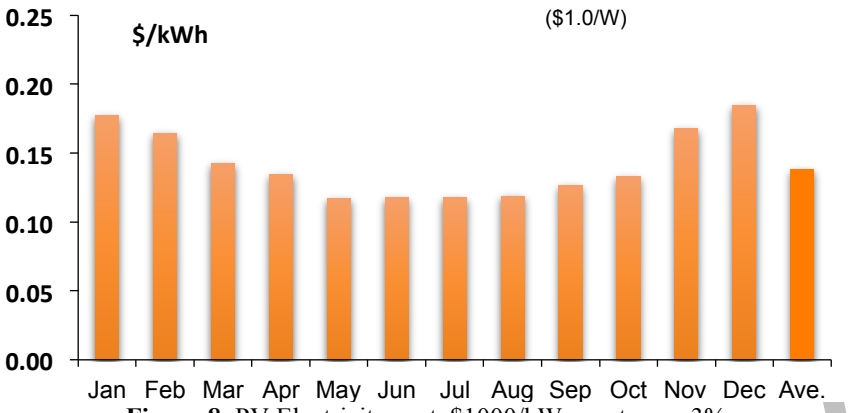

Figure 8: PV Electricity cost, $1000/kW, mortgage: 3%

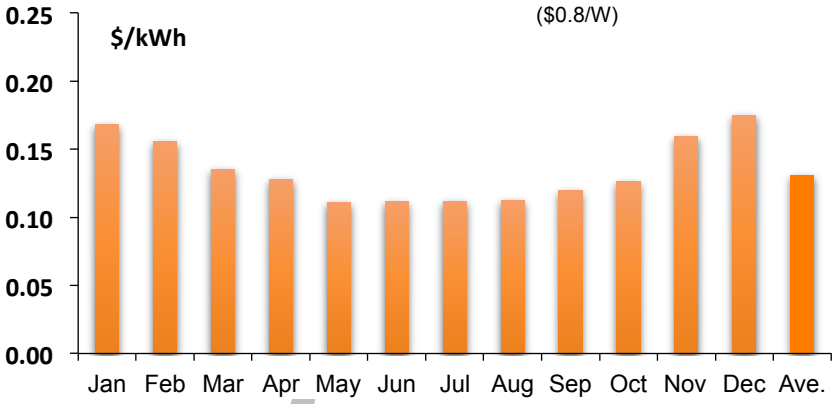

Figure 9: PV Electricity cost, $800/kW, mortgage: 3%

Table 3 shows the annual average electricity production cost in $/kWh for rooftop PV systems installed in Doha. The figures shown in this Table are simulation results of a computer program developed by the author. In this simulation it has been assumed that the installed unit if a 1kW system and installation cost ranges from AD$1200 to AD$400 depending on the quality of PV products.

Table 3: Annual average solar PV electricity cost for different PV installation costs

In $1000 / 5kW Peak	Mortgage:3%	Mortgage: 5%
1.2	0.15	0.18
1.1	0.14	0.17
1	0.14	0.17
0.9	0.13	0.17
0.8	0.13	0.16
0.7	0.13	0.16

0.6	0.12	0.15
0.5	0.12	0.15
0.4	0.12	0.14

Conclusions

This paper has presented the results of a study conducted to estimate an accurate unit price of solar PV electricity ($/kWh) in Doha. The PV electricity prices obtained in this study are based on the location-dependent sun radiation data as well as country's economic factors. As one can see from the Figure 4 to 9, the cost of PV electricity is most probably far above the conventional electricity price. In order to make solar PV utilization attractive to the public, the Qatar's Government needs to offer high incentive or to develop an attractive feed-in tariff to encourage house owners to come forward with interest of using rooftop solar PV systems. In conclusion, the government policy settings will continue to be an important factor in the solar energy market outlook. Research, development and demonstration by both the public and private sectors will be crucial in accelerating the development and commercialization of solar energy, especially large-scale solar power stations.

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Biography

Ahmad Zahedi (PhD), IEEE, SM'95 is an Associate Professor in Power Engineering and Head of Electrical and Computer Engineering at the School of Engineering and Physical Sciences of James Cook University, Queensland, Australia. He has educated in Iran and Germany and is author or co-author of more than 160 publications including 4 books, and has trained 16 postgraduate candidates at Master and PhD levels, and completed 15 research and industry-funded projects. He has 20 years tertiary teaching and research and 6 years industry experience.

Earthquake Response and Performance Evaluation of Cine RCC Dam Considering Sedimentation Effect

Murat Emre Kartal, Murat Cavusli, Ismail Hakki Ozolcer, Muhammet Karabulut

Bülent Ecevit Üniversitesi, Zonguldak, TÜRKİYE
Email : karabulut@beun.edu.tr

Abstract: Ground motion effects on a roller-compacted concrete (RCC) dams in the earthquake zone have great importance. Therefore seismic response and performance of RCC dams should be determined. This study presents two-dimensional earthquake response and performance of a RCC dam considering linearly elastic behaviors. Finite element model of the Cine RCC dam is constructed by using ANSYS finite element analysis program. Finite element model of the dam includes reservoir water and also in some cases sedimentation. Reservoir water is designed by fluid finite elements based on the Lagrangian approach. 1999 Kocaeli earthquake acceleration records are considered in all numerical analyses. In the scope of this study, seismic behavior and performance of a selected RCC dam are examined for empty and full reservoir conditions. In addition to this, sedimentation is also considered is with full reservoir condition on reservoir bottom. According to numerical analyses, maximum horizontal displacements and principle stress components are compared and evaluated by dam height. Besides, earthquake performance of the dam estimated by performance analyses.

Keywords : Finite element analyses, Lagrangian method, Performance analyses, Roller compacted concrete dam, Sedimentation.

E-assessment in Higher Education Based on Multiple Choice Questions

Ali Algafori

University of Tripoli, Computer Science Department, Tripoli, Libya

aalgafori@tripoliuniv.edu.ly

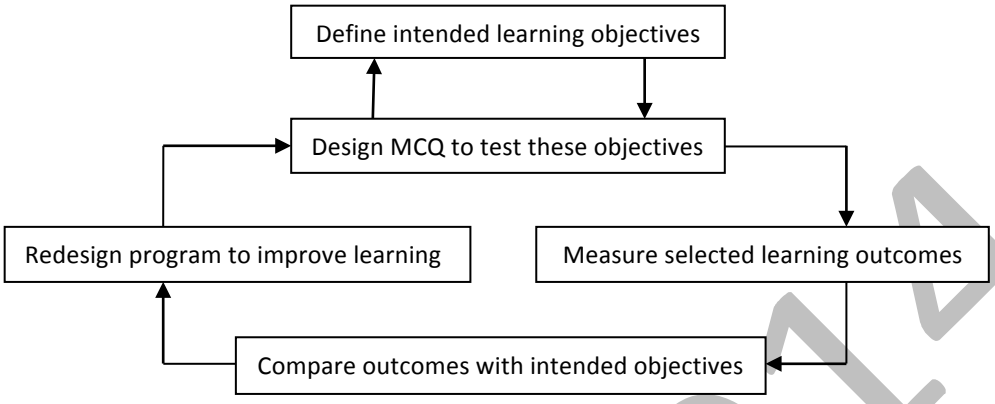
Abstract: In this paper, we demonstrate the need to develop an e-assessment system for scientific disciplines such as computer science based on multiple choice questions (MCQ). Assessment is central to learning and teaching. The Information and communication technology (ICT) revolution opened doors on new ways of assessment. Computer based assessment (CBA) is proving to be an effective solution for mass education. As number of students in higher education institutions is getting larger, CBA is becoming an inevitable choice. Multiple choice questions are the most suitable for CBA. In recent years many CBA systems have been developed in Institutions with different degrees of success. In the United States for example, the U.S. military pioneered the use of CBA in the early seventies. Since then, the number of states using CBA increased rapidly. Other countries like Singapore and Norway are beginning to consider ways in which CBA can be used to enhance student assessment.

Key words: e-assessment, computer based assessment, multiple choice questions, degree of certainty, computer based testing, confidence indicator.

Introduction

The process of assessment in higher education has been about examinations. As number of students increases staff will struggle to conduct examinations in a satisfactory fashion by providing invigilators in sufficient numbers, providing printed copies of the exam to a large number of students making sure it is readable and error free and providing enough answer sheets. That can be costly especially for institutions with limited resources. Moreover, large number of answer papers to be corrected may make the assessment process inaccurate, staff will spend longer times checking and correcting answers, and students feedback will be delayed sometimes to the extent that students loose the benefit of knowing and learning from their mistakes (Russell, 2004). Lots of these drawbacks can be avoided if questions were designed in the form of MCQ's. MCQ type proved to be very suitable for CBAs. The aspects of CBA which appealed to us most were the ability to assess large numbers of students on a regular basis (Adams, 2002).

Assessment learning cycle using MCQ



Rationale for using MCQ tests

In this paper we focus on using MCQ in assessing students and discussing why this type of tests is sufficient in measuring the different cognitive abilities of mind and its suitability to CBA programs. MCQ are often seen as an efficient option when considering a fast method of assessing a large number of students (Alter, 1993).

There are some researchers , however, who argue that MCQ testing has some limitations. Their argument is that MCQ promotes factual recall and do not encourage or test high-level cognitive processes. Some also argue that MCQ tests composed of four option questions, for example, will give a maximum of 25% chance for guessing the correct answer. The solution to that is usually done by cancelling the mark of one correct answer for each four wrong answers. But that is not completely fair for some students because may be all wrong answers were not a result of pure guessing, and all correct answers were the result of the student understanding of the subject involved. So why penalize the student for something that he/she did not do.

However, other researchers maintain that the result of MCQ depends on how the tests are designed and they can be used to evaluate learning in higher cognitive levels such as reasoning, analyzing and problem solving (Nicol, 2007).

Gardner-medwin introduced a critical modification called confidence-based marking (CBM). In this method students do not only choose the correct answer, but also they are required to rate their confidence on a scale of three points. High, medium and low plus a forth reply as "no-reply" are given. The student must choose the confidence level at each question he/she answers (Nicol, 2007).

The table below lists the strategy of allocating points (marks) to right and wrong answers.

Table 1: Confidence-based marking

Degree of certainty	low	medium	high	no-reply
Mark if answer is correct	1	2	3	0
Penalty if answer is wrong	0	-2	-6	0

As seen from the table, the penalty for wrong answers when the examinee is very confident is high but no penalty for wrong answer if degree of certainty is low, which means student will get marks if some questions are answered correctly with low confidence. i.e. guessing can still benefit the student and will count for a maximum of 33% of the total score.

A better scheme may be the following: (Adams, 2002)

Table 2: A modified version of Table 1.

Degree of certainty	score if correct answer is chosen	score if incorrect answer is chosen
Positive	4	-4
Fairly certain	3	-3
Rational guess	2	-2
No defensible reason for choice	1	-1
Omission	0	0

In this scheme it is clear that the reward and penalty are balanced. It goes without saying that students must have prior knowledge of the scoring scheme and how it works with clear explanation of how to answer the confidence indicator. Armed with this information, students will not be surprised when they see their scores.

The aspects of computer assisted assessment which is of interest to us are the ability to assess large numbers of students on a regular basis, the speed by which students can get feedback due to auto marking of questions (which can be immediate), the accuracy of the assessment results, the savings in using paper products which translate to savings in institution's operational costs and finally the flexibility in conducting exams with minimum staff presence and even at the absence of the course instructor. Confidence indicator can be included in the MCQ test to increase the accuracy and credibility of the test. Distracters such as "None of the above" or "Correct answer is not given", can usually be added to the answer options to minimize guessing.

The multiple-choice format is most frequently used to test knowledge and comprehension but instructors with expertise in writing MCQ can devise questions to evaluate higher order learning that includes, Application, Analysis, Synthesis and Evaluation. MCQs can also be used to assess the ability of students to integrate information from several sources. Some of the 'faults' of multiple-choice examinations are not intrinsic to the MCQ themselves but rather result from a lack of skill in constructing clear, unambiguous, challenging questions which measure the level of cognitive performance and higher-order thinking which best match the objectives of the course (Dawson, 2006).

How the CBA software should work

Students in a particular course can log on to workstations in the examination hall using their student ID's and the course he/she is taking the exam in. The system will use that to verify the student's identity and assure that he/she is actually enrolled in the course chosen. If verification is successful a fixed number of questions (pre decided by the software parameters set by course instructor) will be displayed one at a time on the user's screen. The set of questions displayed for each student, the order in which they are displayed and the order of the answer choices in each question are controlled by some random order related to student's id and the system time. This will make the replication of the set of questions very unlikely to any adjacent set of students.

The software can even be configured so that a student can take any exam he wishes from the courses he/she is enrolled in during the examination days. This will benefit the student who may for some legitimate reason does not show up on the announced exam date. The marking is done right after the student finishes the test after which the student's record database is updated accordingly. For this to work right, it requires the institution to employ an examination software that is mounted on a set of networked workstations in PVN configuration.

It remains important to add that much of the innovative work in computer-based assessment (CBA) in higher education has been in institutions where systems and tools development has been seeded by project funding. Even then, use is often limited to a few departments. Scaling up the use of e-assessment requires financial commitment and senior management support. Where these exist, many of the case studies show that there is a greater confidence in the capability of e-assessments to deliver a return on investment, and a wider acceptance of the benefits of change amongst staff (JISC, 2007).

Rough estimate of the cost of using white paper for tests

If we assume that each student will use 5 sheets for the test, then a pack of 500 sheets will give 100 individual test papers. We will assume the minimum cost of one pack is $4.
If tests are repeated twice each semester, meaning four times per year, then the estimated cost of papers used in the tests for a university of large number of students (e.g. University of Tripoli), for say 10 classes of this size, can be estimated as follows:

10x4x4=$160. per one academic year

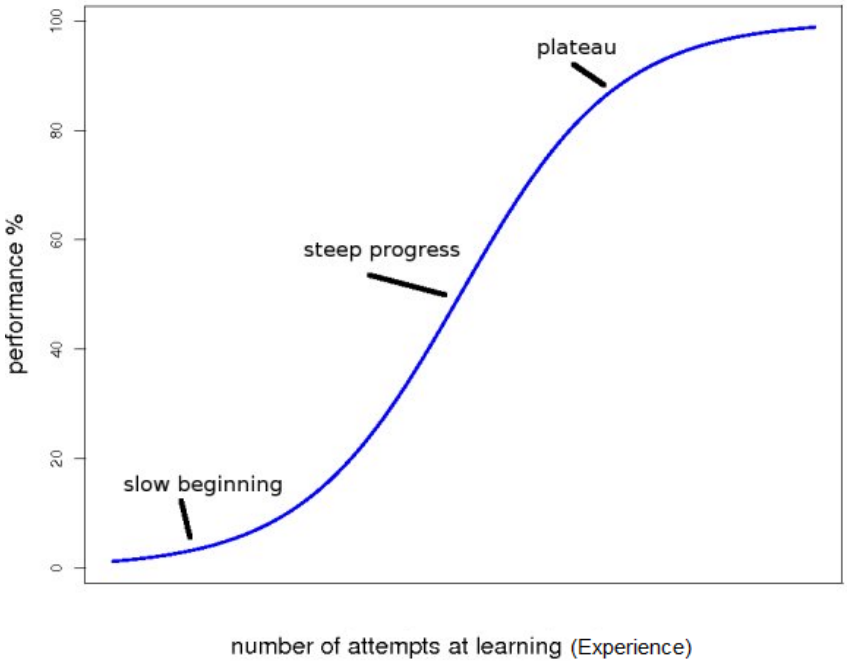
If we assume there are only 10 courses per year that can be adapted to MCQ tests and classes are of size 100 students, then the above cost will become: $1,600 per year. The total cost should also include the cost of ink used in the printing and the cost of copying and duplicating. There is also the cost of disposing of the old tests and the cost of maintaining the machines used in mass printing and cost of employing people to do the printing and the maintenance.

For a university with large student body, there must be many courses that can be adapted to MCQ type tests. The total number of students in these courses can be a large number. Tests in these courses are repeated semester after semester. So clearly the total cost can be quite high. This cost is usually overlooked and not seen as an independent cost item, for the lack of specific studies that focus on this side of the institution's operational cost.

Using automated MCQ assessment test in Computer science courses

MCQ testing is used in a variety of different disciplines. Medicine, Biochemistry, Zoology and Pharmacology are just few examples. Our aim is to use MCQ in computer science courses and we claim that MCQ will be a sufficient tool to test for cognitive processes involved in learning computer science. Careful design of the MCQ tests will result in questions that require students to use the different cognitive abilities of their brains to arrive at the correct answer and will not be tested for only factual recalling.

Designing a successful and efficient MCQ tests in computer science will facilitate the computer based assessment (CBA) with its advantages of faster, more accurate test results and faster student feed backs resulting in a better learning curve as shown below.



To support our claim that MCQ can be adapted to test different cognitive processes in computer science courses, we list below several examples from different courses in the field (GRE, 2004).

1. Which of the following algorithms has running time $O(n^2)$ in the worst case but O(n log n) on average?

(A) Bubble sort (B) Merge sort (C) Heap sort (D) Quick sort (E) Tournament sort (F) None of the above

2. In the Internet Protocol (IP) suite of protocols, which of the following best describes the purpose of the Address Resolution Protocol?

(A) To translate Web addresses to host names
(B) To determine the IP address of a given host name
(C) To determine the hardware address of a given host name
(D) To determine the hardware address of a given IP address
(E) To determine the appropriate route for a datagram

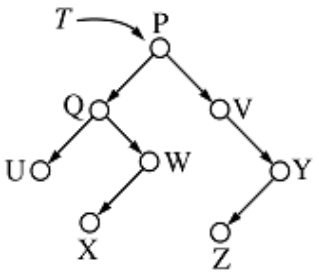
3. Consider the following pseudo code :

```
X := 1;
I :=  1;
While (X <= 1000)
    Begin
            X
        X := 2   ;
        I := I + 1;
    End;
```

What is the value of I at the end of the pseudo code?

(A) 4 (B) 5 (C) 6 (D) 7 (E) 8

4. Which of the following represents a postorder traversal of T :



(A) UXQWYZVP
(B) UQXWPVZY
(C) UXWQZYVP
(D) UXZQWYVP
(E) XZUWYQVP

5. Let A and B be two sets of words (strings) from Σ^*, for some alphabet of symbols Σ. Suppose that B is a subset of A. Which of the following statements must always be true of A and B?

I. If A is finite, then B is finite.
II. If A is regular, then B is regular.
III. If A is context-free, then B is context-free.

(A) I only (B) II only (C) III only (D) I and II only (E) I, II and III

6. Consider the following function.

```
double power(double base, unsigned int exponent)
  {
    if (exponent == 0)
       return 1.0;
    else
      if (even(exponent))
         return power(base*base, exponent/2);
      else
        return power(base*base, exponent/2)*base;
  }
```

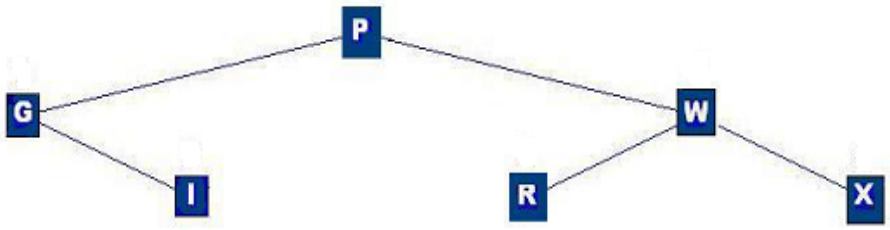
How many multiplications are executed as a result of the call power(5.0, 12) ? (Do not include divisions in this total.)

(A) 12 (B) 9 (C) 8 (D) 6 (E) 5

7. Which of the following statements about a remote procedure call is true?

(A) It is used to call procedures with addresses that are farther than 2^{16} bytes away.
(B) It cannot return a value.
(C) It cannot pass parameters by reference.
(D) It cannot call procedures implemented in a different language.
(E) It is used to call procedures at an outer nesting level.

8. Consider the given AVL Tree. What kind of rotation would be needed to rebalance this tree if the value 'H' was inserted? [Woodford]



(A) no rotation required
(B) RL
(C) LL
(D) LR
(E) RR

9. Page fault occurs when

(A) The page is corrupted by application software
(B) The page is in main memory
(C) The page is not in main memory
(D) One tries to divide a number by 0
(E) The virtual memory is less than main memory

10. Which of the following scheduling policies is well suited for a time-sharing operating system?

(A) Shortest job first (B) Round robin (C) First-come-first-serve (D) Elevator (E) None of the above

These are just a few examples of questions in different subjects of computer science that are formulated in MCQ type. Several other branches of science are very adaptable to this type of tests. Botany, Zoology, medicine and pharmacology are just few examples. In fact, with careful design of questions many branches of science and engineering can be adapted to MCQ tests. It is clear how easy it is to auto correct this type of questions using the proper software.

The software that we intend to use will have the following features:

1. Delivering the student mark at the end of the test.
2. Allowing the instructor to control the test parameters to decide the number of questions in the test and which material they cover.
3. Allowing the instructor to change the order of the answer choices in each question.
4. Questions will be chosen randomly from the questions database and is related to the student ID so no adjacent students will have the same set, sequence or answer choices.
5. Sending the results directly to student's record database in the institution.
6. Eliminating errors that may result when instructors correct tests manually due to fatigue, changes in mood, unclear writing or subjectiveness in judgment.

Advantages of the proposed system

- ✓ Elimination of the need for paper products in exams which translates to big savings in institution's operational costs, especially for large number of students in tests.
- ✓ University entrance exams can be performed with high degrees of success, fairness and credibility.
- ✓ Invigilators are kept to a minimum, freeing staff to do more useful work at the time of the exam.
- ✓ Students can get feedback right after they finish the exam.
- ✓ Students from different courses or even from different departments can take their exams at the

- ✓ No penalty for late students or students showing up the next day. Exam can be taken any time within the exam period with no fear of questions leak.
- ✓ Increased accuracy and authenticity of student grades in their courses.
- ✓ Freeing faculty of the tiring process of correcting answers especially for large number of students.

With the help of confidence index mentioned above, MCQ tests can become a very effective tool in measuring the effectiveness of the learning process and provides a good feedback of the strengths and weaknesses that can be used to improve teaching and learning.

Conclusion

Studies of using computer testing have been conducted since the early seventies of the past century. At those early days, computers and computer usage were not widely spread, so exam takers were not comfortable when faced by computer based tests. Problems such as lack of scratch workspace and the inability to review and skip or repeat individual test items were found to significantly affect test performance. All these problems can now be eliminated using the state of the art software our current technology can offer us. We strongly advocate the use of computer based assessment and adapting tests in many scientific discipline courses to MCQ format. Instructors have to work much harder on designing and maintaining a large pool of questions and their answers, making sure that the questions words are carefully chosen, are 100% unambiguous and reflect the need to test the student comprehension of the course material. Questions should also be reflective of the different cognitive processes involved in learning such material. The instructors reward for their primary hard work is : " Not to worry about correcting exams later on".

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E-Consumer Behaviour as a New Trend of Consumption in Poland

Felicjan Bylok, Arnold Pabian, Piotr Tomski

Czestochowa University of Technology, Faculty of Management, Poland
bylokfelicjan@gmail.com

Abstract: In the contemporary economy, one of the significant factors determining the activities of enterprises is that of change in the behaviour of consumers on the market. These changes may be the result of the impact of various circumstances. The most important of these include the impact of the environment in economic, demographic, socio-cultural, technical and technological dimensions, among others. Each of the aforesaid dimensions has an impact on the formation of new forms of consumption in both the short-term and long-term periods of time. One of the new forms is e-consumer behaviour, which involves the realization of the process of consumption on the Internet. Its development is associated with new forms of communication. Mobile equipment (cellular phones, smartphones, tablets) with connections to the Internet facilitate the acquisition and consumption of consumer goods outside of traditional shops, which in turn has an impact on the creation of new trends of consumption.The main aim of this paper is to describe the trend of e-consumer behaviour on the consumer market. The authors focus on the answer to the question of whether this trend shall dominate in the near future. With the aim of finding the answer to the aforesaid question, the authors analysed the most important economic, social and cultural factors influencing the development of e-consumer behaviour at the beginning of the 21st century. The most significant features of e-consumption have been presented. The perspectives of e-consumer behaviour in Poland has also been illustrated on the basis of quantitative and qualitative research. The practical implication of the analysis carried out is the indication of the growth in potential of consumption on the Internet. Nevertheless, the social implication of this paper is the emphasis of the significance of this new trend in consumption and its implications for producers.

Key words: e-consumer, consumer trends, consumption, consumer behaviour

Introduction

In the 21st century, the development of IT technologies is leading to numerous social and economic consequences. One of the most important of these is the development of e-commerce and new sectors of services. The sale of consumer goods by means of new forms of communication, namely, the Internet, cellular phones, interactive television is becoming more widespread. A multitude of virtual shops are emerging on the Internet that offer almost unlimited opportunities in terms of the choice of products and services, speed of purchase, as well as a multitude of aspects involving information about products. They are becoming important centres of consumption, namely places that facilitate the consumption of various goods and services (Ritzer 2001, p.21). The rapid development of e-consumer behaviour is dependent to a large extent on the technical progress associated with the new forms of communication. The appearance of smartphones and tablets with access to the Internet has expanded the possibilities of developing the new forms of communication. These include the interactive digital television, electronic advertising kiosks, electronic catalogues of mail-order houses and other firms, TV networks of home purchases, advertising broadcasts, as well as forms of online trade on the Internet.

The development of electronic forms of communication has influenced the creation of new forms of consumer behaviour. From the perspective of the sociology of consumption, we may observe the creation of the "new consumer", namely, the people who realize the process of purchasing with the aid of the Internet by means of the following: identifying the need, searching for a solution, making purchases of goods and services. The process of consumption realized by the new forms of communication has an impact on the change in the trends of consumption and lifestyles. New consumer norms are being created. As a result of availing of purchases on the Internet the expectations and customs of consumers are changing. On the one hand, the "new" consumer by way of access to numerous sources of information is becoming critical and sceptical with regard to the world of goods, while simultaneously conscious of the requirements with relation to the prices and quality of goods. On the other hand, the "new" consumer is subjected to the impact of constant advertising that appears in all forms of communication, e.g. cellular phones, the Internet, TV, radio etc., as a result of which the averaging out of tastes and their standardization are taking place. With relation to the changes in consumption, the question arises as to whether the new form of consumer behaviour realized on the Internet is a long-term trend in Poland and in what scope. The authors formulate conclusions relating to the perspectives of the development of the trend of e-consumer behaviour in Poland on the basis of the method of critical analysis of the existing documents – books, papers, reports and other works.

E-consumer behaviour as a mega-trend

Consumer behaviour in the 21st century involves constant change and the impact on this process involves various factors. The most important ones include globalization, networking and informatization. They create the circumstances for the formation of new consumer behaviour, which may be termed as a trend. H. Veilgaard defines this trend as the process of change that may be perceived from a variety of perspectives (Veilgaard 2008, p. 9). Nevertheless, Ph. Kotler defines trend as a direction or series of events characterized by a certain drive and durability (Kotler 2005, p. 159). Hence, the consumer trend is termed as any change in consumer behaviour that has a defined period duration, as well as occurring in several areas and in the activities of a consumer, while also remaining compatible with the other important factors, both the existing ones, as well as those emerging at the same time (Celeste, 1991). From a time perspective, it is possible to discuss the short-term or long-term trends. Short-term trends are reactions to the current economic and social situation, e.g. the economic crisis has had an impact on the search for ways to adjust to the new economic reality. However, together with its conclusion, the associated trends disappear. Nevertheless, long-term trends are of a constant nature and are most frequently the result of profound social, cultural and economic changes.

In literature devoted to the field of marketing, it is possible to encounter various typologies of the contemporary consumer trends. For instance, American marketing analysts have worked out the 10 most important trends. According to the American firm JWT, it is possible to distinguish the following trends: all the world's a game which encompasses behaviour directed towards super-modern technologies, particularly computer games, which shape specific behaviour in the virtual world and the real world; the urgency economy, whose essence involves the subjection to uninhibited consumption in today's world without waiting for the future; non-commitment culture relates to consumer behaviour characterised by the transitory relations between the seller and the producer, as well as the lack of loyalty and allegiance to the brand; eat, pray, tech pays attention to the fact that the possession of goods of high technology has grown to the ranking of elementary needs that are essential to life; de-teching is associated with the bases of "digital abstinence" caused by the escape from the digitalized and completely modern technologies of the world; retail as the third space relates to changes in the functioning of traditional sales in the direction of transforming it into a unique consumer experience; creative urban renewal is associated with the situation of gradual integration of the trademark with the iconic space of a contemporary city; worlds colliding relates to the overlapping of the virtual world and the real world, which favours the development of modern technologies; hyperpersonalization is based on the search for highly individualized products and services; outsourcing self-control relates to the maintenance of self-discipline and moderation in terms of consumption (10 trends for 2011, pp. 1-87).

Another interesting proposition of trends in consumer behaviour was presented by B. Mróz who distinguished the following: gender blending, which involves the fading of differences in the division of social roles in the area of consumption between men and women; LOHAS (Lifestyles of Health and Sustainability) is associated with the departure from over-consumption in the direction of a lifestyle that propagates ecological consumption, sustainable development and respect for the environment; do-it-yourself doctors encompasses behaviour associated with care for personal health, physical and

and experiences, sharing economy is associated with consumer cooperation in terms of acquiring new goods; while the hyperpersonalization relates to the search for unique items that are adjusted to individual expectations and preferences (Mróz 2013, pp.134-165).

Each of the aforesaid typologies contains behaviour that is characteristic of e-consumption, which signifies the fact that the process of satisfying consumer needs is realized on the Internet where a consumer identifies the needs, searches for solutions, carries out purchases of products and services, while even consuming them in the virtual world. With relation to this, new trends of consumption are being formed (particularly with reference to the trends of acquiring consumer goods). The trend of e-consumer behaviour due to its strong ties with the IT society may be acknowledged to be the one which shall define the future consumer behaviour.

In characterising this trend, it is possible to distinguish a multitude of its features. One of these is the use of the modern methods of consumption for the realization of the process of consumption. The development of the Internet, as well as the means of communication (smartphones, tablets, mobile phones, laptops with functions of access to the Internet) has had an impact on the creation of new products and consumer services only available in the virtual world.

Another feature of e-consumer behaviour is the acquisition and accumulation of consumer information. The commercial Internet provides a consumer with the possibility of availing from a databank with reference to the process of creating a given product and other information about the product that is helpful in taking a decision to purchase. This enables the acquisition of information from other consumers that use the given products or avail of specific services. In the case of websites offering a wide range of consumer goods, there is the possibility of a relatively fast familiarisation of the offers of the particular shops, whereas in the case of the traditional way of acquiring goods the acquisition of information on the offers of particular shops requires a lot of effort and time.

A further feature is that of prosumption, which involves participation in the creation of an individualized product. Consumers get involved in part of the work executed by specialists in an enterprise, i.e., by means of active participation in the process of designing a given product, which in its final stage acquires individualized features adjusted to the expectations of a consumer. D. Tapsott defines this aspect of presumption as the desire to possess varied types of consumer goods in accordance with personal concepts and active participation in the creation of the given goods (Tapsott, Williams 2008, pp. 215-218). Thus, it was assumed that products are the arena for experimentation in the case of potential clients and taking account of the changes proposed by them, while simultaneously treating consumers as partners and not only clients (Tapsott, Williams 2008, pp. 215-218). Consumers are encouraged to share knowledge with producers (Ziemba, Eisenbardt 2014). Sometimes their knowledge is availed of to solve specific problems that producers are faced with. This may take on the following three forms: crowdfunding which involves the joint financing of specific projects by the Internet society, co-creation associated with the commonly executed creative work, as well as microtasting involving the execution of small tasks constituting part of the common project by the virtual society (Mróz 2013, p. 92).

The features of e-consumption are new forms of making purchases by means of the organization of consumers into virtual consumer societies in which mutual cooperation is significant which facilitates taking shrewder purchasing decisions. With this aim in mind, review platforms are created, on which consumers exchange information about products and services, or societies are also formed around brandnames. Apart from the exchange of information, virtual consumer societies undertake active operations on the market by means of various forms which include, among others, social shopping taking on the form of purchases made by groups and social offering involving purchases in which the initiating party is a group of consumers (Mazurek 2012, p. 162).

The choice of e-consumption as a type of consumer behaviour is influenced by many factors as follows: firstly, there is the possibility of making rapid purchases in virtual shops, secondly, the possibility of choice in a virtual shop depending on the needs and preferences, thirdly, a consumer may store a large amount of information about products and possibilities of purchasing that is not offered by brochures and technical descriptions, fourthly, there is the possibility of acquiring a broader range of information on a given product from a producer by means of electronic mail. Research on e-consumers indicates that the main reasons for the choice of Internet shops are as follows: the greater convenience and saving of time, ease of purchasing, saving of money, good fun, better selection of products, easier delivery and availability of information (Windham, Orton, p. 48). The benefit of Internet purchases relating to entertainment is worth mentioning. In the case of some consumers, the possibility of surfing the Internet, comparison of prices, searching for bargains and participation in auctions are elements of good fun and the feeling of pleasure.

Prerequisites for the shaping of the trend of e-consumer behaviour

The development of e-consumer behaviour is influenced by many conditions of an economic, social and technological nature. The most significant economic conditions include the differentiation of the offers of goods and services with regard to target groups, the increase in the mass spread of cheap trademark substitutes of comparable use value, the expansion of the segment of low prices of consumer goods and services, the emergence of new techniques of sales, changes in the sphere of satisfying basic needs, as well as the wide availability of consumer credit. Another equally significant factor in terms of stimulating behaviour associated with e-consumption is the possibility of availing of credit cards as a method of disbursing money. The increase in the availability of credit cards for the payment of purchases in Internet shops was enabled by the implementation of electronic methods of payment for goods and services. The infrastructure of the electronic funds transfer was created and the processes of accepting credit cards were prepared and implemented. Thanks to all this, the application of credit cards in e-commerce has become a widespread phenomenon. A further economic factor in supporting the development of e-commerce is the pursuit of acquiring products, i.e. designer goods at reduced prices. This process may be termed the "logic of cheapness" (Jäckel 2006:274), which is illustrated in the fact that consumers compare the prices of goods between themselves and search for those that are at the lowest price. Another form of the "logic of cheapness" is that of purchases made in groups. These purchases are the result of the need for simplicity, frugality, the trend towards "jumping" from one offer to another (Flatters,Wilmott 2009:106-112). Group buying or social buying involve the collection of an appropriately large group of consumers that are interested in purchasing a specific product and its acquisition via the Internet (Bilińska-Reformat 2013:98). In the case of a consumer, this type of purchase is an opportunity to avail of the attractive offers price-wise, while in the case of firms this is a marketing tool of a broad promotional application.

A significant influence on the development of e-consumer behaviour is created by circumstances of a social nature, of which one is mass communication. The rapid development of television has evoked a multitude of consequences in society. One of these relates to the changes in the manner of spending leisure time. According to R.D. Putman, television has "privatized" or "individualized" the way in which leisure time is spent, by occupying an increasingly important position among the ways of spending free time (Putman 1995: 65-75). The unidirectional form of communication that is characteristic of television has created the feeling of anonymity and feeling of emotion in solitude. It has made viewers dependent on a unidirectional form of managing communication as a way of spending leisure time, self-education and finding activities. The creation of such attitudes among people has become the basis for the development of new forms of communication. The Internet by utilizing the customs of people in terms of spending leisure time at home offer the possibility of two-way communication. It has provided the tools, thanks to which it is possible to satisfy consumer needs without leaving the home. Over the course of a short period of time, the Internet has facilitated purchases of required products in any place where there is a possibility of connecting to the Internet.

Another circumstance is the growth in the activity of women and the associated chronic lack of time with reference to running the household. The professional activity of women has had an impact on changing the lifestyles of women, which is illustrated by the fact that the modern-day woman has less time to run the household, which in turn means that they have less time to do shopping. The Internet enables a significant saving of time and also increases the convenience of doing shopping.

A further social circumstance is the individualistic orientation associated with post-material values (Bylok 2013, p.158). In the sphere of consumption, this is witnessed by the pursuit of creating an individual style of consumption. The application of new communication techniques has had an impact on expanding the area of individualism in consumption and the possibilities of choice of individual styles of life as forms of building self-identity. Technical artefacts support this process. Thanks to the use of the "communicative" means of consumption, it is possible to create an individual style of consumption. A consumer has the possibility to choose various options. M. Prisching defines optionality as each possibility that may and should become a reality, without effort and with the feeling of great pleasure (Prisching 2006, p. 67). Optionality in consumption involves carrying out purchases and availing of the products according to one's own idea. The Internet has significantly facilitated the choice of a specific option of consumption with regard to individual preferences.

The individualistic orientation is associated with the pursuit of feeling new experiences that enable the satisfaction of the need for the feeling of pleasure. Consumers search for unknown and unique experiences not only in real life, but also in the virtual world. Electronic equipment of the latest generation that has access to the Internet facilitates the feeling of new and exciting experiences, e.g. in

attitudes towards e-purchasing, namely the feeling of pleasure on the internet has a positive impact on making purchases on the internet (Jayawardhena 2004).

A significant condition in the development of the trend of e-consumer behaviour is the ideology of technological progress associated with the propagation of technocentric attitudes among consumers, which involve the positive evaluation of everything that is modern and the result of the latest technologies (Wiswede 2000: 45-50). This is carried out by spreading the concept of the almighty power of the techniques, as well as the fact that human labour shall become restricted to servicing technical equipment. The realization of this ideology is the technologizing of everyday life associated with the widespread use of goods equipped with new IT technologies. The possession of goods created by the sector of high technologies has become not only an important need for many consumers, but also a determinant of social status, or lifetime success. Contemporary man is increasingly dependent on goods equipped with modern technologies. The possession of modern mobile products (cellular phones, smartphones, tablets), which fulfil the function of handy "digital assistants", guides and helpers in everyday life is becoming essential. This equipment is equipped with special programs and applications facilitating the realization of the process of consumption in any place and at any time.

Behaviour of e-consumers in Poland

The desk research method was applied for the analysis of the existing data on the behaviour of e-consumers in Poland, which was executed on the basis of the data published in the following: reports, papers, articles in magazines. As a result of the research carried out, the findings relating to the perspectives of the development of e-consumption in Poland were formulated.

In the first decade of the 21st century, there was rapid growth in the development of e-consumer behaviour in Poland. This is first and foremost conditioned by the range of access of consumers to the Internet. As indicated by research carried out by Głównego Urzędu Statystycznego (Central Statistical Office) in 2013, access to the Internet was registered in the case of 71% of households, including 68.8% with broadband access. If Polish people have access to the Internet, they most frequently avail of it in their homes (60.6%), while subsequently in the workplace (20.8%) and in the homes of other people (10.5%) (GUS 2013, p.9). An analysis of the socio-demographic features of the people using the Internet is interesting. The findings of research carried out by CBOS (Public Opinion Research Centre) indicates that in 2013 there was almost widespread use of the Internet by the youngest Poles of ages less than 25 years of age (93%), while the vast majority of people aged between 25 and 45 (88%). The number of users of the Internet decreases with age and the lowest percentage of internauts is aged 65 or over (11%). Polish people who usually avail of the Internet are in the majority of cases people who are relatively well-educated (higher education is held by 92% of users, while medium level education in the case of 73% of internauts). The variable differentiating users of the Internet is that of professional status. The largest group of users of the Internet consists of people employed in managerial positions (97%), while also administrative and office workers (88%). However, the smallest group of people using the Internet consists of unqualified workers (40%) (CBOS 2013). Hence, the typical user of the Internet in Poland is a young individual that is relatively well-educated and occupies a relatively high position in the workplace. The findings of research on the consumer behaviour of Polish people indicate that this group of consumers is featured by spontaneity in terms of purchases and behaviour aimed at attaining pleasure in consumption (Bylok 2005, pp. 335-360).

Availing of the Internet with the aim of realizing the process of consumption depends on the level of Internet skills, namely the use of Internet browsers, participation in chats and discussion forums, utilizing programs for exchanging film files and music files, as well as buying and selling on the Internet. Research on the IT competences reflects that 35% of Polish people possess high level and medium level Internet skills. However, 29% of Poles possess low levels, while 35% do not possess any skills (Szymanek 2013, p. 27).

The scope of e-consumption is dependent on the equipment which users are in possession of. Research by CBOS indicates that there is a systematic rise in the number of people in possession of mobile equipment such as laptops, cellular phones, notebooks, tablets and smartphones in Poland, which has a positive impact on the increase in the interest of consumption on the Internet. In comparison with 2010, when the users of this equipment amounted to 45%, in 2013 73% of Poles declared their access to wireless connections with the Internet by means of such equipment (CBOS 2013). Polish people are increasingly availing of mobile equipment to make purchases online. Currently, every sixth person buys online by means of mobile equipment. The increasingly

trend is tied with the growth in the quantity of mobile equipment in Poland as the number of mobile viewings for websites in the category of e-commerce tripled in 2012 (Gemius Report 2012: 54).

The scope of availing of e-commerce tools has had an impact on the development of e-consumption in Poland. The most significant of these includes price comparison websites, namely service websites in which consumers may compare the prices of products in various Internet shops (59%) and service websites with reviews and opinions on products on the Internet (57%). Consumers also avail of advertising portals, in which internauts may inform about products which they would like to sell/buy (40%), group buying, or in other words, service websites in which internauts who are interested in the same product may negotiate the price with the supplier or buy more cheaply (19%), as well as shopping malls, namely service websites concentrating shops of a similar assortment (16%) (Gemius Report 2012:100). Each of these tools favours the taking of consumer decisions.

Together with the increase in the access to the Internet among Polish people, there is also a rise in consumption with this method. In 2012 by comparison with 2008, the percentage of people making purchases grew from 66% to 72%. The largest group of consumers constitutes people both on auctions, as well as on online shops (58%). These are usually people aged less than 35, having a higher level education and holding a higher social position, while also living in large cities. Another group of consumers consists of people buying exclusively on online shops (24%). These are most frequently women and people aged over 35. This is the result of the growing popularity of clothing shops on the Internet which offer innovative solutions, e.g. virtual changing rooms or 360 degree photos. The final group consists of people buying exclusively on online auctions (19%) who are most often people of a lower level of education and living in the country or in small towns (Gemius Report 2012:28). Hence, the socio-demographic features have an impact on the choice of place for making purchases on the Internet.

The structure of products purchased on the Internet makes for interesting reading. The consumer goods which are most frequently purchased are clothing and footwear – bought by 32% of internauts. Furthermore, consumers willingly buy articles associated with motoring (12%), electronic equipment (10%), cosmetics, children's toys and goods (9% each). Nevertheless, food products are relatively seldom purchased (2%) (CBOS 2013).

Apart from behaviour associated with the purchase of consumer goods on the Internet, e-services are of significant importance. M. Dąbrowska defines them as the new way of providing services with the use of the Internet from the moment of the firm contacting the client with the aim of presenting their offer by means of ordering services to their provision and contact following the execution of services (Dąbrowska 2008, p.44). The feature of e-services is their interactivity, situational personalization and possibility of regulation in real time (Rust and Lemon 2001). Depending on the type of e-services, they may be rendered on the Internet and their consumption may take place while availing of the Internet or in the real world following their purchase online. Of all the e-services, Polish people relatively often avail of banking services via the Internet (83.4%). Availing of electronic banking is favoured by people with higher education, namely the higher the level of education, the more often Polish people avail of e-banking. Further types of services which consumers search for on the Internet are e-culture (56.9%), e-learning (55.9%), e-administration (34.5%), e-insurance (28.1%) and e-health (16.7%). Research indicates that women avail of services in the sphere of e-culture, e-learning and e-health more frequently than men. In turn, men avail more of the services of e-administration and e-insurance. The most active group of consumers availing of e-services are people aged between 25 and 34, as well as between 35 and 44 (Wolny 2013, pp.256-257).

In the analysis of consumer behaviour on the Internet, a significant role is played by the motives of e-purchasing (Bourlakis et al. 2008). The most important motives that stimulate Polish people in choosing e-consumption include saving money associated with the low prices offered by Internet shops (80%), the lack of time and convenience (71%), while also free delivery (34%). The possibility of spending a pleasant time doing shopping online is also important (15%) (Gemius Report, pp.15 and 33). An equally significant motive behind consumer behaviour online is the need to feel experiences. Internauts choose playing computer games most frequently as a source of entertainment, while also downloading files with games, music, films and graphics (28%), listening to the radio, watching TV online (29%) and playing network games (8%) (Szymanek 2013, p. 43). In sum, it is possible to state that in the case of consumers, making a decision to purchase a given product is associated with financial benefits, saving time and the feeling of pleasure.

In the process of the behaviour of an e-consumer, utilizing the Internet for searching information about products is significant. In Poland, knowledge about new products is searched for by 49% of internauts, whereas in turn, reading, downloading files of newspapers and magazines which contain information about new products is important for 30% of the people availing of the Internet (Szymanek

engines (Google, Bing, Yahoo) - 29%, while also on online auctions -26%. Consumers avail of online shops familiar to them to a lesser extent - 14%, while price comparison websites -13% with the aim of acquiring information about new products (Gemus Report 2012: 32).

The development of e-consumer behaviour as a trend is certified by the frequency of making purchases by mean of electronic forms of consumption. As indicated by the Gemius report, of all the internauts who declare their tendency to make purchases online, almost half of them admit that they do shopping there at least several times a year (44 proc.), whereas the virtual basket is filled by 20% of Polish people more or less once a month. However, purchases on the Internet are made several times a month by 16% of respondents. A mere 4% of Polish people buy systematically on the Internet (Gemius Report 2012). This data reflects the fact that Polish consumers do not make purchases in Internet shops very systematically.

The defined trends of consumer behaviour become a long-term trend when consumers perceive them to be important for the future. In analysing the expectations of Polish consumers with relation to e-consumption, it is worth indicating the factors which are important determinants of potential behaviour. Research shows that Polish people would more frequently make purchases on the Internet in a situation of improving their financial situation (23%), lower prices (20%), lower costs of delivery (19%) and broader assortment of available products (5%) (Gemius Report 2012, p. 42). These factors are of first and foremost an economic dimension, thus the development of e-consumption in Poland is decided by economic conditions in terms of its functioning.

Discussion

The presented findings of the research reflect the fact that there is great potential for the development of consumption in terms of the Internet in Poland. Hence, it is essential to consider the perspectives of developing the trend of e-consumer behaviour. In Poland, the development of this trend is influenced by many factors. Firstly, a consumer finds the website of the Internet shop quickly, orders the sought after item of trade and leaves it quickly. Secondly, shopping becomes convenient, a consumer may make purchases at home, in the office, in an airplane, or indeed anywhere where access to the Internet may be had without the necessity to visit crowded retail shops. Purchases may be made at any time of the day and on any day of the week. Thirdly, it saves time that is necessary to search for products on Internet shops, in which only several minutes are necessary in order to see the offer of a shop, whereas searching for goods in traditional shops requires a lot of time. Fourthly, a consumer may store a large quantity of information about products and the possibilities of a purchase which is not facilitated by brochures and technical descriptions. Fifthly, there is the possibility of acquiring a wider scope of information about a given product from a producer by means of electronic mail. Sixthly, a consumer has the possibility of acquiring a product manufactured in another country, but which is made available on the Internet. Seventhly, an important circumstance in the choice of e-consumption is that of attaining pleasure while making purchases on the Internet. In the case of some consumers, the possibility of surfing the Net, comparing prices, finding bargains and participating in auctions are elements of good fun and the feeling of pleasure.

Apart from the factors that have a positive impact on the development of e-consumer behaviour, there are also barriers that hinder its development. These are first and foremost, the slow technical processes and difficulty with ensuring the safety of credit cards. Another barrier is the organization of Internet shops. The reality of virtual shops is divergent from theory, in that many barriers exist which hinder the development of this area of trade. There are no broad ranges of products, while there are also problems with timely deliveries to the homes of clients who have bought products, errors in communication on the Internet take place, while the sellers do not always respond to questions regarding specific features of the products sold in their shops by electronic mail (Windham and Orton 2001: 158-159). Another barrier to the development of consumption is the lack of trust with relation to Internet shops which is connected with uncertainty in terms of the quality of the goods and the execution of the transaction itself. Another barrier is the non-adherence to ethical norms on the part of e-sellers, namely the lack of a guarantee of privacy and safety of e-consumers, the lack of responsibility of e-sellers, the lack of a precise description of the products that is in accordance with the reality (Avshalom et al. 2007). In Poland, the most significant barriers to purchasing on the Internet is the fear of being cheated by the seller (66%). Another important barrier is the limited safety of the transaction (27% of those analysed refrained from a purchase as they did not want to reveal details concerning their credit cards) (CENEO 2013).

Conclusions

Deliberations on the perspectives of the development of e-consumption as a new trend of consumption in Poland lead to the formulation of several conclusions. Firstly, as a result of the constant process of change in the technological means of communication, growth exists in the potential possibilities of satisfying consumer needs by way of new forms of consumption. Secondly, new forms of consumer behaviour are emerging as a result of the development of new forms of sales in terms of goods and services on the Internet. Thirdly, individualistic attitudes are being created in consumption. This is favoured by the differentiation of the offers of consumer goods in Internet shops that facilitate the individualization of the styles of consumption. The styles of consumption are to an increasingly lesser extent dependent on the influences of social classes and levels or groups. Fourthly, the acquisition of goods with the aid of electronic means of communication enables the satisfying of the need to feel pleasure and experience adventures characteristic of consumption that is directed towards the feeling of pleasure that is the feature of a consumer society. Fifthly, there are technical and psychosocial barriers hindering the development of consumption via the electronic means of communication. This refers to on the one hand, the limitation of the safety of electronic transactions, while on the other hand, the habits, customs, patterns and trends of consumption that are characteristic of traditional consumption. Likewise, the lack of skills in the use of a personal computer and the skills to avail of the Internet are barriers to gaining access to the Internet market of consumer goods. This is particularly visible among elderly people who in the majority of cases do not possess a personal computer.

Analysis of the circumstances of the formation of the trend of e-consumption and its state of development in Poland render it possible to state that consumption by means of the electronic means of communication is becoming increasingly mass in terms of scale and shall gradually displace traditional consumption. With relation to this fact, producers and those offering consumer goods should focus greater attention on activities connected with offering goods and services in the virtual world.

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Effect of meteorological factors on the daily average levels of particulate matter in the Eastern Province of Saudi Arabia:

A Cross-Sectional Study

Mahmoud Fathy El-Sharkawy[1], Gehan Raafat Zaki[2]

[1] Department of Environmental Health, College of Applied Medical Sciences, University of Dammam, Kingdom of Saudi Arabia
mfsharkawy2002@yahoo.com

2 Assistant Professor of occupational hygiene and air pollution, Department of Occupational Health and air pollution, High Institute of Public Health, University of Alexandria, Egypt
gehanra@yahoo.com

Abstract: Particulate matter (PM) is a key indicator of air pollution. Particles with an aerodynamic diameter less than 10 μ (PM_{10}), and 2.5 μ ($PM_{2.5}$); are inhaled and deposited in the respiratory system. The fate of air pollutants, including PM, is highly dependent on meteorological parameters as they control natural emissions, transport, chemistry and deposition. This study was a cross-sectional one aimed at assessing the effect of meteorological factors on the daily average levels of PM in the Eastern Province of Saudi Arabia during year 2012. Two monitoring stations with the HORRIBA APDA-371 Continuous Particulate Monitors were distributed in Dammam and Khobar governorates for incessantly recording the hourly ambient levels of $PM_{10}$and $PM_{2.5}$. Simultaneously, the meteorological parameters (wind speed, wind direction, air temperature, relative humidity, barometric pressure, and precipitation) were recorded by the WS600-UMB weather parameters' sensor. The daily average levels PM_{10}, and $PM_{2.5}$ exceeded the U.S. National Ambient Air Quality Standards (NAAQS) for 19.5%, and 45.8% in the Dammam station measurement days and 27.1% and 36.1% in the Khobar measurement days respectively. They were correlated positively with wind speed and air temperature. Their relationships with wind direction, relative humidity, atmospheric pressure, and precipitation were negative.

Key words: air pollution, meteorological factors, particulate matter, Saudi Arabia.

Introduction

Eastern Province has the largest and the most important governorates in the Kingdom of Saudi Arabia (KSA) from both the number of population and the developed economy points of view. Dammam is the capital of the Eastern Province and represents its major seaport. Its population is about 768,602 inhabitants. It presents at 26.43°N latitude, and 50.11°E longitude, and at 10 m above the sea level. Khobar is the second important large city in this region. Its population is about 165,799 inhabitants. It presents at 26.28°N latitude, and 50.21°E longitude. Its height above sea level is similar to that of Dammam. Due to the presence of several industrial, commercial, educational and recreational areas, there is an increase in the migration of people to these two governorates with a subsequent increase in the human and traffic activities. Consequently, a change in the air quality level is expected (El-Sharkawy & Zaki, 2012).

Air pollution becomes a significant challenge all over the world, especially in the developing

important air pollutant from the public health point of view (Hu, Jia, Wang, & Pan, 2013; Qiu et al., 2012). Respirable (PM_{10}), and fine ($PM_{2.5}$) particulate matters are suspended particles with aerodynamic diameters ≤ 10 μm and 2.5 μm respectively. Their multiple sources include natural, industrial and traffic (Tian, Qiao, & Xu, 2014).

Many scientific studies have linked particulate matters' breathing to a series of significant health problems, including asthma aggravation, increase in respiratory symptoms, reduced lung function, cardiovascular disease, and premature death. The excess of daily mortality and morbidity are associated with exposure to respirable and fine particulates (Pandey et al., 2013; Reyna, Bravo, López, Nieblas, & Nava, 2012; Valavanidis, Vlachogianni, Fiotakis, & Loridas, 2013). In addition to health hazards, respirable and fine particulates play a vital role on climate change through their impact on radiative balance and aerosol–cloud interaction (Trivedi, Ali, & Beig, 2014; Vellingiri et al., 2014). In addition, PM can contribute to the variation of the visual range, which is the most obvious sign of atmospheric pollution to the public(Cheung, Wang, Baumann, & Guo, 2005; Yang et al., 2007).

The air quality situation of an area is largely dependent on the emission strength in combination with meteorology. The fates of air pollutants are highly determined by meteorological parameters such as wind speed, wind direction, air temperature, humidity, barometric pressure and height of the mixing layer. Moreover, they control natural emissions, transport, chemistry and deposition. Changing meteorological conditions on short and long time scales may affect the atmospheric pollutants' concentrations (Tai, Mickley, & Jacob, 2010; F. Zhang, Wang, Lv, Krafft, & Xu, 2011). For particulate matter, the limited number of studies do not agree on the direction of the anticipated change with meteorological factor (Jacob & Winner, 2009).The importance of air pollution attracts many studies in the recent decades towards understanding the spatio-temporal distribution and the effect of meteorology on the evolution of particulate matters (Ali, Budhavant, Safai, & Rao, 2012; Gugamsetty, 2012). Since particulate matter consists of many components with different physical and chemical properties, the effect of the meteorological parameters on the individual components varies and is more uncertain than for other pollutants (e.g. ozone)(Dayan et al., 2011; Mues et al., 2012; Whiteman, Hoch, Horel, & Charland, 2014).

The present study was aimed to assess the effect of meteorological factors on the daily average levels of respirable and fine particulate matters in the Eastern Province of Saudi Arabia during year 2012.

Materials and Method

This study was a cross-sectional analytical study, in which two different locations were selected as fixed air pollution monitoring stations in the Eastern Province of Saudi Arabia (Figures 1 and 2). Station No. 1 was located in the west municipality of Dammam at 26.40˚N latitude, 50.04˚E longitude, while station No. 2 was located at El-Khobar housing region at 26.06˚N latitude, and 50.21˚E longitude.

The study period extended from January 1, 2012 to December 31, 2012. The concentration of respirable (PM_{10}), and fine particulates ($PM_{2.5}$) were measured and recorded by the Horiba APDA-371 Continuous Particulate Monitor(Ielpo, Paolillo, de Gennaro, & Dambruoso, 2014; Solomon, Hopke, Froines, & Scheffe, 2008)using the beta attenuation principle. This monitor depends on collection of particulates on glass-fiber filter. The carbon-14 (C_{14}) represents a continuous source of high-energy electrons (beta rays), which attenuates as they collide with the clean filter. These beta rays are detected and counted by a sensitive scintillation detector to determine a zero reading. The Monitor automatically advances this spot of tape to the sample nozzle, where a vacuum pump then pulls a measured and controlled amount of dust-laden air through the filter tape, loading it with ambient dust ($PM_{2.5}$ or PM_{10}, depending upon the sampling head). At the end of an hour, this dirty spot is placed back between the beta source and the detector thereby causing an attenuation of the beta ray signal, which is used to determine the mass of the particulate matter on the filter tape and the mass concentration of particulate matter in the ambient air. The decrease of the signal scintillation counter is inversely proportional to the mass loading on the filter. For quality control, the monitor was automatically calibrated, and the zero testing of blank filter paper is performed at the beginning and end of the measurement period(CPCB, 2011).

The meteorological parameters were simultaneously recorded by the WS600-UMB weather parameters' sensors that compact weather station measures air temperature, relative humidity, precipitation quantity, air pressure, wind direction, and wind speed. Temperature was measured using a highly accurate NTC-resistor, while humidity was measured using a capacitive humidity sensor. Both sensors were located in a ventilated radiation shield to reduce the effects of solar radiation. Absolute air

which take cyclical measurements in all directions. The resulting wind speed and direction were calculated from the measured run-time sound differential.

The above instruments were adjusted to save the measured concentrations and meteorological data as one-hour averages in the character-separated values (csv) format that easily transformed to excel sheet. The daily averages' concentrations and meteorological parameters, including prevailing wind directions were subsequently calculated. Local daily wind speed was then classified according to the Beaufort's wind force scale(Y. Zhang, Duc, Corcho, & Calbimonte, 2012) into light, and gentle-moderate.

The data were entered and statistically analyzed using the Statistical Package for the Social Sciences (IBM SPSS Statistics-21). The PM_{10}, $PM_{2.5}$, and the meteorological parameters (numeric variables) were classified according to the sampling station, season, local wind speed, and its prevailing direction (categorical variables) and expressed as [median (Inter quartile range[1])]. The Kolmogorov-Smirnov Z test was used to check normality of the numeric data. Mann-Whitney, Kruskal-Wallis

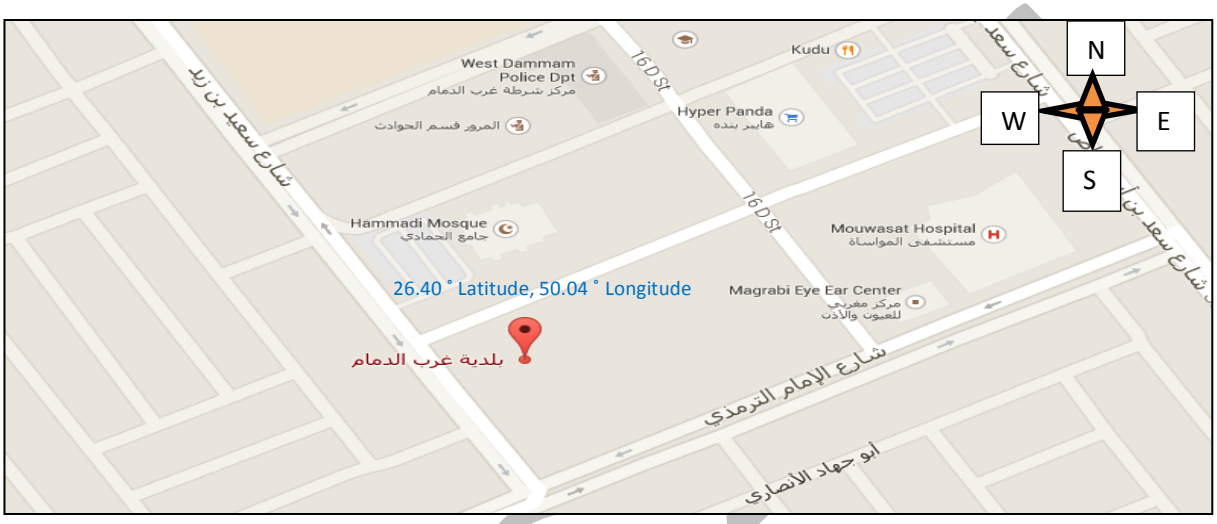

Figure 1: Location of Dammam Particulate Matter Monitoring Station

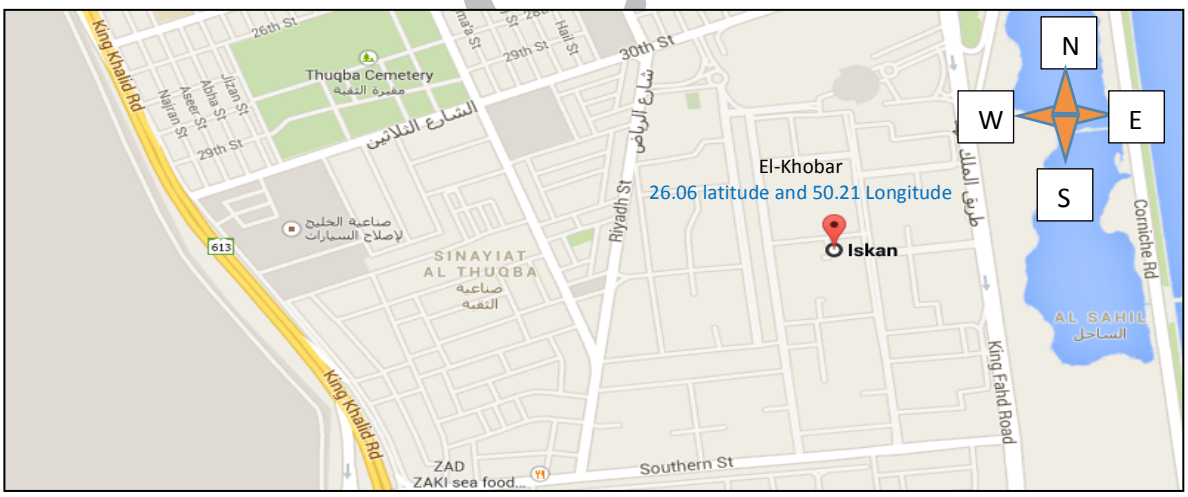

Figure 2: Location of El-Khobar Particulate Matter Monitoring Station

were used to check the significance of discrepancy in case of variables with two, and more classes respectively. The power, significance, and direction of relationships between two variables were tested using Spearman's rho correlation coefficient (Ott; & Longnecker., 2010; Peng; & Dominici., 2008).

Results

There were totally 618 measurement days, 308 for station-1 in Dammam and 310 for station-2 in El-Khobar. Levels of PM_{10} and $PM_{2.5}$ in Dammam were higher than the Saudi National Ambient Air Quality Standards for 60 (19.48%), and 141 (45.78%) measurement days, while those in El-Khobar exceeded this standard for 84 (27.1%), and 112 (36.13%) measurement days (Table 1). The PM_{10} and $PM_{2.5}$ showed non-parametric behavior (highly significant Kolmogorov-Smirov test of normality). The [Median (Interquartile range)] for PM_{10} and $PM_{2.5}$ in Dammam station [81.72 (92.20) $\mu g/m^3$] and [32.96 (31.52) $\mu g/m^3$] were higher than those in El-Khobar [80.81 (127.34) $\mu g/m^3$] and [27.17(32.62) $\mu g/m^3$] respectively (Table 2). These levels had a positive weak highly significant Spearman's rho correlation coefficients with local wind speed [0.272, 0.172] and air temperature [0.282, 0.300] at 0.001 level. They exhibited negative greatly significant coefficients with prevailing wind direction [-0.383, -0.308 respectively], relative humidity [-0.538, -0.180], and barometric pressure [-0.517, -0.468]. The precipitation exhibited very weak negative correlation coefficient with PM_{10} [-0.109] and $PM_{2.5}$ [0.079] [Figure 3].

The overall data indicates that the highest daily PM_{10} concentration [116.4 (117.7) $\mu g/m^3$] was found during the fall season with the lowest relative humidity [18.5 (11.6)%], followed by summer [91.9 (136.9) $\mu g/m^3$], spring [76.4 (80.7) $\mu g/m^3$]. While the lowest mean level was recorded during winter

Table 1: Days of daily average concentrations of respirable and fine particulates higher than the Saudi National Ambient Air Quality Standards

	Station-1 (the west municipality of Dammam at 26.40 ° latitude, 50.04 ° longitude)	Station-2 (El-Khobar housing region at 26.06° latitude, and 50.21° Longitude)
	No (%)	
Number of days of daily average PM_{10}>150µg/m^3	60 (19.48%)	84 (27.10%)
Number of days of daily average PM_{10}<150µg/m^3	248 (80.52%)	226 (72.90%)
Total	**308**	**310**
Number of days of daily average $PM_{2.5}$>35µg/m^3	141(45.78%)	112 (36.13%)
Number of days of daily average $PM_{2.5}$<35µg/m^3	167 (54.22%)	198 (63.87%)
Total	**308**	**310**

[45.0 (74.7) µg/m3] of maximum relative humidity (55.5%). There was highly significant PM10 variation at different seasons. The maximum PM2.5 was recorded during summer season [40.1 (62.5) µg/m3], followed by winter [29.5 (25.8) µg/m3], fall [29.5 (24.5) µg/m3], and spring [27.9 (20.4) µg/m3]. The fine particulate concentrations had non-significant variation with seasons. Generally, the PM10, and PM2.5 were higher at gentle-moderate winds than at light ones (Table-2).

In Dammam station, the "southeast light wind" was the most frequent (34.2% of the total measurement days), followed by the "southeast gentle-moderate" (17.9%), "south light" (16.0%), and "southwest light" (11.4 %). The maximum PM_{10} level was at the "southern gentle-moderate wind" [**215.1 (154.2)** $\mu g/m^3$**]** during summer, while the minimum one [**21.1 (13.6)** $\mu g/m^3$]) was at the "western gentle moderate wind" during winter. The highest $PM_{2.5}$ [84.0 (23.0) $\mu g/m^3$] was at the "southeast light wind" during fall, and the lowest [16.9 (13.8)$\mu g/m^3$] was at the "south light wind" during spring (Table 3).

In El-Khobar station, the "southeast light" winds were the most frequent (47.5%), followed by "south light" (18%), and "southeast gentle-moderate" (11.8%). Winter season recorded the highest

"southwest gentle-moderate winds" respectively. The PM_{10}, and $PM_{2.5}$ were of the lowest values at the "southeast light winds" during the summer season (Table 4).

Discussion

Dammam is the capital of the Eastern Province of Saudi Arabia, and its area is bigger than El-Khobar. In addition; the industrial, commercial, educational, recreational and traffic activities in Dammam are higher than those in El-Khobar(Al-Homaidan, 2008).. For this reason, the daily PM_{10} and $PM_{2.5}$ levels in Dammam were the highest in Dammam. This finding is in accordance to the results of another study, which was previously conducted in the same two cities (El-Sharkawy & Zaki, 2012).

In the present study, the PM_{10} and $PM_{2.5}$ levels had a positive weak highly significant Spearman's rho correlation coefficient with air temperature. This may be due to the increased road dust re-suspension, and contribution of secondary particles on the relatively warm sunny days. This result is consistent with the results of similar studies in different areas of the world such as Athens (Vardoulakis & Kassomenos, 2008), China (Trivedi, et al., 2014), and United States (Tai, et al., 2010). On the other hand, this positive correlation is contradictory to other studies in Brimingham ammonium nitrates on particulates, and the reduced particulate matter dispersion under cold stable meteorological conditions may be the main cause of the negative correlation.

The positive statistically significant correlation of PM_{10} and $PM_{2.5}$ with local wind speed may be related to dust excitation at the stronger winds that may carry PM from other areas (southeast is the daily prevailing wind direction in the two sampling stations in 53.5% of the measurement days). This result is in accordance with the result of the Buenos Aires study during summer (Bogo et al., 2003; Trivedi, et al., 2014). On contrary, other studies in Athens and Brimingham (Vardoulakis & Kassomenos, 2008),

Table (2): Spatial and seasonal variation of the daily average PM_{10}, and $PM_{2.5}$ concentrations and meteorological factors of Dammam and El-Khobar monitoring stations, 2012

		24-Hour Average PM_{10} Concentration ($\mu g/m^3$)						24-Hour Average $PM_{2.5}$ Concentration ($\mu g/m^3$)						Meteorological Factors as [Median (IQR)]					
		N[1]	Median[2]	Q_1[3]	Q_3[4]	IQR[5]	P-Value	N	Median	Q_1	Q_3	IQR	P-Value	Wind Speed (m/sec)	Wind Direction (°)	Prevailing Wind Direction	Air Temperature (°C")	Relative Humidity (%)	Pressure (hpa)	Precipitation (mm)
Spatial variation	Station-1[6]	308	81.7	41.7	133.9	92.2	>0.05[7]	308	33.0	23.0	54.5	31.5	<0.05	2.7 (1.1)	146.9 (27.2)	SE	33.0 (13.3)	27.9 (25.5)	998.7 (9.4)	0.0 (0.0)
	Station-2[8]	310	80.8	32.5	159.8	127.3		311	27.2	14.0	46.6	32.6		2.3 (1.3)	147.7 (27.9)	SE	32.2 (8.9)	24.7 (24.1)	999.5	0.0 (0.0)
Seasonal Variation	Fall	172	116.4	49.1	166.8	117.7	<0.05[9]	172	29.5	19.8	44.3	24.5	>0.05	2.5 (1.0)	158.1 (65.7)	SE	27.6 (10.1)	18.5 (11.6)	997.6 (4.1)	0.0[10]
	Winter	160	45.0	26.6	101.3	74.7		160	29.5	19.5	45.3	25.8		2.5 (1.5)	202.2 (68.2)	S	19.0 (7.4)	55.3 (29.6)	1013.9 (7.3)	0.0 (0.0)
	Spring	163	76.4	46.6	127.3	80.7		163	27.9	19.8	40.2	20.4		2.5 (1.7)	144.9 (13.2)	SE	32.0 (6.9)	29.5 (19.9)	1003.1 (5.1)	0.0 (0.0)
	Summer	123	91.9	19.3	156.2	136.9		123	40.1	7.6	70.1	62.5		2.7 (1.3)	143.1 (7.1)	SE	36.5 (3.1)	27.7 (19.9)	995.9 (4.3)	0.0[10]

[1] Number of measurement day
[2] The middle number between the smallest and the highest numbers
[3] The middle number between the smallest number and the median of the data set (the first quartile).
[4] The middle number between the median and the highest number of the data set (the third quartile).
[5] Interquartile Range.
[6] Atthe west municipality of Dammam at 26.40 ° latitude, 50.04 ° longitude
[7] P-value using Mann-Whitney test
[8] El-Khobar housing region at 26.06° latitude, and 50.21° Longitude
[9] P-value using Kruskal-Wallis H test
[10] Precipitation is constant during fall, and summer seasons (zero mm)

Table 3: Wind speed and prevailing wind direction as related to the particulate matter concentrations in Dammam air monitoring station at 26.40 ˚ latitude, 50.04 ˚ longitude, Saudi Arabia, 2012

Season	Prevailing Local Wind Direction	No[1]	Light wind (<3.1 m/sec)				Gentle-Moderate wind (3.1-7.8 m/sec)				
			PM10 Concentration ($\mu g/m^3$)	P-Value[2]	PM2.5 Concentration ($\mu g/m^3$)	P-Value	No	PM10 Concentration ($\mu g/m^3$)	P-Value	PM2.5 Concentration ($\mu g/m^3$)	P-Value
Fall	SE[3]	14	170.0 (64.8)	<0.05	84.0 (23.0)	<0.05	1	--	<0.05	--	<0.05
	S[4]	24	115.8 (57.7)		34.7 (21.4)		5	179.5 (72.7)		73.1 (45.2)	
	SW[5]	15	46.1 (76.6)		32.6 (10.0)		6	126.6 (82.3)		26.9 (56.4)	
	W[6]	5	91.2 (84.6)		36.4 (13.0)		4	119.8 (194.5)		30.9 (96.7)	
	NW[7]	3	--		--		4	149.7 (53.3)		28.7 (55.8)	
Winter	E[8]	0	--	>0.05	--	>0.05	2	--	>0.05	--	>0.05
	SE	6	25.5 (28.3)		19.5 (9.5)		2	--		--	
	S	19	35.2 (20.7)		27.7 (13.1)		0	--		--	
	SW	12	31.6 (22.1)		20.7 (19.0)		6	25.7 (23.1)		17.1 (4.0)	
	W	12	30.0 (23.4)		24.9 (22.6)		13	21.1 (13.6)		18.2 (6.9)	
	NW	1	--		--		0	--		--	
Spring	SE	38	69.7 (52.8)	<0.05	26.5 (14.8)	<0.05	36	131.2 (102.6)	<0.05	42.1 (39.2)	<0.05
	S	6	26.8 (22.4)		16.9 (13.8)		1	--		--	
	SW	8	51.2 (16.1)		35.9 (5.6)		0	--		--	
	W	2	--		--		0	--		--	
Summer	SE	47	95.2 (35.6)	-	54.7 (32.8)	- -	16	215.1 (154.2)		80.8 (63.6	--

Jinan, China (Yang, et al., 2007), and Milan, Italy (Marcazzan M. Grazia, Vaccaro, Valli, & Vecchi, 2001)revealed a negative correlation between PM_{10} concentration and the wind speed. The better dispersion and the consequent PM dilution at higher wind speed are the main cause of the negative relation.

The particulates' concentrations disclosed negative correlation with relative humidity because of the settlement and removal of particulate matter, especially coarse size out of the humid atmosphere. This negative relation is compliant with those of the Delhi (Trivedi, et al., 2014), and European studies (Vardoulakis & Kassomenos, 2008), while it is contradictory to studies that have been conducted in Jinan, China(Yang, et al., 2007)and Hangzhou, China(Jian, Zhao, Zhu, Zhang, & Bertolatti, 2012). This discrepancy is due to the formation of secondary particles at high relative humidity.

[1] Number of measurement days
[2] P-value using Kruskal-Wallis H test
[3] South-East
[4] South
[5] South-West
[6] West
[7] North-West
[8] East

Due to the limited amount of rainfall in Saudi Arabia all over the year, levels of PM_{10} and $PM_{2.5}$ showed a negative weak correlation coefficient with the precipitation which usually acts as a scavenging sink for particulates. This result is consistent with that of the European (Vardoulakis & Kassomenos, 2008), Beijing (Tian, et al., 2014), and United States (Tai, et al., 2010) studies.

Table 4: Local Wind speed and prevailing wind direction as related to the particulate matter concentrations in El-Khobar air monitoring station at 26.06˚ latitude, and 50.21˚ Longitude, Saudi Arabia, 2012

Season	Prevailing Local Wind Direction	Light wind (<3.1 m/sec)					Gentle-Moderate wind (3.1-7.8 m/sec)				
		No[1]	PM10 Concentration (µg/m^3)	P-Value[2]	PM2.5 Concentration (µg/m^3)	P-Value	N	PM10 Concentration (µg/m^3)	P-Value	PM2.5 Concentration (µg/m^3)	P-Value
Fall	N[3]	2	--	<0.05	--	>0.05	0	--	<0.05	--	<0.05
	E[4]	1	--		--		0	--		--	
	SE[5]	48	38.2 (109.3)		18.4 (19.4)		6	172.1 (205.8)		42.7 (53.4)	
	S[6]	18	168.3 (106.8)		26.8 (44.3)		2	--		--	
	SW[7]	5	131.6 (95.9)		24.2 (17.0)		0	--		--	
	W[8]	4	139.3 (38.8)		25.1 (16.3)		0	--		--	
	NW[9]	5	148.2 (100.2)		31.8 (11.1)		0	--		--	
Winter	N	2	--	<0.05	--	<0.05	0	--	<0.05	--	<0.05
	NE	2	--		--		0	--		--	
	E	20	91.7 (66.2)		46.9 (25.3)		0	--		--	
	SE	62	64.9 (110.1)		22.0 (28.5)		15	218.6 (124.4)		75.8 (47.2)	
	S	34	113.6 (155.5)		30.5 (24.6)		9	135.3 (127.1)		36.6 (27.6)	
	SW	14	43.9 (107.7)		21.1 (11.5)		4	205.9 (500.4)		91.5 (167.5)	
	W	8	78.3 (95.0)		30.8 (13.8)		1	--		--	
	NW	5	148.2 (100.2)		31.8 (11.1)		2	--		--	
Spring	SE	43	78.6 (81.7)	<0.05	25.2 (21.5)	<0.05	7	137.9 (90.0)	<0.05	39.7 (13.7)	<0.05

[1] Number of measurement days
[2] P-value using Kruskal-Wallis H test
[3] North
[4] East
[5] South-East
[6] South
[7] South-West
[8] West
[9] North-West

	S	18	42.3 (46.9)		17.9 (12.7)	3	--	24.4 (6.7)
	SW	1	--		--	0	--	--
Summer	SE	37	12.0 (35.0)		3.3 (15.2)	19	143.3 (251.2)	41.5 (78.8)
	S	2	--		--	1	--	--

On the other hand, the concentrations of the two PM types showed a negative highly significant coefficient with barometric pressure. This is similar to the Beijing study (Tian, et al., 2014), and non-compliant with the European study (Vardoulakis & Kassomenos, 2008).

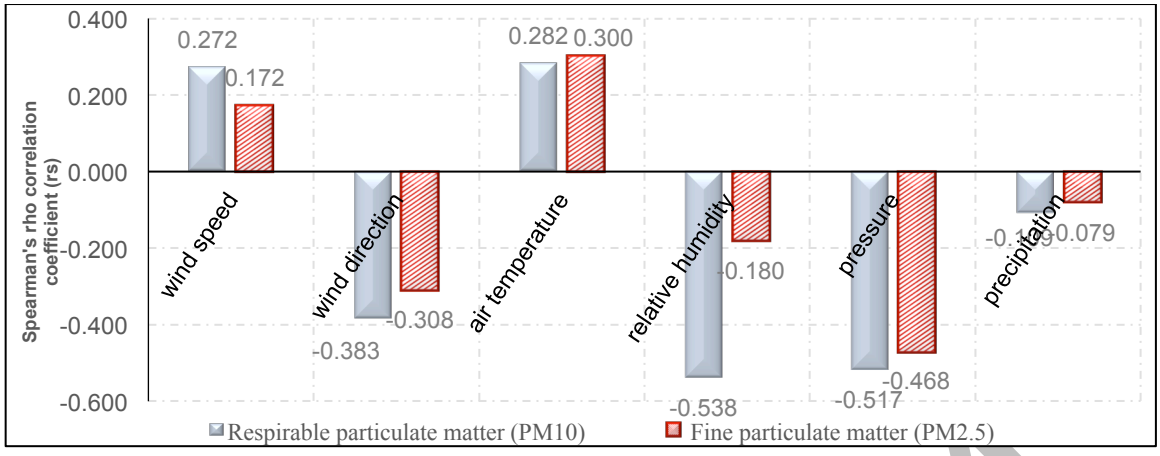

Figure 3: Spearman's rho correlation coefficient of PM_{10}, $PM_{2.5}$ and the major meteorological factors

The overall data of the present study indicates that the fall season was of the highest PM10 concentrations due to the lowest relative humidity. The winter season had the lowest PM10levels because of the maximum relative humidity and wet deposition, in addition to the highest barometric pressure. The Italian study (Marcazzan, Vaccaro, Valli, & Vecchi, 2001) stated that the winter values of particulate matter were higher those of summer due to the frequent persistent thermal inversions during winter, and the greater wind speed that broadens the mixing layer and improves air quality during summer.

The highest PM2.5 level that has been recorded during the summer season in the present study may be attributed to the highest air temperature and the lowest atmospheric pressure, while the lowest PM2.5value was recorded during the spring season. Based on several studies, the seasonal variation differs from one location to another. For example; A Buenos Aires study indicated higher PM2.5 during the summer season (congruent with this study) due to the slightly higher wind speed that may generate more PM2.5(Bogo, et al., 2003). While the Korean and Hong Kong studies revealed that the highest PM2.5was during winter because of the thermal inversion (L. Y. Chan & Kwok, 2001; Vellingiri, et al., 2014).

In Dammam station, the maximum PM_{10} concentration [215.1 (154.2) $\mu g/m^3$] was recorded at the "southeast gentle-moderate wind" during summer. This may be due to the high wind speed, in addition to the highest air temperature, and the lowest pressure. The lowest level of PM_{10} [21.1 (13.6) $\mu g/m^3$] was found at the "western gentle moderate wind" during winter because of the high relative humidity and the very low human activities at the western area. As for $PM_{2.5}$, the highest concentration which was found at the "southeast light wind" during fall is due to the presence of dense population and high traffic activity in this direction.

In El-Khobar, the winter season recorded the highest PM10, and PM2.5 levels at gentle-moderate southeastern and southwestern directions. This may be owing to thermal inversion during this cold season. The lowest levels of both PM types that were found during the summer season at the "light southeast winds" can be attributed to the higher air temperature and lower atmospheric as stated in the Italian and European studies(Marcazzan, et al., 2001; Vardoulakis & Kassomenos, 2008).

Conclusions

Concentrations of both PM_{10}, and $PM_{2.5}$ have the positive weak highly significant Spearman's rho correlation coefficients with local wind speed and air temperature, while they have negative significant coefficients with prevailing wind direction, relative humidity, and barometric pressure. In addition, precipitation has a very weak negative coefficient with the two types.

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Effects of a juvenile hormone analogue, pyriproxyfen, on reproduction of the Mediterranean flour moth, Ephestia Kuehniella Zeller

Manel Hami & Nadia SOLTANI-MAZOUNI

Laboratoire de Biologie Animale Appliquée, Département de Biologie, Faculté des Sciences,

Université d'Annaba, 23000-Annaba (Algérie)

Email :manelhami@yahoo.fr

Abstract : Juvenile hormone analogue (JHAs) imitate physiological activities of juvenile hormone and able to suppress insect pest population in host commodities. For verification of this, an experiment was carried out to evaluate the effect of a JHA, pyriproxyfen, on growth and reproduction of the Mediterranean flour moth, Ephestia kuehniella Zeller (Lepidoptera: Pyralidae), an important pest in stored products worldwide, were evaluated under laboratory conditions. The insect growth regulator (IGR) was applied topically (LD_{50}) to newly emerged pupae. Moreover, it prolong pupal stage duration and inhibited adult exuviation with an LD_{50} of 2,53ng/pupa and LD_{90} of 14,68 ng/pupa. In a follow-up experiment, the adults that survived from treated pupae were investigated for different reproductive event parameters. The treated adults showed a dose-dependent increase in pre-oviposition period, and a decrease in oviposition period, which in turn resulted in a lower fecundity and egg viability. Typically, measurements of ovarian ecdysteroids production by an enzyme immunoassay showed an increase in the hormonal amounts recorded in treated series compared to control series. The results showed that pyriproxyfen may be applied as an insecticide to decrease the damage caused by Mediterranean flour moth on stored products. Pyriproxyfen can be used with low side effects to humans.

Keywords: insecta; Ephestia kuehniella; pyriproxyfen; toxicity; reproduction; ecdysteroids

Elastic Foundation Effects on Three Dimensional Arch Dams

Murat Emre Kartal, Muhammet Karabulut, Bayram Kaya, Derya Tanrivermis

Bülent Ecevit University, Faculty of Engineering, Zonguldak/TURKEY
Email:karabulut@beun.edu.tr

Abstract: Dynamic effects on an arch dam should be taken into account together with gravity and hydrostatic pressure for the most critical conditions. This study presents three-dimensional linear earthquake response of an arch dam. Different soil parameters and ground motion accelerograms are used in the finite element analyses. The Type 3 double curvature of an arch dam which is one of the five type models suggested in Arch Dams Symposium organized in England in 1968 is considered in this paper. All numerical analyses are carried out by SAP2000 program for empty reservoir case. In the scope of this study, modal analyses and modal time-history analyses are performed using three dimensional finite element model of the arch dam and arch dam-foundation interaction systems. According to numerical analyses, maximum horizontal displacements and principle stresses are shown by height and also evaluated earthquake for various soil conditions and earthquakes. Besides this study clearly appears that the soil conditions are very effective on the dynamic response of an arch dam.

Keywords: Type 3 Arch dam, Finite element method, Modal time-history analyses, Static and dynamic analysis

ETKILI WEB TASARIMINDA KRITERLER

Murat Dağıtmaç, Engin Çiftçi

Yildiz Teknik Üniversitesi, Enformatik Bölümü, İstanbul/Turkey

mdagitmac@yildiz.edu.tr

Abstract: People have been using internet for communication, shopping, obtaining information, education and work. According as this rapid development, the same things as what is being thought about electricity today will be thought about internet in a few years. Internet is changing people's living, working and entertainment styles just as electricity changed a lot of things for previous generations. Web sites are becoming more important for people day by day. A lot of web pages have emerged and internet has turned into a web site dumping ground. In this study, the criterion of designing a remarkable and interesting web site has been researched.

Key words: web page, design, internet, graphic

Özet:İnsanlar interneti iletişim, alışveriş, bilgi edinme, eğitim ve çalışma amaçlı kullanmaktadırlar. Bu hızlı gelişime bağlı olarak bugün elektrik için ne düşünülüyorsa, birkaç yıl içinde internet için de aynı şeyler düşünülecektir. Nasıl elektrik önceki nesiller için pek çok şeyi değiştirdiyse, internet de insanların, yaşama, çalışma hatta eğlenme tarzlarını değiştirmektedir. Her geçen gün web sitelerin önemi insanların hayatında daha fazla önem arzetmektedir. Bir o kadarda web sitesi çıkmaya başlamıştır. İnternet artık web site çöplüğüne dönüşmeye başlamıştır. Bu çalışmada yapılmış bir çok Web sitesinin arasından dikkat çeken ve ilgi uyandıran bir web sitesi tasarlamanın kriterleri bulunmaya çalışıldı

Anahtar Kelimeler: Web Sitesi, Tasarım, İnternet, Grafik

Evaluation of Consumer Confidence Index of Central Bank of Turkey

Consumer Tendency Survey

Derya Karagöz . Serpil Aktaş

Department of Statistics. Hacettepe University. Beytepe. Ankara. Turkey

Abstract : Consumer confidence index is an indicator used to measure consumer confidence based on the degree of optimism on economy. Basically. it is a measure that reveals how optimistic or pessimistic consumers are with respect to the economy in the near future. The consumer confidence index calculated from the survey results can take value between 0-200. Consumer confidence index greater than 100 indicates an optimistic outlook for consumer confidence. Consumer confidence index is smaller than 100 represents the worst case. In this paper. consumer confidence index data are collected for the periods 2004-2012 from Central Bank of Turkey and analyzed using repeated measures analysis to investigate whether there is a trend throughout the years..

Key words: Consumer confidence index. Central Bank of Turkey. Repeated measures analysis.

Introduction

The repeated statement was added to the general linear model (GLM) procedure in 1984, since the methodology of univariate analysis of variance does not enough to resolve the covarince structure of repeated measures. The separate analyses at each time point, univariate analysis of variance, univariate and multivariate analyses of time contrast variables, and mixed model methodology are several statistical methods used for analyzing repeated measures data. The designs of repeated measures can be one-way repeated measures (one treatment factor) and two-way repeated measures (two treatment factors: one repeated factor (the trials factor) and one treatment factor (the groups factor)) which is a special type of repeated measures design that is frequently used by researchers is (Montgomery,2001).

The aim of this study is to analyze the Consumer confidence index (CCI) data using one-way repeated measures analysis and to investigate whether there is a trend throughout the years. The CCI data is collected for the periods 2004-2012 from Central Bank of Turkey and is calculated from the survey results. CCI can take value between 0-200. If it is greater than 100. it indicates an optimistic outlook for consumer confidence (CC) and if it is smaller than 100, it represents the worst case. CCI is a measure that reveals how optimistic or pessimistic consumers are with respect to the economy in the near future.

The remainder of our paper is organized as follows. In the next section, the definition of the consumer confidence index is given. In Methodology Section starts with a summary explaining the methodology of the repeated measures analysis experiments and then presents the theory of the repeated measures analysis of variances. Then we represent the analysis of CCI data for Central Bank of Turkey. Finally, the conclusions of this study is given in the last section.

Consumer Confidence Index

CC is one of the many indicators that is designed to measure the changes in economic activity and widely used in macroeconomic assessments and forecasts. CCI is a measure of consumer attitudes. Firstly. consumer attitudes might improve consumption forecast by reporting on consumers' views about their own and the economy's recent, current and expected economic conditions. Thus these data may be more informative about future consumer spending . Secondly, consumer attitudes may incorporate households' estimates of the impacts of rare shocks whose effects cannot be directly estimated from past experience or data (Brand. 2012).

A CCI measures how consumers feel about several economic factors. The measure is based on several questions by an interviewer to the consumer. The result which is represented by a numerical value speaks to

consumer's evaluation of their own financial situation, employment chances, expenditure intentions and their opinion of general economic conditions. The index is based on a randomly selected sample of consumers that is representative of the country for which the index is constructed. The computation of a business confidence index essentially follows the same format except that it is the responses of business persons to business-focused questions that are captured and measured. These indices may rise or fall from period to period or remain unchanged (Kelvin, 2011).

The analysis of CC derives from the distinct literature of psychological economics. It is widely accepted that the perceptions and expectations of households determine the type of responses given during the survey. Katona (1960 and 1968) studied much in this area. The author argues that as one of the main tendency measures, economic sentiment can be credited with having additional information on the future path of the economy. An increase in confidence should lead to a rise in consumption expenditure with a certain lag. Since income cannot reflect all changes in consumption. CC offers help as an indicator because it allows one to measure both the ability and willingness to buy that individuals possess alongside other significant economic and financial variables. One can separate the literature on CC into three distinct approaches. The first argues that there is a significant and strong relationship between consumer sentiment and consumption expenditures (Carroll et al. 1994). The second fails to find any supportive evidence of empirical significance, rejecting the validity of consumer confidence as a leading indicator (Garner, 1991). Finally. the third uses some form of unconventional methodology to bridge the gap between qualitative survey data and quantitative analysis, resulting in favorable (Jansen and Nahius, 2003) and non-favorable evidence (Dominitz and Manski, 2004). However. the common point of all these studies is to focus on the explanatory power of CC thus restricting it to the role of an exogenous variable. The approach used by each of these studies range from the use of time series models to estimate the predictive ability of consumer confidence on household spending; to the use of consumer expectations and changes in future consumer sales activity; to the use of unconventional methodology like analyzing forecast errors regarding the CCI, the possible relationship between the blue chip economic indicators and consumer sentiment, or micro-level expectations data in a Euler- equation framework (Kelvin. 2011).

Methodology

The Repeated Measures Analysis of Variances (rANOVA) is one of the most widely used experimental designs in the past two decades because of advancements in computing hardware and software. Specifically in educational, psychological, diet and population research, multiple measurements are made on the same experimental units over a period of time, such data are called repeated measures. The repeated measures experiments interest on how treatment means change over time; and how treatment differences change over time. i.e.. is there a treatment by time interaction? The repeated measures data analysis distinctive is the

covariance structure of the observed data. The assumptions of using the F test to analyze an experimental design are :

- The response variable is continuous,
- The residuals follow the normal distribution,
- The subjects are independent,
- The within-subject covariance matrices are equal for all between-subject groups. This assumption is tested by Box's M test,
- All of the within-subject covariance matrices are circular. This assumption is tested by Mauchly's test and be studying the values of epsilon (defined below). The circularity assumption is not necessary when only two repeated measures are made. When the significance level of Mauchly's test is < 0.05 then sphericity cannot be assumed.

The one-way repeated measures analysis model is given;

$$y_{ij} = \mu + \alpha_j + d_{ij} + \varepsilon_{ij} \; . i = 1 \ldots n. \;\; j = 1 \ldots k$$

where n is the number of observation, k is the number of treatment

y_{ij} : the response variable

μ : is the overall mean effect

α_j : is a fixed effect of treatment j

d_{ij} : is a random effect of observation i in treatment j

ε_{ij} : is a random error observation i in treatment j

- $\varepsilon_{ij} \sim NID(0.\sigma_\varepsilon^2)$, approximately normally independently distributed with mean of 0 and variance of σ_ε^2.
- $d_{ij} \sim NID(0.\sigma_d^2)$, approximately normally independently distributed with mean of 0 and variance of σ_d^2.

Assuming d_{ij} and ε_{ijk} are independent

$$E(y_{ij}) = \mu + \alpha_j + \tau_i$$
$$Var(y_{ij}) = \sigma_d^2 + \sigma_\varepsilon^2$$

and the covariance between any two different observations on the same subject is

$$Cov(y_{ij} \; . \; y'_{ij}) = Var(d_{ij}) = \sigma_d^2 \; . \; j \neq j'.$$

Analysis of CCI data for Central Bank of Turkey

In this study the CCI data is collected for the periods 2004-2012 from Central Bank of Turkey from the Central Bank of Turkey database. In monthly, consumer tendency survey, consumers' assessments on current situation and their expectations for personal financial standing and general economic situation have been evaluating by the Central Bank of Turkey. Indices are compiled in accordance with the balance method of European Union. The balance is calculated as the difference between the percentages of positive and negative responses and 100 is added to this difference, thus forming a separate diffusion index for each question. Then, the general index is calculated by taking arithmetic means of diffusion indices of the questions included in consumer confidence index. The consumer confidence index calculated from the survey results is evaluated within the range of 0-200. It indicates an optimistic outlook when the index is above 100, but it indicates a pessimistic outlook when it is below 100. CCI data set and was downloaded for the Central Bank of Turkey web page (http://evds.tcmb.gov.tr/fame/webfactory/evdpw/yeni/cbt-uk.html) and is given in Table 1. For this data set the each CCI is observed monthly. This data is analyzed using repeated measures analysis to investigate whether there is a trend throughout the years. The response variable y_{ij} is CCI at month i in year j, the treatment factor α_j is a fixed effect of year j and d_{ij} is a random effect of month i in year j. Treatment factor is often referred to as the within-subjects factor. The repeated measures analysis model for this data set is given;

$$y_{ij} = \mu + \alpha_j + d_{ij} + \varepsilon_{ij} \; . i = 1 \ldots 12. \;\; j = 1 \ldots 9$$

Table 1: The CCI data collected for the periods 2004-2012 from Central Bank of Turkey

2004	2005	2006	2007	2008	2009	2010	2011	2012
111.40	105.40	101.70	91.80	92.10	71.60	79.20	91.30	92.20
111.90	105.20	101.10	92.70	87.60	74.00	81.80	93.60	93.20
111.00	102.10	101.70	92.40	82.00	74.80	84.70	93.40	93.90
111.00	100.40	102.30	93.70	76.20	80.80	85.80	93.50	91.10
107.30	100.30	100.10	95.00	75.40	83.30	86.60	92.80	92.10
106.60	99.10	92.20	94.20	75.00	85.30	88.00	96.40	91.80
105.40	99.20	88.60	95.50	77.00	82.40	87.50	94.80	92.80
105.40	97.50	91.40	98.20	79.80	81.30	87.40	91.70	91.10
101.20	95.50	91.40	97.10	80.70	81.90	90.40	93.70	88.80
102.80	98.10	91.60	96.20	74.20	80.50	89.00	89.70	85.70
103.70	99.50	93.30	92.50	68.90	78.40	91.30	91.00	89.20
105.20	99.50	92.00	93.90	69.90	78.80	91.00	92.00	89.00

The descriptive statistics for CCIs are displayed in Table 2. Figure 1 also shows the mean trend by years. As shown in Table 2 and Figure 1, the highest consumer confidence index mean is observed in 2004 due to the some economic precautions on the economy. It can be seen a decline until 2006. The mean index in 2006 is not different from the mean index in 2007. After 2007, there was a serious decline until 2008 which has the lowest CCI mean. Between 2009 and 2008 there was a stagnation. Since the last quarter of 2008, the global economic crisis around the world was felt in our country. So an increase was observed again from 2009 to 2011. However, after 2011 the mean index again began to decrease.

Table 2: The descriptive statistics of CCI data for the periods 2004-2012

Year	Mean	Variance	Minimum	Maximum
2004	106.91	13.28	101.20	111.90
2005	100.15	8.42	95.50	105.40
2006	95.62	27.26	88.60	102.30
2007	94.433	4.052	91.80	98.20
2008	78.23	45.43	68.90	92.10
2009	79.42	16.78	71.60	85.30
2010	86.89	13.28	79.20	91.30
2011	92.825	3.291	89.70	96.40
2012	90.908	5.443	85.70	93.90

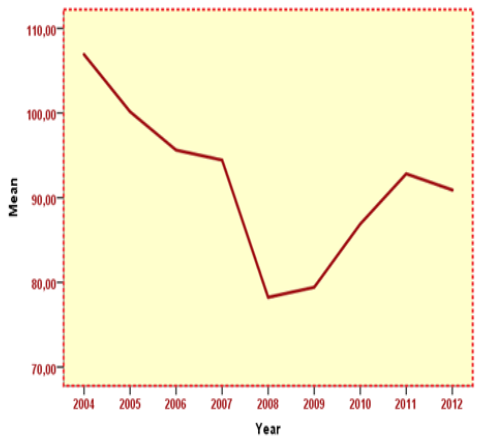

Figure 1 : The graph of the mean of the CCI for the periods 2004-2012

IBM SPSS 20 was used for the data analysis. For the CCI data collected for the periods 2004-2012 from Central Bank of Turkey, the normality assumption holds (P=0.127). The results of the Mauchly's Test of Sphericity is given in Table 3. From the results , we see that, the spherecity assumption does not hold (P=0.00).

Table 3: Mauchly's Test of Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
year	0.000	111.211	35	0.000	0.232	0.278	0.125

The null hypothesis for repeated measures analysis is "there is no trend for consumer confidence index" $H_0: \mu_1 = \mu_2 = \cdots = \mu_9$ can be tested against the alternative hypothesis, H_A: At least one mean is different . The results are given in Table 4. Since the spherecity assumption does not hold , Greenhouse-Geisser, Huyn-Feldt or Lower-bound test can be used. According to the Huynh-Feldt test, the hypothesis

is rejected in the 5% significance level. So the mean of the CCI are different and has a trend for the periods 2004-2012. The multiple comparison test is performed to make the pairwise comparison, and the results of tests for the pairwise comparison are given in Table 5.

Table 4 : Repeated Measures ANOVA Results

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
year	Sphericity Assumed	8190.546	8	1023.818	67.029	0.000
	Greenhouse-Geisser	8190.546	1.858	4408.251	67.029	0.000
	Huynh-Feldt	8190.546	2.220	3689.288	67.029	0.000
	Lower-bound	8190.546	1.000	8190.546	67.029	0.000
Error(year)	Sphericity Assumed	1344.125	88	15.274		
	Greenhouse-Geisser	1344.125	20.438	65.766		
	Huynh-Feldt	1344.125	24.421	55.040		
	Lower-bound	1344.125	11.000	122.193		

Pairwise comparisons: The null hypothesis for pairwise comparisons is $H_0: \mu_i = \mu_j$, $i \neq j$ and alternative hypothesis is $H_A: \mu_i \neq \mu_j$, $i \neq j$. The results of pairwise comparisons with respect to Bonferroni test are given in Table 5. By considering Central bank of Turkey data, the consumer confidence index's means are not different for the years 2006 – 2007-2010- 2011, 2012, and 2008-2009-2010 and 2010-2012 and 2011-2012 , However the consumer confidence index's means for the others years are different. Especially the mean of the consumer confidence index's in 2004 is different from the other years.

Table 5: : Bonferroni Pairwise comparisons

(i) year	**(j) year**	**Mean Dif. (i-j)**	**Std. Error**	Sig.[b]	**95%Con.Interval for Diff.**	
					Lower Bound	**Upper Bound**
	2005	6.758*	0.516	0.000*	4.570	8.947
	2006	11.292*	0.799	0.000*	7.905	14.678
	2007	12.475*	1.505	0.000	6.094	18.856
2004	2008	28.675*	1.560	0.000*	22.059	35.291
	2009	27.483*	1.995	0.000*	19.025	35.941
	2010	20.017*	2.028	0.000*	11.418	28.616
	2011	14.083*	1.075	0.000*	9.525	18.642
	2012	16.000*	0.712	0.000*	12.981	19.019
	2006	4.533*	1.025	0.037*	0.188	8.878
	2007	5.717	1.351	0.051*	-0.010	11.444
2005	2008	21.917*	1.562	0.000*	15.295	28.538
	2009	20.725*	1.914	0.000*	12.610	28.840
	2010	13.258*	1.823	0.001*	5.529	20.987

	2011	7.325*	0.999	0.001*	3.091	11.559
	2012	9.242*	0.699	0.000*	6.278	12.206
	2007	1.183	1.934	1.000	-7.019	9.386
	2008	17.383*	1.727	0.000*	10.062	24.705
2006	2009	16.192*	2.400	0.001*	6.016	26.367
	2010	8.725	2.394	0.139	-1.424	18.874
	2011	2.792	1.607	1.000	-4.022	9.605
	2012	4.708	1.297	0.143	-0.793	10.209
	2008	16.200*	2.151	0.000*	7.080	25.320
	2009	15.008*	0.907	0.000*	11.163	18.854
2007	2010	7.542*	0.925	0.000*	3.619	11.464
	2011	1.608	0.794	1.000	-1.757	4.974
	2012	3.525	1.052	.234	-0.938	7.988
	2009	-1.192	2.849	1.000	-13.273	10.889
2008	2010	-8.658	2.916	0.459	-21.022	3.706
	2011	-14.592*	1.977	0.001*	-22.976	-6.208
	2012	-12.675*	1.697	0.000*	-19.872	-5.478
	2010	-7.467*	0.928	0.000*	-11.403	-3.531
2009	2011	-13.400*	1.091	0.000*	-18.025	-8.775
	2012	-11.483*	1.509	0.000*	-17.883	-5.084
2010	2011	-5.933*	1.204	0.016*	-11.039	-0.827
	2012	-4.017	1.573	0.964	-10.684	2.651
2011	2012	-1.917	0.558	0.202	-4.284	0.451

* The mean difference is significant at the %1 level.

Conclusions

The CCI data for the periods 2004-2012 from Central Bank of Turkey was taken directly from the Central Bank of Turkey web page. We analyzed the CCI data using rANOVA and investigated that there is a trend through the years.

The evaluation of Turkish Economy's growth, inflation, labor and employment, public finance, foreign trade, balance of payments and tourism revenue figures for the period of 2001-2013 is very important in regards to the development and dynamics of the country's economics in the recent ten years.

In 2002, Turkey's economy took some precautions to overcome the economic crisis. It also started a growth period with the support of global help. These precautions ensure the trust and stability on

the economy. During the period of 2002-2007, a high growth rates, substantial increase in exports and production and decrease on the inflation rates occurred. Since the last quarter of 2008, the global economic crisis around the world relatively affected the Turkey's economy. The year 2009 also was a difficult financial based crisis year for Turkey's economy.

Therefore, the dynamics on the CCI depend upon the structural movements in the economy.

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Experimental investigation of heat transfer in a rectangular channel with perforated ribs

Mehmet Eren[*,a], Sinan Caliskan[a], Muammer Zırzakıran[b]

[*a]Department of Mechanical Engineering, Hitit University, 19030, Çorum, TURKEY

[b]Vocational College of Erzurum, Atatürk University, ERZURUM

Abstract: Ribs are known to enhance the heat transfer between the energy-carrying fluid and the heat transfer surfaces. One effect of surface roughness is to increase momentum transfer and flow resistance. An experimental investigation of forced convection heat transfer in a rectangular channel with perforated ribs is presented. Measurements are carried out for a rectangular channel, rib transverse pitch (S) to transverse rib height (e) ratio of S/e=12.0, and a rib height (e) to channel height (H) ratio of e/H= 0.1. The convective fluid was air, and the Reynolds numbers considered for the channel flow case range from 5375 to 36362. The aim of the work was to study the effect of the thermal performance of the ribbed channel. The heat transfer results were obtained using an infrared thermal imaging technique. The heat transfer results of the perforated ribs are compared with those of a smooth plate. The presence of perforated ribs produces higher heat transfer coefficients than the smooth plate surfaces. Results show a 34.1% increase in heat transfer due to the use of ribs. These perforated ribs show a more significant increase in heat transfer coefficient for channel flows.

Keywords: Heat transfer; perforated ribbed channel; thermal imaging technique; Pressure drop

Introduction

Perforated rib arrays inside internal channels are often used in heat exchanger systems to enhance the heat transfer in gas turbine blade cooling channels. A typical application is the internal cooling of gas turbine blade: the ribs break the laminar sublayer and create local wall turbulence due to flow separation and reattachment between the ribs, thus greatly enhancing the cooling effect.

First studies dealt with uniformly heated square or rectangular channels with two opposite rib-roughened walls; continuous, regularly spaced, transverse ribs have been the most common ribbed geometry for years (Han, Glickmann and Rohsenow, 1978 – Han, 1988). The effects of the most important parameters (rib height, rib pitch, channel aspect ratio, hydraulic diameter, and Reynolds number) on heat transfer and pressure drop were investigated. Further studies (Han,Park and Lei, 1985 – Han, Ou, Park and Lei, 1989) showed that the use of parallel angled ribs can have a significant impact on local heat transfer and pressure drop because of the secondary flow induced by the rib angle. To overcome this drawback, modified ribs in the form of “perforated ribs” have been applied instead of solid ones (Liou, Chen, 1998 – Karwa, Maheshwari,Karwa, 2005). Caliskan (Çalışkan, 2013) investigated heat transfer and flow characteristics under impingement of a multiple circular jet array with perforated rib surfaces (PRS) and solid rib surfaces (SRS) with an infrared thermal imaging technique and a Laser-Doppler Anemometry system, respectively.

Perforated ribs have been designed. In order to investigate the convective heat transfer performance of perforated ribs, an experimental set-up was established. The effects of perforated ribs from the channel bottom on the heat transfer and pressure drop characteristics were examined.

Experimental setup

The experimental setup is shown in Fig. 1. The experimental system consisted of a honeycomb, an entrance section, a test section, a centrifugal blower, an infrared thermography system, perforated ribs, and devices for measuring flow velocity, temperature and pressure difference. Air was drawn in by a variable speed fan and passed through the test section of the channel. The channel inner cross section dimensions were 100mm (wide) and 50mm (height). The channel was constructed with 9mm thick plexiglass plates. The dimensions of the heating plate were 100mm (width) and 270mm (length). In the experiments, the heating plate was made of stainless steel foil. It was firmly clamped and stretched between two copper bus bars. The foil was electrically heated by means of a high current DC power supply to provide a constant heat flux surface. The perforated ribs were mounted on the bottom of the channel to enhance the convective heat transfer. The averaged heat transfer coefficient on the plate surface was measured for various rates of airflow through the channel.

Views of perforated ribs are shown in Fig. 2. The perforated ribs were made of high conductivity aluminum material. The perforated ribs were attached to the stainless steel foil plates by a thin layer of super-glue. The thermal contact resistance due to the super-glue introduced a minor conservative preference to the reported results (Rallabandi, Rhee, Gao, Han, 2010). Thermal images were obtained from an IR camera positioned on the bottom of the heater assembly vertical to the z-direction. The air velocity was measured by the Kimo LV107-type anemometer connected to the output of the blower. ALMEMO and a pressure transducer were used to determine the pressure drop between the air inlet and outlet at the test section. The inlet and outlet temperatures of the channel air were measured in different locations of the channel by using a K-type thermocouple. All of these thermocouples were connected to a PC-based data acquisition system. The infrared thermography system, which included a ThermaCAM SC500 camera from FLIR systems and a PC with AGEMA Researcher software, could measure temperatures from -20 ^{o}C to 1200 ^{o}C with an accuracy of ±2%. The infrared camera used an uncooled focal plane array detector with 320x240 pixels, which operated over a wavelength range of 7.5-13 μm. The field of view was 25^{o}x18.8^{o}/0.4m; the instantaneous field of view was 1.3 m-rad, and the thermal sensitivity was 0.07^{o}C at 30^{o}C. The images captured by the infrared camera were displayed and recorded using a computer for further analysis.

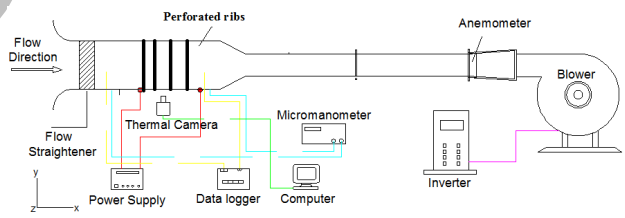


Figure 1: Experimental set-up

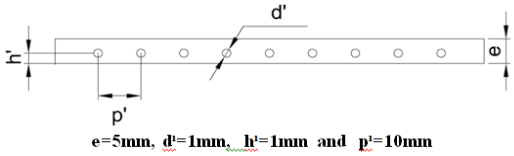


Figure 2: Schematic view of present perforated ribs

The bottom side of the stainless steel foil was covered with a layer of black backing paint. The emissivity of each side of the plate was measured with an AE anemometer and was found to be 0.82 and 0.13 for the painted and unpainted surfaces, respectively.

The local heat transfer coefficient and Nusselt number were defined as:

$$h_x = \frac{q_{conv}}{(T - T_{b,x})} \quad (1)$$

where T and T_{bx} were the local temperature of the heating surface and the bulk fluid, respectively.

$$Nu_x = \frac{h_x D_h}{k} \quad (2)$$

The convective heat flux was evaluated as follows:

$$q_{conv} = \frac{Q_{el} - Q_{loss}}{A} \quad (3)$$

where Q_{el} was the measured input power to the heater. Radiation, free convection from the bottom side, and conduction were considered as heat losses.

The radiation heat flux from both sides of the sheet was given by

$$q_r^{front} = \varepsilon_t \sigma \left(T^4 - T_b^4 \right) \quad (4)$$

$$q_r^{back} = \varepsilon_b \sigma \left(T^4 - T_\infty^4 \right) \quad (5)$$

where ε_t and ε_b are the emissivities of the unpainted and painted surfaces, respectively. σ is the Stefan-Boltzmann constant.

The free convection heat flux from the bottom side of the sheet was calculated using

$$q_f = h_f \left(T - T_\infty \right) \quad (6)$$

where the free convection coefficient h_f was defined as 1.1 W/m^2K, for an air velocity of 0.1 m/s (Janssen, Warmoeskerken, 1991)

The conduction was given by:

$$q_c = k \frac{\Delta T}{t} \quad (7)$$

where k was the thermal conductivity of the sheet, ΔT was the temperature difference across the sheet, and t was the thickness of the sheet. As a result of the thinness of the sheet, the lateral conduction was negligible as reported by Lytle and Webb (Lytle, Webb, 1994). The sum of Q_{loss} was typically in the range of 7.3 to 10.4% of Q_{el} at the highest Reynolds number.

The averaged Nusselt number Nu_{avg} was calculated by integrating the local Nusselt number over the heating surface, i.e.,

$$Nu_{avg} = \frac{1}{L} \int Nu(x) \partial x \quad (8)$$

The Reynolds number based on the channel hydraulic diameter was given by

$$\mathrm{Re} = \frac{\rho u D_h}{\mu} \quad (9)$$

where D_h=2WH/(W+H) was the channel hydraulic diameter.

Friction factor, f, can be written as

$$f = \frac{\Delta P}{\left(\frac{L}{D_h}\right)\rho U^2/2}$$

(10)

where Δp was pressure drop across the length of the channel, L.

The experimental uncertainties had been determined by a standard error analysis. Both the inlet and outlet temperatures of the air were measured by using calibrated K-type thermocouples with an accuracy of 0.3 °C. The inlet velocities at the centers were measured by an anemometer with an uncertainty of 0.03 m/s. The uncertainty in the experimental data was determined according to the procedure proposed by Kline and McClintock (Kline, McClintock, 1953). In our experiment, the fluid properties were assumed constant. The uncertainty in the calculation of the Nusselt number and Reynolds number was found to be less than 6.2% and 5.8%, respectively. The uncertainty in the friction factor f was estimated to be 4.2% at the highest Reynolds number and 6.7% at the lowest Reynolds numbers. The maximum uncertainty of the infrared thermography measurements was less than $\pm 1.5\%$.

Results and Discussion

The experimental data for the heat transfer and friction factor in a rectangular duct with perforated ribs was examined under a turbulent flow regime. The present experimental results in a smooth wall channel were first validated in terms of the Nusselt number and the friction factor. The Nusselt number and the friction factor obtained from the present smooth channel were, respectively, compared with the correlations of Dittus-Boelter and Blasius found in the open literature (Incropera, 1996) for turbulent flow in ducts.

Correlation of Dittus-Boelter,

$$Nu = 0.023\,\mathrm{Re}^{0.8}\,\mathrm{Pr}^{0.4} \quad \text{for heating}$$

(11)

Correlation of Blasius,

$$f = 0.316\,\mathrm{Re}^{-0.25} \qquad \text{for} \qquad 3000 \le \mathrm{Re} \le 20{,}000$$

(12)

Fig. 3 and 4 shows, respectively, a comparison of the Nusselt number and the friction factor obtained from the present work with those from correlations of Eqs. (11) and (12). In the figures, the present results reasonably agree well within the ±11.8% deviation for both the friction factor and Nusselt number correlations.

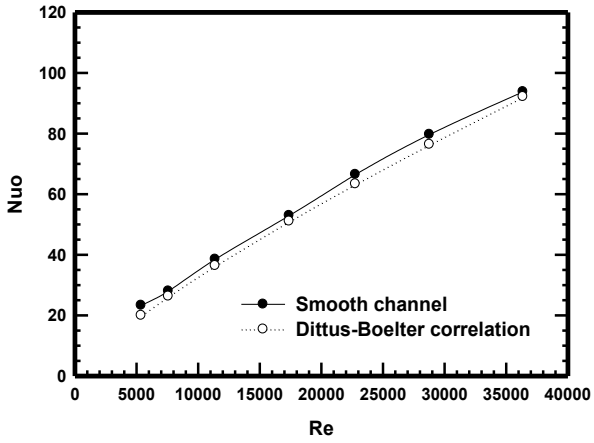


Figure 3: Verification of Nusselt number for smooth channel

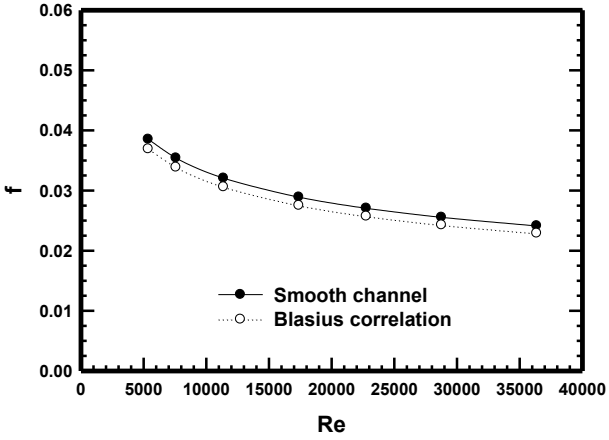


Figure 4: Verification of friction factor for smooth channel

Effects of perforated ribs

The present experimental results on heat transfer characteristics, in a channel equipped with perforated ribs are presented in the form of Nusselt number. The Nusselt numbers obtained under turbulent flow conditions for perforated ribs with different Reynolds number are presented in Fig. 5. As shown in Fig. 5, the use of perforated ribs lead to considerable heat transfer enhancements in a similar trend in comparison with the smooth channel and the Nusselt number values, increase with the rise of the Reynolds number. The maximum difference of the averaged Nusselt number the between smooth and perforated rib is found to occur at Re=36362 with a value equal to 34.1%.

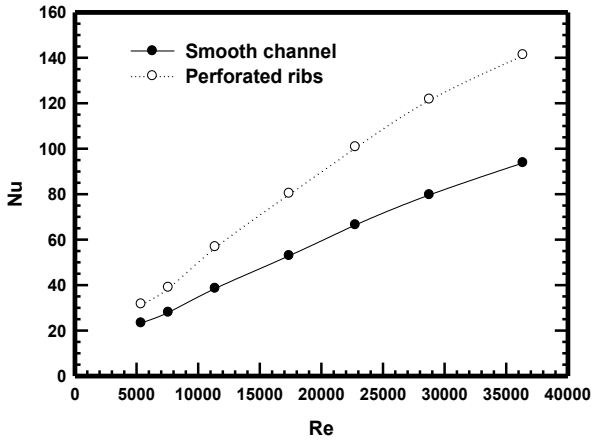
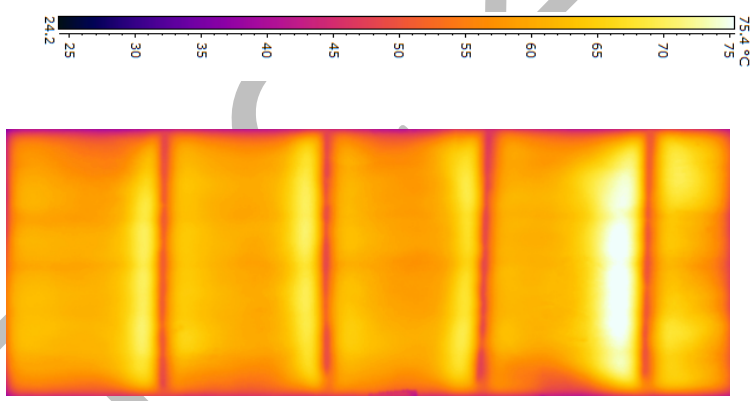
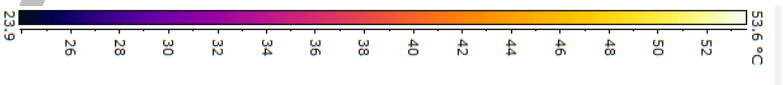


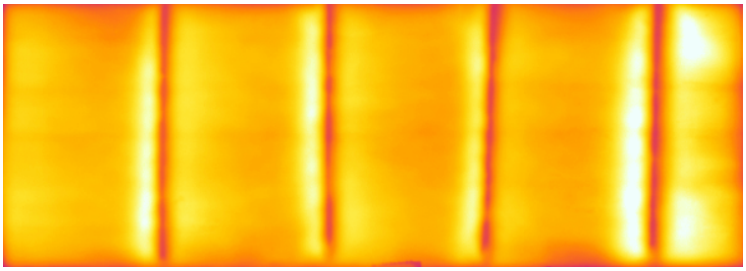
Figure 5: Variation of avareged Nusselt number with Reynolds number

Fig. 6a, b and c present the temperature contours for the perforated ribs in both the streamwise and the spanwise directions for the different Reynold number. As shown in Fig. 6a, b and c, the temperature is decreases with increasing of the Reynolds number. The wall temperatures for the perforated rib surface were lower than the smooth surface, which disrupted the boundary layer more, resulting in a better heat transfer.

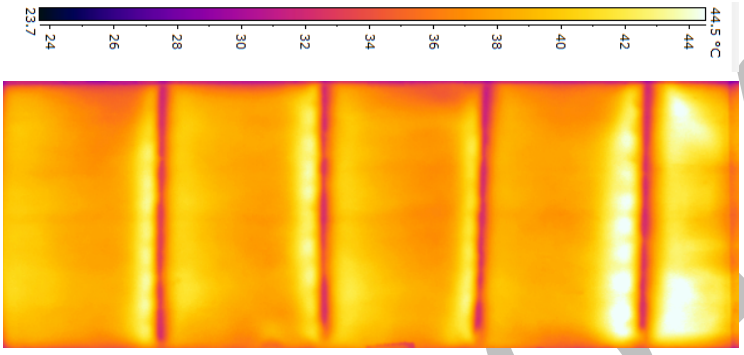


(a) Re=5375

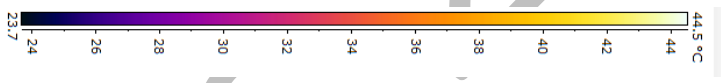




(b) Re=17390



(c) Re=36362



(d) Re=36362

Figure 6: Temperature contours in the x-y plane for the perforated ribs and smooth surface **(a)** Re=5375-perforated ribs, **(b)** Re=17390-perforated ribs **(c)** Re=36362-perforated ribs and **(d)** Re=36362 smooth surface.

Variations of the ratio friction factor, f, versus the Reynolds number for the perforated ribs are shown in Fig. 7. The friction factor found from using the perforated ribs was observed to be higher than that from the smooth duct. This can be attributed to flow blockage and the act caused by the reverse flow due to the presence of the perforated ribs.

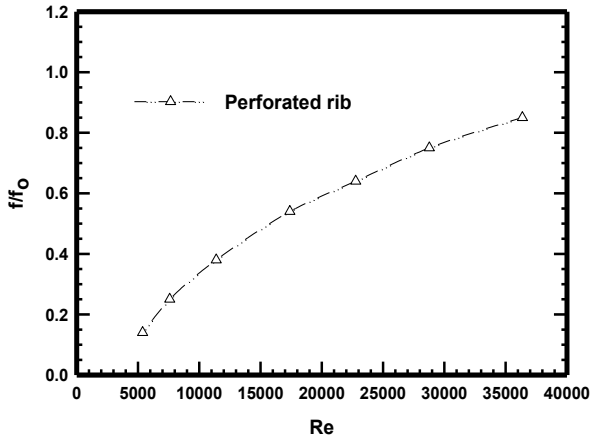


Figure 7: Friction factor ratio with Reynolds number

Conclusions

An experimental investigation in a rectangular duct with perforated ribs under uniform heat flux conditions has been performed.

The following conclusions have been drawn:

- Perforated ribs had significantly enhanced the heat transfer rate, in comparison to a smooth duct. The averaged heat transferred from surfaces with perforated ribs was higher than that of the smooth surface. The disturbance in the boundary layer was formed due to holes, which created higher turbulence due to the separated and reattached flows.
- The present results reasonably agree well within the ±12% deviation for both the friction factor and Nusselt number correlations.
- The maximum difference of the averaged Nusselt number the between smooth and perforated rib is found to occur at Re=36362 with a value equal to 34.1%.

Acknowledgements

The present work is financially supported by the Hitit University (Grant No.MUH01.13.010).

Nomenclature

A convection heat transfer area of channel (m^2)

D_h hydraulic diameter (m)

f friction factor (-)
H channel height (m)
h averaged heat transfer coefficient (W/m^2 K)
k thermal conductivity of air (W/m K)
Nu **Nusselt number (-)**

Nu_{avg} averaged Nusselt number (-)

ΔP pressure drop (Pa)

Pr Prandtl number (-)

Re Reynolds number (-)

Q heat transfer (W)

T temperature (K)

U mean velocity (m/s)

Greek symbols

ρ density of the fluid (kg/m^3)

ν kinematic viscosity (m^2/s)

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Veri Madenciliği Teknikleri ile Depo tasarımı ve Taşıma Maliyetleri Optimizasyonu

Furkan YENER

Harun Reşit YAZGAN

Sakarya Üniversitesi, Endüstri Mühendisliği Bölümü, Türkiye
fyener@sakarya.edu.tr
yazgan@sakarya.edu.tr

Özet: Lojistik sektöründe; depolar günlük pek çok mal hareketinin çok yoğun bir şekilde yaşandığı alanlardan birisidir. Belirli aralıklarla gelen mallar depo içinde uygun yerlere yerleştirilmekte, aynı zamanda da siparişler için ürünler müşterilere teslim edilecek araçlara yüklemeye hazır hale getirilmektedir. Depo içi yerleşim düzeni, depo içindeki mal dağıtım ve toplama maliyetlerine ve siparişlerin hazırlanma zamanına etki eden en önemli faktördür. Bu çalışmanın amacı mal hareketi maliyetini ve teslim süresini en aza indirecek en uygun depo yerleşim düzeninin belirlenmesidir.

Öncelikli olarak, veri madenciliği tekniği kullanılarak, depo içerisinde ki hareketlere etki eden en önemli faktörler olarak ürünlerin sipariş sıklığı ve birlikte sipariş edilme özellikleri belirlenmiştir. Birbiri ile ilişkili ürünler ve birlikte satın alınma oranı dikkate alınarak depo içi tasarımı gerçekleştirilmiştir. Sistemin etkinliğini ölçmek için önerilen yerleşim düzeni ile mevcut depo yerleşim düzenleri karşılaştırılmıştır. Sonuç olarak önerilen depo içi yerleşim düzeni ile daha düşük mesafe kat edilmiş ve dolayısı ile daha düşük maliyet elde edilmiştir.

Anahtar Kelimeler: Depo tasarımı, Veri madenciliği, Apriori algoritması, Çok boyutlu ölçekleme.

Warehouse Design with Data Mining Techniques and Transportation Cost Optimization

Abstract: In logistics, warehouse is one of the place which has very intense movement of goods every day. When goods come in at regular intervals, they are inserted the appropriate place to store. In the same time, orders are gathered from store area and are made ready to send customer with shipment trucks. Warehouse design is the most important factor. It effects goods distribution, collection costs and order preparing time. This study aims to reduce cost of the goods movement and minimize delivery time in order to determine the optimal warehouse layout.

First, using data mining techniques, frequency of orders and order products with the features have been identified as the most important factors that influence the movements in the warehouse. Warehouse interior design has been made by considering products associated with each other and the ratio of the purchases. To measure the effectiveness of the system has been compared to the proposed arrangement and layout of the existing warehouse. Consequently, the layout proposed in storage was lower distance and thereby lower cost is obtained.

Key words: Warehouse Design, Data mining, Apriori algorithm, Multidimensional scaling.

Giriş

Dünyanın küreselleşmesi ve üretim sektörlerinin ucuz iş gücüne doğru kaymasıyla birlikte Lojistiğin önemi artmaktadır. Maliyet kalemleri içerisinde ürün kalitesinde katma değer taşımayan lojistik giderleri tasarruf sağlanmak istenen ilk harcamalardır. Lojistik sektörünün temel yapı taşları olan depolar da, teknolojik imkânlar güncel olarak kullanılmalı, bilişim imkanlarının çokça yararlanılmalıdır. Sevkiyat sürelerinin kısalması ile birlikte ürünlerin depoda bekleme süreleri kısalmış buda depoları yaşayan sistemler haline gelmiştir.

Depo içerisindeki işlemlerin planlanmasının ve doğru yönetilmesinin önemi her geçen gün artmaktadır. Bir deponun iç tasarımından başlayarak tüm süreçler müşteri ihtiyaçlarına uygun olarak tasarlanmalıdır. Eğer doğru analizler sonucunda ulaşılmış depo düzeni hayata geçirilmemiş veya bu tasarım güncelliğini yitirmiş ise deponun işleyişi sırasında problemlerle karşılaşılacaktır.

Günümüzde veri madenciliği çeşitli kurum ve kuruluşlar için önemli hale gelmiştir. Son yıllarda teknolojideki gelişmeler ile veriler kolayca depolanabilmektedir. Depolanan bu veri yığınlarını inceleyebilmek ve ileriye yönelik anlamlı bilgiler elde etmek için geleneksel yöntemler yetersiz kalmaktadır. Bu nedenle veri madenciliği kullanımı kaçınılmaz olmuştur. Birçok sektörde kullanılan veri madenciliğinde önemli olan, anlamlı ve kullanılabilir bilgiler ortaya çıkarmaktır. Eğer veri tabanlarında bilgi keşfi süreci başarılıysa, keşfedilen bilgi organizasyonların karar verme sistemlerinin işleyişini kolaylaştırmaktadır. (Hatice, Ç. ,2012) (Freitas, A, 2002)

Veri madenciliğinde çeşitli teknikler kullanılmaktadır. Bunlardan birisi geçmişteki verilerin analiz edilip aralarındaki birliktelik çıkarımlarının yapılması ve geleceğe yönelik stratejilerde karar vermeyi sağlayan birliktelik kuralları yaklaşımıdır.(Özçakır F. C., Çamurcu A.Y, 2007)

Bu çalışmada ürün kategorileri arasındaki ilişki birliktelik kurallarıyla incelenerek aralarındaki bağlantının güçlü olma durumuna göre depo yerleşim planlaması yapılmıştır. Bir market zincirine ait ana dağıtım deposundan alınan veriler birliktelik kuralları yaklaşımının yapısına göre kodlanmış ve sonuçlar elde edildikten sonra elde edilen düzen değerlerine göre oluşturulan yakınlık matrisinden nesnelerin birbirlerine göre konumlarını daha az boyutlu düzlemde grafiksel olarak göstermeyi amaçlayan çok boyutlu ölçeklendirme analiziyle yerleşim yapılmıştır. (Borg,Groenen, 2005)

Literatür Taraması

Nesneler arasındaki ilişkileri ortaya çıkarmayı amaçlayan bir yaklaşım olan birliktelik kuralları, veri madenciliğinin en popüler yaklaşımlarından biridir. 1993 yılında Agrawal'in yaptığı çalışma birliktelik kurallarının ilk olarak uygulanmaya koyulduğu en bilinen çalışmadır. Bugüne kadar birliktelik kuralları sağlık sektöründe, bilgisayar ve bilişim sektöründe, coğrafya alanında, trafik mühendisliğinde, eğitim alanında, elektrik mühendisliğinde kullanılmıştır.

J. Russell ve Petersen (2000) yaptıkları çalışmada ürün grupları arasındaki talep ilişkilerini birliktelik kurallarıyla analiz etmişlerdir. 4 küçük market üzerinde yapılan bu çalışma sonucunda çapraz kategori fiyat elastikiyetlerinin düşük olduğu gözlenmiştir. Dolayısıyla yapılan pazar sepet analizi çalışmasında, ürün gruplarının mağaza düzenlerinin talep bağlılıklarına göre daha önemli olduğu yorumu yapılmıştır.(Russell, Petersen, 2000)

Pande ve Abdel (2009) genellikle ürün grupları arasında incelenen birliktelik ilişkilerini Amerika'nın Florida bölgesindeki trafik kazalarının hangi koşullarla ilişkilerinin olduğunu belirlemek için kullanmışlardır. Yaptıkları çalışmada trafik kazalarının ışık durumu, yol durumu, hava durumu ve kaza sonucundaki ölüm veya yaralı durumlarına göre birlikteliklerini analiz etmişlerdir. Analizler sonucu gece karanlığı ve sokak lambalarının bulunmadığı virajlı karayollarında ölümlü sonuçlar doğuran kazaların meydana geldiği gözlemlenmiştir. Bu gözlemlere göre alınması gereken önlemler açısından çeşitli yorumlar yapılmıştır.(Pande, Apdel, 2007)

Srikant ve Agrawal (1996) yaşlara göre evlilik durumu ve sahip olunan araba sayılarının birlikteliğini analiz etmişlerdir. Birliktelik kurallarına getirdikleri yeni yaklaşımla bulunan değerlere göre 35-45 aralığında olan evli çiftlerde en az 2 araba bulunduğu gözlenmiş ve buna göre bir promosyon çalışması yapılabileceği yorumu yapılmıştır.(Srikant, Agrawal, 1996)

Tang, Chen, Hu (2007) çok periyotlu ve mağaza düzenli pazar sepet analizine yeni bir yaklaşım önerisinde bulunmuşlardır. Çok sayıda mağazadan oluşan şirkette mevsimlik, aylık, günlük satış

istatistiklerinden ürünlerin yerleşimlerinin bağıntılarını incelemişlerdir. Bu yaklaşımla çok sayıda mağaza içeren ve satışların belirli zamanlardaki değişimlerinin olduğu organizasyonlarda bile pazar sepet analizinin uygulanabileceğini belirtmişlerdir.(Tang, Chen, Hu, 2007)

Videla-Cavieres F. ve Rios (2014) çok sayıda verinin bağlantılarının belirlenmesi için klasik yaklaşımların yetersiz olacağını belirtmişler ve pazar sepeti analizi için grafik tabanlı bir yaklaşım geliştirmişlerdir. Bu yaklaşımda ürünler için özel bir kümeleme uygulanmıştır. Örneğin herhangi bir müşterinin ekmek almasının sıklığından ziyade daha çok hangi tür ekmeği satın aldığı incelenmiştir. Uygulanan grafiksel yaklaşım sayesinde de çok sayıdaki veri grubundan ürünlerin birbiriyle olan birlikteliği belirlenmiş ve yorumlanmıştır.(Videla-Cavieres F., Rios, 2014)

Abramsson-Zetterberg L. , Darnerut, Wretling (2014) İsveç'te ulusal bir yemek temsilciliğinde örneklenmiş en çok tüketilen ürünleri birliktelik kurallarıyla analiz etmişler ve bu ürünlerin içinde yer alan kanserojen madde miktarlarını göz önünde bulundurmuşlardır. En çok kanserojen madde barbekü ürünlerinde tespit edilmiştir. İsveç'te bu ürünlerinin satın alınma oranının %2 olmasından dolayı kanser riskinin en alt seviyede olduğu yorumu yapılmıştır.(Abramsson-Zetterberg L., Darnerut, Wretling, 2014)

Ulaş (2001) Gima Türk A.Ş.'ye ait bir markette yaptığı çalışmada birliktelik kuralları kullanarak ürünler arasındaki ilişkileri bulmayı amaçlamıştır. 3 aylık süreyi kapsayan bu çalışmada ürün kategorileri yerine ürün kodları kullanıldığından sonuçlar üzerinde herhangi bir yorum yapılamamıştır.(Ulaş, 2001)

Çil (2012) Migros Türk A.Ş.'ye ait bir markette yapılan çalışmada ürün grupları arasındaki birliktelik kurallarını analiz etmiştir. Bulunan sonuçlara göre ürün grupları arasındaki güven değerlerini baz alarak çok boyutlu ölçeklendirme yöntemi ile yeni bir market içi yerleşim planı önerilmiştir.(Çil, 2012)

Jong-Seok Lee, Jun, Lee J. ,Kim (2005) yaptıkları çalışmada müşteri tercihlerini veya önceliklerini belirlemek için collaborative filtering (ortak filtreleme-işbirliğine yönelik süzgeç) algoritmasını kullanmışlardır. Yaptıkları çalışmada bu tekniği inceleyerek satış örüntülerini ortaya çıkarmaya çalışmışlardır.(Jong-Seok Lee, Jun, Lee J. ,Kim, 2005)

Birliktelik Kuralları

Bilgisayarların hayatın içinde öneminin artması ve her alanda kullanılmaya başlamasıyla birlikte veriye ulaşım hızı artmıştır. Günlük işlemler içerisinde birçok veri doğrudan veri tabanlarında yerini almaktadır. Perakende sektörü veri madenciliği tekniklerinden en çok yararlanan sektörlerin başında gelmektedir. Süper market uygulamalarında özelleşerek Market sepet analizi adını almış genel literatürde birliktelik kuralları olarak geçen yöntem sayesinde farklı ürünlerin beraber satın alınma oranları incelenebilir. Bu ürünler arasındaki ilişkilerin matematiksel verilere dökülebilmesi sayesinde birçok çalışma yapılabilmektedir.

Market sepet analizi ile müşterilerin yaptıkları alışverişlerden ürünler arasındaki birliktelik kuralları elde edilir. Elde edilen birliktelik kuralları yardımıyla marketler çeşitli stratejiler geliştirirler. Sepet analizinde amaç alınan ürünler arasındaki ilişkiyi bulmaktır. Bir markette ki A ürününü alan müşterilerin hangi olasılıkla B ürününü de aldıkları birliktelik kuralları sayesinde bilinir.(Mehpare T., Umman Ş., 2008)

Birliktelik kurallarını etkili bir şekilde kullanmak için çok sayıda yöntem vardır. Veri yığınlarından anlamlı örüntüler çıkarmak zor bir iştir. Belirli bir amaca uygun olarak kullanılacak bu ilişkilerden önemsiz olanlarını ayırmak için bazı ölçütlerin belirlenmesi gereklidir. Bu ölçütler güven ve destek değerleridir. (Mehpare T., Umman Ş., 2008)

Destek ölçütü, (1) ifadesi ile elde edilir ve veri setinde bu ilişkinin ne kadar sık olduğu gösterir. Güven ölçütü ise (2) ifadesi ile elde edilir ve veri satırında A nesnesinin olması durumunda B nesnesinin de hangi olasılıkla olacağı anlamına gelmektedir.(Birant, Kut, Ventura, Hakan- Benal-Elvan Altınok, Ihlamur, YIL?)

$$Destek(\mathrm{A},\mathrm{B}) = \frac{\mathrm{s}(\mathrm{A},\mathrm{B})}{s(\mathrm{E})} \tag{1}$$

$$Güven(\mathrm{A},\mathrm{B}) = \frac{Destek(\mathrm{A},\mathrm{B})}{Destek(\mathrm{A})} \tag{2}$$

Örneğin; bir markette satın alınan ekmeklerle yumurta çeşitlerinin analiz sonuçlarına göre destek değeri 0,45, güven değeri 0,35 olsun. Bunun anlamı markette yapılan alışverişlerin yüzde 45'inde ekmek ve yumurta çeşitleri beraber satın alınmış ve ekmek satın alan müşterilerin yüzde 35'i de yumurta çeşitlerinden de alım yapmıştır.

Çok Boyutlu Ölçekleme Analizi

Bu çalışmada birliktelik kuralları yaklaşımıyla elde edilen güven değerleriyle ürün kategorileri arasında yakınlık matrisi kurulmuş ve çok boyutlu ölçeklendirme yöntemiyle ürün gruplarının depo içerisindeki yerleri belirlenmiştir. ÇBÖ analizi, yüksek boyutlu veri setlerinde birimlerin (veya değişkenlerin) birbirlerine göre konumlarını daha az boyutlu düzlemde grafiksel olarak göstermeyi amaçlar.(Selim G., 2011)

Young ve Household (1938) ile Richerdson (1938) 'in çalışmalarıyla ÇBÖ analizindeki ilk adım atılmıştır. Fakat ÇBÖ analizinin temellerinin atıldığı dönemin şartlarında bilgisayar teknolojileri çok ileri düzeyde olmadığından uygulama düzeyine geçilememiştir.(Selim G., 2011)

ÇBÖ analizinde n birim ya da nesneden oluşan bir veri setinden elde edilen uzaklık değerleriyle, n noktanın tek ya da m (m < n) boyutlu uzayda, genellikle öklid uzayında grafiksel gösterimini elde etmek amaçlanmaktadır. M boyutlu bir öklid uzayında, i. ve j. noktalar arasındaki uzaklık eşitlik (3) ifadesi ile elde edilmektedir. (Giguere, 2006)(Abramsson-Zetterberg L., Darnerut, Wretling, 2014)

$$d_{ij} = \sqrt{\sum_{a=1}^{m} (x_{ia} - x_{ja})^2} \tag{3}$$

CBÖ analizinde amaç, orijinal uzaklıklar ile konfigürasyon uzaklıkları arasındaki uyumsuzluğun bir göstergesi olan stress değerini en küçüklemeye çalışmaktır. Burada n değişkenli n boyutlu veri matrisine sahip olan n birey ya da birimin kaç boyutlu bir uzayda gösterilebileceğine karar vermede, istenilen boyut için elde edilen konfigürasyon uzaklıkları ile orijinal veriden elde edilen uzaklıklar arasındaki uygunluk dikkate alınmaktadır. (Giguere, 2006)

Gerginlik (stress) ölçüsü;

$$S = \sqrt{\frac{\sum_{i=1}^{R} \sum_{j=i+1}^{R} (\partial_{ij} - d_{ij})^2}{\sum_{i=1}^{R} \sum_{j+1}^{R} d_{ij}^{\,2}}} \tag{4}$$

Burada n veri setindeki eleman ya da nesne sayısını, ∂_{ij} değerleri gözlenen uzaklıklar olan p_{ij} değerlerinin, geometrik sunumdaki d_{ij} uzaklıklarına optimal yakınsamalarını ifade etmektedirler. Stres değerinin sıfıra eşit olması mükemmel uyumu gösterirken, bire eşit olması tam uyumsuzluğu göstermektedir. Kruskal (1978) 0,05 stres değerinin iyi, 0,20 stres değerinin zayıf bir uyumu gösterdiğini ileri sürmüştür. Ancak bu değişebilen bir kavram olup, birim ya da nesne sayısı arttıkça ve boyut sayısı azaldıkça stres değerinin arttığı bilinmektedir.(Giguere, 2006)

ÇBÖ analizi, metrik olan ÇBÖ ve metrik olmayan ÇBÖ şeklinde iki grupta incelenmektedir. Metrik olan ÇBÖ analizi nicel ve metrik uzaklıklara dayalı verilere uygulanmaktadır. Metrik olmayan ÇBÖ analizi ise skor, sıralı, kategorik verilere uygulanmaktadır. Metrik olmayan ÇBÖ, metrik olan ÇBÖ ye göre daha az varsayım gerektirmektedir ve bu nedenle daha tercih edilirdir.(Özdamar, 2004) Bu nedenle bu çalışmada da metrik olmayan ÇBÖ analizi kullanılmıştır.

Uygulama ve Yorumlar

Bu çalışmanın amacı, bir ana dağıtım deposunun farklı müşterilerinden gelen siparişlerini, veri

madenciliği yöntemlerinden birliktelik kurallarıyla inceleyerek kategoriler arası ilişkileri ortaya çıkarmak ve bu ilişkilere göre birlikteliği yüksek olan ürün gruplarını daha yakın konumlandırılacak şekilde çok boyutlu ölçeklendirme kullanarak depo dizaynı yapmaktır.

Araştırma sırasında, veri madenciliği uygulamasında yol gösterici bir süreç olan ve çoğu veri madenciliği uygulamasında standart olarak kullanılan CRISP-DM modeli uygulanacaktır. Bu modele göre proje 5 safhadan oluşmaktadır. Araştırmanın oluşturulması, verilerin oluşturulması, verilerin hazırlanması, modelleme ve değerlendirme.

Uygulamanın gerçekleştirildiği işletmenin amacı rekabetin hızla arttığı perakendecilik sektöründe müşterilere daha iyi hizmet verebilmek, müşteri siparişlerini daha hızlı hazırlayabilmek ve daha az maliyet harcamaktır.

İşletme içinde çok sayıda ürün grubu ve grupların içinde yer alan ürün çeşitleri mevcuttur. Eldeki satış verilerine göre çeşitli stratejiler uygulanmaktadır fakat ürünler arasındaki bağlantılar bilinmediğinden buna dair bir çalışma yapılmamaktadır.

İşletme ile görüşüldüğünde bir veri ambarına sahip olduğu fakat bunun yorumlanması konusunda bilgi sahibi olunmadığı görülmüştür. Veri madenciliğinin önemi ve yapılacak çalışmalar ile çeşitli yerlerde stratejiler geliştirilebileceği anlatılarak işletmeden veriler alınmıştır.

İşletmeyle yapılan görüşmeler sonucunda ham veriler alınarak. Veri madenciliğinde verilerin hazırlanması prosedürlerine uyarak işlenmiştir. Bu verilerde sipariş ID, ürün ID ve ürün adet adı altında 3 kategoriye ait bilgiler bırakılarak diğer veriler ayıklanmıştır. Müşterilerin belirli bir dönemdeki siparişlerini içeren veri setinin çalışma için kullanılacak formunun bir örneği bölümü Tablo 1 de verilmiştir.

Tablo 1: Düzenlenmiş sipariş verileri

Sipariş ID	Ürün ID	Miktar
1	11	20
1	2	15
1	8	12
1	22	17
2	11	13
2	9	18
3	6	27
3	15	13
3	13	11

Müşteri siparişleri daha rahat işlem yapabilmek için belirli ürün gruplarına ayrılmıştır. Çalışma kapsamında yapılacak analiz kategoriler arasında yapılacağından alınan ham veriler Tablo 2'deki ürün gruplarını kapsayan kategorisel veriye dönüştürülmüştür.

Tablo 2: Oluşturulan ana ürün grupları

No	Ürün Grubu Adı	No	Ürün Grubu Adı
1	İçecek	12	Margarin Ve Sıvı Yağlar
2	Et Ve Etli Mamuller	13	Dondurmalar
3	Balık Ürünleri	14	Alkoller Ve Tütün Ürünleri
4	Süt Ve Süt Ürünleri	15	Pasta hane Ürünleri
5	Kahvaltılıklar	16	Kırtasiye Ürünleri
6	Meyve Ve Sebzeler	17	Deterjan Ve Temizlik Ürünleri
7	Bakliyatlar	18	Kozmetik Ürünleri
8	Unlu Mamuller	19	Züccaciye
9	Bisküvi Ve Şekerlemeler	20	Bebek Ve Oyuncak
10	Dondurulmuş Gıdalar	21	Elektronik Malzemeler
11	Kuru Yemişler	22	Giyim Ürünleri

Birliktelik kurallarının belirlenmesi için RapidMiner Studio programı kullanılmıştır. Tablo 3'te düzenlenen verilerde satırlar siparişleri ve sütunlar da ürün gruplarının numaralarını göstermektedir. Daha sonra Tablo 3'teki excel formatındaki veriler çekilerek, destek değeri 0.4, güven değeri 0.7 olacak şekilde Şekil 1'deki model oluşturulmuştur.

Tablo 3: Ürün grupları ve siparişler arasındaki matris

Ür. / Sip	1	2	3	4	5	6	..	..	16	17	18	19	20	21	22
1	0	0	0	1	0	1	..	..	0	0	0	0	1	0	0
2	0	0	1	0	0	0	..	..	0	0	0	0	0	0	0
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
668	0	0	0	1	1	0	..	..	0	0	0	1	0	0	0
669	0	0	0	1	1	0	..	..	0	0	0	0	0	0	0
770	0	0	0	0	0	1	..	..	0	0	1	1	0	0	0

Birliktelik kurallarının belirlenmesi için RapidMiner Studio programı kullanılmıştır. Tablo 3'te düzenlenen verilerde satırlar siparişleri ve sütunlar da ürün gruplarının numaralarını göstermektedir. Daha sonra Tablo 3'teki excel formatındaki veriler çekilerek, destek değeri 0.4, güven değeri 0.7 olacak şekilde Şekil 1'deki model oluşturulmuştur. RapidMiner programı kullanılarak birliktelik kuralları çıkarılmıştır.

Şekil 1: RapidMiner Studio Modeli

Ürün grupları arasında elde edilen destek ve güven değerlerinin bir bölümü Tablo 4 ile gösterilmiştir.

Tablo 4: Ürün grupları arasındaki birliktelik kuralları

Kural	Öncül Ürün Grubu	Sonuç Ürün Grubu	Destek	Güven
1	1	4	0,072	0,498
2	20	11	0,058	0,197
3	16	1	0,066	0,421
4	8	14	0,043	0,328
5	7	1	0,056	0,359
6	2	3	0,051	0,278
7	5	7	0,071	0,302
8	3	6	0,046	0,289
9	12	9	0,041	0,345
10	10	13	0,047	0,319

Tablo 4'te oluşan birliktelik kurallarından bir bölümü verilmiştir. Görülen alanlar şöyle yorumlanmaktadır.
1 ve 4 numaralı ürün gruplarından ürünlerin toplam alışverişlerin yüzde 7,2'sinde beraber satın alındıkları görülmüştür. 1 numaralı ürün grubundan ürün satın alanların yüzde 49,8'i, 4 numaralı ürün grubundan ürün de satın almaktadır.

İşletmeyle yapılan görüşmelerde depo düzeninin kendileri için bir sorun olduğu ve düzensiz yerleşmeden dolayı depo içerisinde istenen ürünlerin bulunmasının zorluk çıkardığı belirtilmiştir. Bu

nedenle mevcut depo düzeninin yeniden tasarlanmasına karar verilmiştir. Soruna çözüm olarak birliktelik kurallarında birlikteliği yüksek olan ürünlerin depo içinde daha yakın konumlandırılmasıyla depo içinde geçen atıl zaman ve ürünün bulunma zorluğunun ortadan kaldırılması amaçlanmıştır. Bunun için ilk olarak birliktelik kurallarında olan güven değerleri göz önüne alınarak Tablo 5'teki kategoriler arası yakınlık matrisi oluşturulmuştur. Yakınlık matrisinde 0 değeri kapıyı, diğer değerler ürün kategori numaralarını temsil etmektedir.

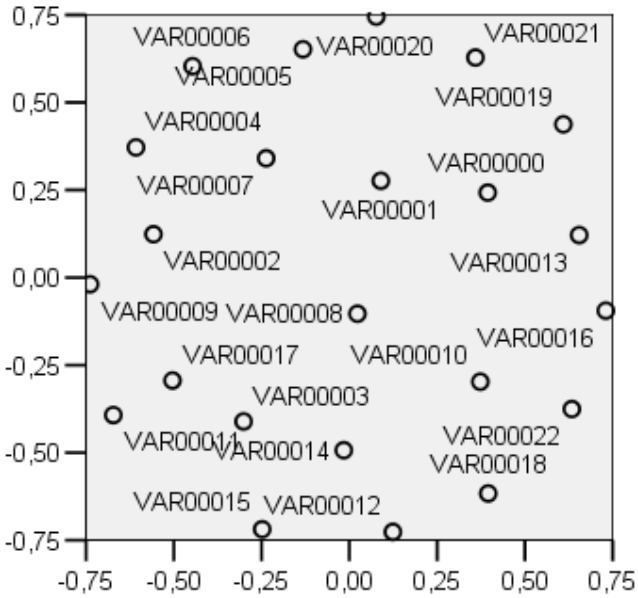
Tablo 5: Ürün grupları arasındaki ilişki matrisi

Ür. \ Ür.	0	1	2	3	..	..	19	20	21	22
0	-	0,056	0,053	0,060	..	..	0,047	0,032	0,023	0,018
1	0,084	-	0,014	0,018	..	..	0,040	0,026	0,020	0,021
2	0,028	0,044	-	0,018	..	..	0,040	0,026	0,020	0,021
..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..
20	0,067	0,054	0,068	0,045	..	..	0,041	-	0,021	0,002
21	0,052	0,031	0,014	0,007	..	..	0,045	0,037	-	0,008
22	0,053	0,056	0,058	0,053	..	..	0,078	0,036	0,071	-

Çok boyutlu ölçeklendirme analizi için SPSS programı kullanılmıştır. Oluşturulan yakınlık matrisi programa girilerek analiz yapılmış ve Şekil 2'deki iki boyutlu grafik elde edilmiştir.
ÇBÖ analiz sonucuna göre stres değeri 0,143 ve kareli korelasyon katsayısının (R2) değeri 0,93 olarak elde edilmiştir. Sonuçlar anlamlı ve kabul edilebilirdir.

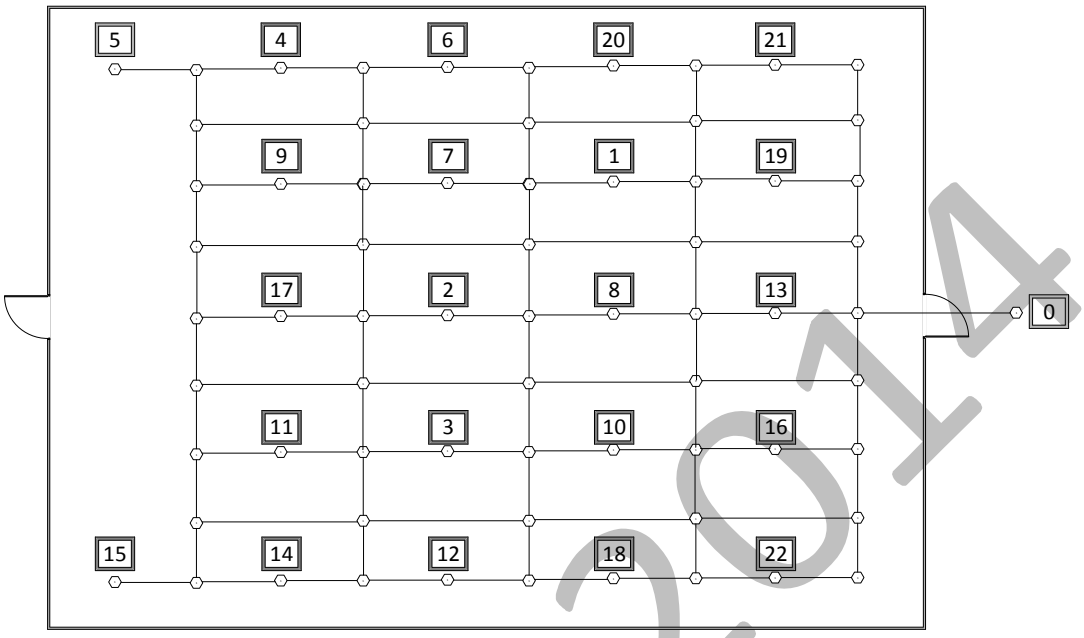
Çok boyutlu ölçekleme analizi sonucunda ürün grupları iki boyutlu düzlem üzerinde şekil 2 deki gibi dizilmiştir.

Şekil 2: Çok Boyutlu Ölçekleme Analizi Sonuçları



ÇBÖ analiz sonuçlarına göre şekil 3'teki yeni bir depo yerleşimi önerilmiştir.

Şekil 3: Önerilen Depo Düzeni



Önerilen yeni yerleşim düzeninde ürünler birliktelik analizinde elde edilen ilişkilerin yardımıyla farklı adreslerde depo edilmeye başlanmıştır.

Sonuçlar ve Yorumlar

Perakende sektöründe hizmet veren bir depoda farklı ürün gruplarının bir sipariş içerisinde toplanılarak sipariş hazırlandığı için beraber daha fazla sipariş edilen ürün grupları birliktelik kuralları ve Çok boyutlu ölçekleme analizi yardımıyla yaklaştırılmıştır. Çalışma sonucunda elde edilen sonuçların doğruluğunu test etmek için 770 adet farklı siparişten, 4855 adet farklı üründen oluşan veri setinin her iki depo yerleşimi için toplanması toplam mesafeler hesaplanmıştır. Tablo 6'da görülebileceği gibi önerilen yeni yerleşim düzeninde 2310 metre daha az yol kat edilmiştir. Eğer aynı sürelerde iki düzende sipariş toplanma işlemi gerçekleştirilseydi önerilen yerleşim düzeninde yaklaşık 45 adet fazla sipariş toplanabilirdi.

Tablo 6: Depo Tasarımlarının Karşılaştırılması

Yerleşim Düzenlerinin Karşılaştırılması(metre)	
Mevcut Yerleşim	41834
Önerilen Yerleşim	39524

Lojistik sektörünün önemli yapılarından biri olan depolarda her gün, defalarca tekrarlanan sipariş toplama işleminin iyileştirilmesi bu çalışma kapsamında sağlanmıştır.

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Farklı agrega mineralojisi ve tane dağılım optimizasyonlarının kendiliğinden yerleşen GRC betonların mekanik özelliklerine etkisi

Serkan SUBAŞI[1], Mehmet EMİROĞLU[1], Ahmet BEYCİOĞLU[1], Bekir ÇOMAK[1],

Volkan ÖZDAL[2], Enis BİLİM[2], Muhammed MARAŞLI[3]

[1]Düzce Üniversitesi, Teknoloji Fakültesi, İnşaat Mühendisliği Bölümü, Konuralp, Düzce, TURKEY.

[2]Düzce Üniversitesi, Fen Bilimleri Enstitüsü, İnşaat Mühendisliği Anabilim Dalı, Konuralp, Düzce, TURKEY.

[3]Fibrobeton Yapı Elemanları San. İnş. ve Tic A.Ş, Düzce, TURKEY.
abeycioglu@gmail.com

Abstract: Bu çalışmanın amacı, dünyada kullanımı giderek yaygınlaşan cam fiber takviyeli betonlarda (GRC) farklı mineralojik özelliklere sahip olan agregaların ve tane dağılımlarının kendiliğinden yerleşen GRC betonların mekanik özelliklerine etkisini araştırmaktır. Çalışma kapsamında hazırlanan GRC karışımlarında silis ve bazalt olmak üzere iki farklı mineralojik özelliğe sahip olan 0-1500 mikron aralığında tane boyutuna sahip olan agregalar, CEM I 52,5 R beyaz portland çimentosu ve hiperakışkanlaştırıcı kimyasal katkı maddesi kullanılmıştır. Silis ve bazalt agregaları ile 3 farklı tane dağılım optimizasyonuna sahip GRC beton örnekleri hazırlanmıştır. Hazırlanan örnekler üzerinde taze beton yayılma ile 7 ve 28. günlerdeki basınç dayanımı değerleri ölçülmüştür. Sonuç olarak; agrega mineralojisindeki farklılığa bağlı olarak basınç dayanımı değerlerinde önemli bir değişim olduğu, bazalt agregası ile üretilen GRC'lerin silis agregası ile hazırlanan GRC'lere göre daha yüksek basınç dayanımı değerlerine ulaştığı görülmüştür. Ayrıca GRC üretiminde kullanılan standart tane dağılımına kıyasla çalışma kapsamında gerçekleştirilen optimize edilmiş tane dağılımları ile basınç dayanımı değerlerinde %54'lere varan bir artışın sağlanabileceği tespit edilmiştir.

Keywords: GRC, Agrega, Mineraloji, Mekanik özellikler, Tane dağılımı, Beton

Giriş

Cam elyaf takviyeli beton (Sektörel terminolojik adıyla: Glass Fiber Reinforced Concrete GRC), farklı mekanik özelliklere sahip olan çimento harcı ve kırpılmış cam elyafların birleşimiyle oluşan kompozit bir malzemedir (Enfedaque et al, 2015). Çimento iyi bir basınç dayanımına sahip olmasına rağmen çok düşük bir çekme dayanımına ve düktiliteye sahip olan gevrek bir malzemedir ve bu gevrek davranış ancak liflerin dahil edilmesiyle modifiye edilebilmektedir (Itterbeeck et al, 2009). GRC içerisinde kullanılan cam elyaf, çimento harcının basınç dayanımını düşürmeden tokluğunu, eğilme dayanımını ve çekme dayanımını iyileştirmektedir (Enfedaque et al, 2011). GRC'lerin temel kullanım alanı özellikle cephe kaplama panelleridir. Bunun yanısıra yüksek mekanik özellikleri, yangın dayanımı, korozyon direnci, kolay kalıplanabilirliği nedeniyle birçok farklı uygulamada da kullanılabilmektedir (Enfedaque et al. 2012). Avrupa'da GRC özellikle yapısal olmayan cephe kaplama panellerinin üretiminde 30 yılı aşkın bir süredir kullanılmaktadır (Correia, et al 2006). GRC üretiminin ilk başladığı yıllarda en çok ilgi çeken sorunlardan bir tanesi özellikle çimento harcının yüksek alkalinitesi nedeniyle cam elyafların durabilite sorunlarıydı. Zaman geçtikçe bu sorun alkali direnci yüksek elyafların üretimiyle pratik bir biçimde çözülmüş oldu (Ferreira et al, 2007).

Bu çalışmada kompozit GRC malzemenin temel iki bileşeninden olan, kompozitin dolgu kısmını temsil eden ve mekanik performans üzerinde önemli düzeyde katkı sağlayan harç fazına yoğunlaşılmıştır. Bu kapsamda kompozitte geçirimlilik, bağlayıcı kullanım miktarı vb birçok parametreyi etkileyen agraga tane dağılımı üzerinde çalışılmıştır. Çalışmada 3 farklı tane dağılım optimizasyonları ve iki farklı agrega türüyle üretilen GRC'lerin basınç dayanımları belirlenmiştir.

Materyal ve Yöntem

Çalışmada hazırlanan GRC karışımlarında agrega olarak 0-1500 mikron aralığında tane boyutuna sahip silis ve bazalt agregaları kullanılmıştır. Agregalardan silis kumu Çeliktaş AŞ'den bazalt kumu ise Aldur madencilik'ten temin edilen doğal agregalardır. Çalışmada optimize edilmiş kum karışımları ile üretilen tüm GRC serilerinde bağlayıcı olarak Çimsa çimento fabrikasından temin edilen CEM I 52,5 R tipi beyaz portland çimentosu kullanılmıştır. Kullanılan CEM I 52,5 R tipi beyaz portland çimentosuna ait fiziksel, kimyasal ve mekanik özellikler ise Tablo 1'de verilmiştir.

Tablo 1. Kullanılan çimentoya ait fiziksel, kimyasal ve mekanik özellikler

			Standart değerler	
Kimyasal özellikler	Sonuçlar	Test metodu	En az	En çok
Kızdırma kaybı (%)	3.3	EN-196-2	-	5
Çözünmeyen kalıntı (%)	0.18		-	5
SO3 (%)	3.23	XRF	-	4
Çözünen krom Cr-6 (ppm)	0.50	EN-196-10	-	-
Klorür (%)	0.0090	EN-196-2	-	0.10
Fiziksel özellikler				
Beyazlık (%)	85.3			
Özgül yüzey (Blaine) (cm2/g)	4470	EN-196-1,3,6	-	-
Priz başlangıç (dakika)	145		45	-
Hacim genleşmesi (mm)	1		-	10
Mekanik özellikler				
2 günlük basınç dayanımı (MPa)	39.1		30	-
28 günlük basınç dayanımı (MPa)			52.5	-

GRC betonların premix dökümlerinde beklenen en önemli özelliklerden bir tanesi de yüksek akışkanlıktır. Bu yüzden çalışmada üretilen GRC premix'lerde FİBRO WR 78 tipi hiperakışkanlaştırı kimyasal katkı kullanılmıştır. Bu katkının en önemli özelliği firmanın kendi bünyesinde üretimini gerçekleştirdiği bir hiperakışkanlaştırıcı olmasıdır. Optimize edilmiş silis ve bazalt kumu ile üretilen GRC'lere ait karışım oranları ise Tablo 2'de görülmektedir. Çalışmada üretilen GRC'lerde betonda kullanılan agrega türüne ve optimize edilmiş tane dağılımına uygun olarak OPT1BA, OPT2BA, OPT3BA, OPT1SA, OPT2SA ve OPT3SA şeklinde altı farklı kısaltma kullanılmıştır. Bu kısaltmalarda OPT optimizasyonun kısaltması olup yanında bulunan rakam ise kaçıncı optimizasyon olduğunu temsil etmektedir. Kısaltmalardaki BA ve SA ise bazalt agregası ve silis agregasını belirtmek için kullanılmıştır.

Tablo 2. Üretilen GRC'lere ait karışım oranları

Karışıma giren malzeme	Standart üretim (R)	OPT1BA	OPT2BA	OPT3BA	OPT1SA	OPT2SA	OPT3SA
CEM 1-52,5R Çimento	1000	1000	1000	1000	1000	1000	1000
Silis Kumu (30-35 AFS)	1000	-	-	-	-	-	-
Silis Kumu(optimize edilmiş)		0		0	1000	1000	1000
Bazalt kumu (optimize edilmiş)		1000	1000	1000	0	-	-
Su	300	300	300	300	300	300	300
Wr 78 Akışkanlaştırıcı	4	5	4	6	4	4	5
Yayılma cm	22	24	25	23,5	24,5	22	23

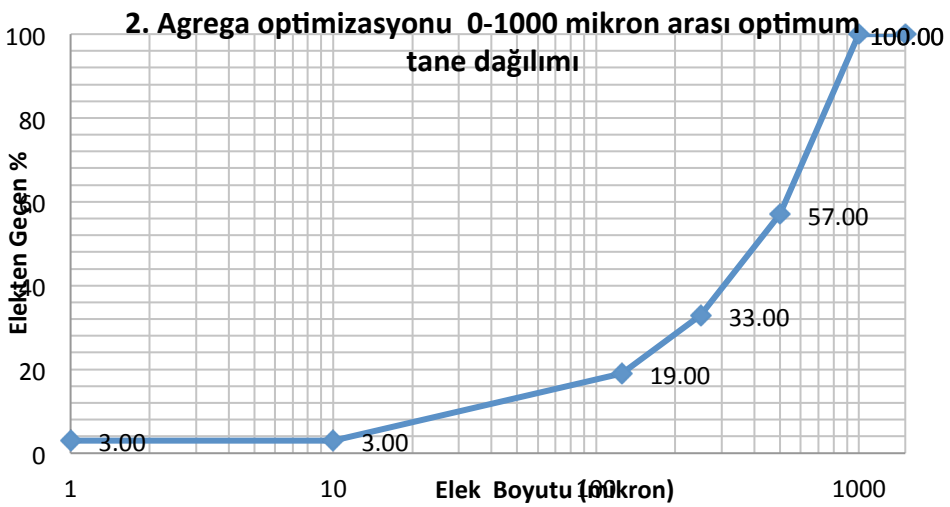
W/C	0,30	0,30	0,30	0,30	0,30	0,30	0,30

Bilim Sanayi ve Teknoloji Bakanlığı tarafından desteklenen ve 1346.STZ.2012-1 koduyla devam eden üniversite-sanayi işbirliği projesinin ön bulguları sunulan bu çalışmada deneysel olarak silis ve bazalt agregası içeren GRC premix'lere ait yayılma çapı ölçümleri ve 7 ve 28. günlerdeki basınç dayanımı deneyleri gerçekleştirilmiştir. Deneylerde yayılma çapı ölçümleri TS EN 1170- 1 ve basınç dayanım ise 50x50x50 mm küp GRC beton numuneleri üzerinde TS 196-1 standardına uygun olarak gerçekleştirilmiştir.

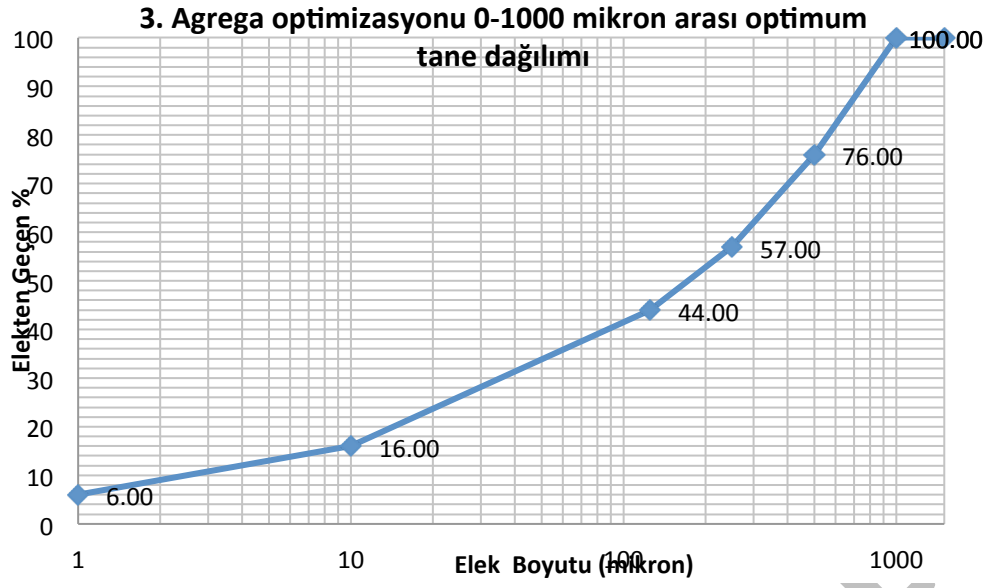
Bulgular ve Tartışma

Çalışmada gerçekleştirilen agrega optimizasyonlarından elde edilen ve maksimum kompasite ile minimum boşluk oranlarının elde edildiği karışımlar için tane dağılımı grafikleri Şekil 1, Şekil 2 ve Şekil 3'de görülmektedir.

Şekil 1. OPT1 tane dağılımı grafiği



Şekil 2. OPT2 tane dağılımı grafiği



Şekil 3. OPT3 tane dağılımı grafiği

Çalışma özellikle GRC premix harçlarının mekanik performanslarının geliştirilmesi amacıyla gerçekleştirildiği için 3 farklı optimizasyona sahip gradasyonda silis ve bazalt agregasının kullanıldığı tüm GRC karışımları için yayılma çaplarının sabit tutulması amaçlanmıştır. Çalışmada üretilen GRC karışımlarının yayılma çapı ölçümleri tüm optimizasyonlar için Tablo 3'de görülmektedir.

Tablo 3. Üretilen tüm GRC premix karışımlarının yayılma çapları

	Numune kodu	Yayılma çapı (cm)
1. Agrega optimizasyonu	R	22
1. Agrega optimizasyonu	OPT1SA	24,5
1. Agrega optimizasyonu	OPT1BA	24
2. Agrega optimizasyonu	R	22
2. Agrega optimizasyonu	OPT2SA	22
2. Agrega optimizasyonu	OPT2BA	25
3. Agrega optimizasyonu	R	22
3. Agrega optimizasyonu	OPT3SA	23
3. Agrega optimizasyonu	OPT3BA	23,5

Çalışmada üretilen GRC'ler üzerinde gerçekleştirilen basınç dayanımı deneylerinden elde edilen değerler 1. agrega optimizasyonu için Tablo 4'de, 2. agrega optimizasyonu için Tablo 5'de ve 3. agrega optimizasyonu için ise Tablo 6'da verilmiştir.

Tablo 4. 1. Agrega optimizasyonuna göre üretilen GRC'lerin basınç dayanımı değerleri

GRC kodu	7.Günlük (MPa)	Ortalama (MPa)	28.Günlük (MPa)	Ortalama (MPa)
R	60,16	60,40	71,81	67,52
	53,92		64,18	
	67,11		66,58	
OPT1SA	77,45	76,58	82,36	83,79
	74,47		89,00	
	77,82		80,00	
OPT1BA	92,80	94,09	103,00	103,67
	95,44		106,00	
	94,04		102,00	

Tablo 4'de verilen 1. agrega optimizasyonu değerleri yorumlanacak olursa R kodlu normal gradasyonla üretilen referans GRC numuneler hem 7 hem de 28 günlük kür uygulamasından sonra sırasıyla 60,40 ve 67,52 MPa ile en düşük basınç dayanımı değerlerini almıştır. OPT1BA kodlu optimize edilmiş tane dağılımı içeren seri ise 7. günde 94,09 ve 28. günde ise 103,67 MPa ile en yüksek basınç dayanımı değerlerini almıştır.

Tablo 5. 2. agrega optimizasyonuna göre üretilen GRC'lerin basınç dayanımı değerleri

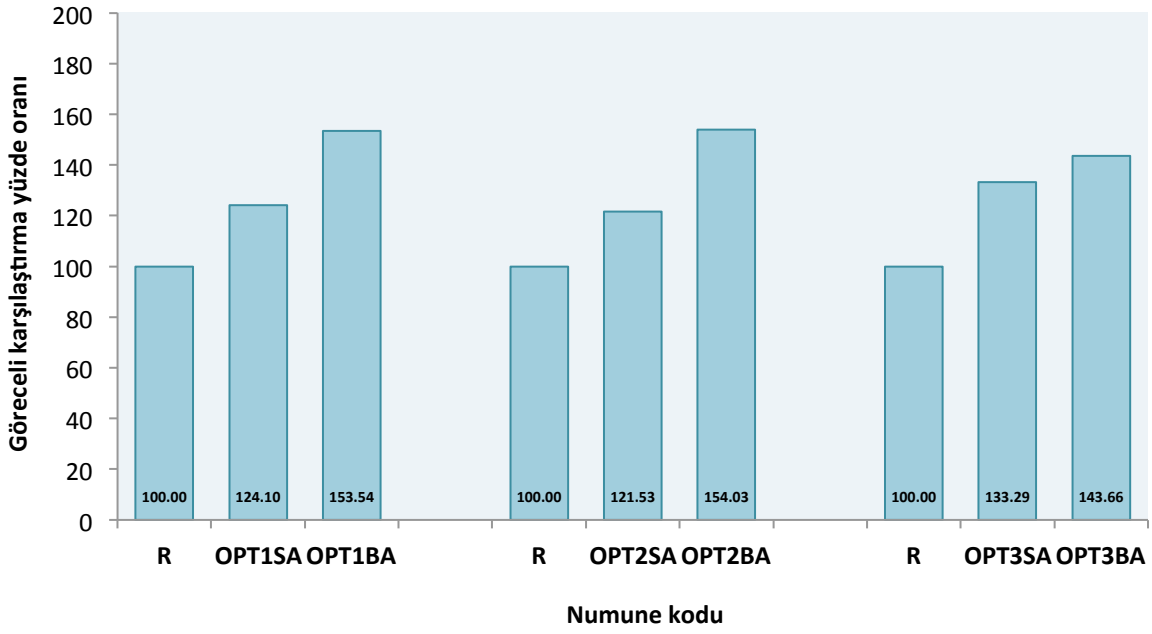
GRC kodu	7.Günlük (MPa)	Ortalama (MPa)	28.Günlük (MPa)	Ortalama (MPa)
R	60,16	60,40	71,81	67,52
	53,92		64,18	
	67,11		66,58	
OPT2SA	91,72	90,87	82,9725625	82,06
	90,02		81,6482375	
	-		81,55488125	
OPT2BA	80,92	99,13	105	104
	101,93		103	
	95,24		-	

1. Agrega optimizasyonuna benzer şekilde, Tablo 5 ve 6'da verilen 2. Agrega optimizasyonu değerleri ile 3. Agrega optimizasyonu değerleri de yorumlanacak olursa; R kodlu referans numune sırasıyla hem 7 hem de 28 günlük kür uygulamasından sonra 60,40 ve 67,52 MPa ile en düşük basınç dayanımı değerlerini almıştır. 2. ve 3. agrega optimizasyonuna uygun olarak tane dağılımı içeren serilerden OPT2BA kodlu GRC karışımı 7. günde 99,13 ve 28. günde ise 104 MPa, OPT3BA kodlu GRC karışımı ise 7. günde 85,65 ve 28. günde ise 97 MPa değerlerini almıştır.

Tablo 6. 3. agrega optimizasyonuna göre üretilen GRC'lerin basınç dayanımı değerleri

GRC kodu	7.Günlük (MPa)	Ortalama (MPa)	28.Günlük (MPa)	Ortalama (MPa)
R	60,16	60,40	71,81	67,52
	53,92		64,18	
	67,11		66,58	
OPT3SA	81,17	80,61	89,65	90
	81,82		88	
	78,84		66,34	
OPT3BA	89,67	85,65	95	97
	86,37		98,4	
	80,92		98,12	

Elde edilen bulguları daha anlamlı bir şekilde yorumlayabilmek amacıyla Şekil 4'de sunulan göreceli karşılaştırma grafiği oluşturulmuştur. Grafikte görüldüğü gibi 1., 2. ve 3. optimizasyon işlemlerinden elde edilen gradasyonlarla GRC üretildiğinde üretilen GRC betonun basınç dayanımı değerleri silis agregası kullanılan seride 1. Optimizasyon için referans numuneye göre %24, 2. Optimizasyon için %21 ve 3.optimizasyon için ise %33 oranında bir artış göstermiştir. Bazalt agregası kullanılan serilerde ise referans numuneye göre bu artışlar sırasıyla 1. Optimizasyonda % 53 ikinci optimizasyonda %54 ve üçüncü optimizasyonda ise %43 değerini almıştır.



Şekil 4. Basınç dayanımlarının karşılaştırılması için göreceli karşılaştırma grafiği

Sonuçlar

Bu çalışmada silis ve bazalt agregalarının ve bu agregalarda gerçekleştirilen tane dağılım optimizasyonlarının kendiliğinden yerleşen GRC betonlarda basınç dayanımına etkisi araştırılmıştır. Çalışmada gerçekleştirilen tane dağılım optimizasyonu ile GRC'lerin basınç dayanımlarında %21'den %54'e varan artışlar elde edilmiştir. Bu durum tane dağılımının kompozit malzemelerde mekanik performansı etkilediğini göstermektedir. Ayrıca çalışmada elde edilen sonuçlara göre, silis agregası ile bazalt agregası aynı karışım dizaynına göre üretilen GRC'lerde kullanıldığında üretilen betonlar farklı mekanik performanslar göstermiş ve basınç dayanımı değelerine göre bazalt agregası silis agregasına kıyasla daha iyi bir performans göstermiştir.

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Farklı Kesit Geometrilerine Sahip Betonarme Kolonların Davranışına Beton Basınç Dayanımının Etkisi

*[1]Abdulhalim Akkaya, [2]Naci Çağlar, [2]Aydın Demir

*[1] Teknoloji Fakültesi, İnşaat Mühendisliği, Sakarya Üniversitesi, Türkiye

[2] Mühendislik Fakültesi, İnşaat Mühendisliği, Sakarya Üniversitesi, Türkiye

Özet: Betonarme kolon davranışının kavranabilmesi için, kesit davranışının iyi bilinmesi gerekir. Kesit davranışı ise, en sağlıklı biçimde moment-eğrilik ilişkisi üzerinden elde edilir.

Bu çalışmada, eşit kesit alanına ve farklı kesit geometrisine sahip betonarme kolon modellerinin davranışına beton basınç dayanımının etkisi analitik olarak incelenmiştir. Kolonların davranışları, malzemelerin doğrusal olmayan davranışı göz önüne alınarak moment-eğrilik ilişkisi üzerinden elde edilmiştir. Bu amaçla daire, kare ve dikdörtgen kesitli kolon modelleri oluşturulmuştur. Oluşturulan modellerin analizleri XTRACT sonlu eleman yazılımı ile yapılarak modellere ait moment-eğrilik ilişkileri elde edilmiş ve grafik halinde sunulmuştur. Beton basınç dayanımının kolon davranışına etkileri, etkin eğilme rijitliği, eğrilik sünekliği ve kesit dayanımı açısından değerlendirilmiştir.

Anahtar kelimeler: Moment-eğrilik, Betonarme Kolon, Beton Basınç Dayanımı, Etkin Eğilme Rijitliği, Dayanım, Süneklik

Effect of Concrete Compressive Strength on RC Columns Behavior Having Different Geometry

Abstract: In order to fully understand reinforced concrete column behavior, sectional behavior should be known well. The section behavior can be observed the most appropriately from moment-curvature relationship.

In this study, behavior of reinforced concrete (RC) columns having equal cross section area and different geometry is investigated analytically in terms of concrete compressive strength. Behavior of RC columns is observed via moment-curvature relationship by taking into account nonlinear properties of materials constituting reinforced concrete. For this purpose different column models having circular, square and rectangular geometry are constituted. The moment-curvature relationships of created RC column models are obtained by using XTRACT v3.0.9 program and the results are demonstrated on bilinear curves. Effects of investigated parameters on column behavior are evaluated in terms of effective flexural stiffness, curvature ductility and strength.

Key words: Moment-curvature, RC column, Concrete compressive strength, Effective flexural stiffness, Strength, Ductility

Giriş

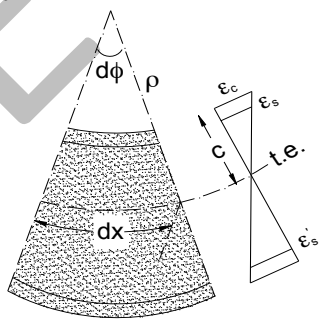
Dünyada betonarme yapı sistemlerinin kullanılmaya başlanması, 19. yüzyıl sonlarına kadar dayanmaktadır. Ülkemizde de yaygın olarak kullanılan bu sistem, beton ve donatı çeliği olmak üzere iki ana malzemeden oluşmaktadır. Bu iki malzemeden betonun davranışı gevrek, çeliğin davranışı ise sünektir. Beton doğrusal-elastik olmayan davranış sergilerken, donatı çeliğinin elasto-plastik davrandığı, yani akma gerilmesine ulaşıncaya kadar doğrusal elastik, akma gerilmesini aştıktan sonra ise plastik davranış sergilediği kabul edilir. Bu iki malzemenin birleşiminden meydana gelen betonarme malzemesinin davranışı ise nonlineer olup hem betonun, hem de çeliğin mekanik özelliklerinden etkilenmektedir (Ersoy & Özcebe, 2012).

Betonarme yapı elemanlarının davranışını, elemana ait kesit davranışı belirlemektedir. Kesit davranışı, kesitte kullanılan malzeme, kesitin geometrisi ve kesite etki eden yüklemelere bağlıdır. Eğilme etkisi altında ki bir kesitin davranışı ise en sağlıklı biçimde moment eğrilik ilişkisinden belirlenebilir. Moment eğrilik ilişkisi gerçek malzeme davranışını temel alarak yapılan analitik ve deneysel çalışmalar sonucu elde edilir (Canbay , Ersoy , Özcebe, Sucuoğlu, & Wasti, 2008).

Bu çalışmada, eşit en kesit alanına sahip dairesel, kare ve dikdörtgen betonarme kolon kesit modelleri oluşturulmuştur. Bu modellerin davranışına, beton basınç dayanımının etkisi araştırılmıştır. Kolon modellerinin davranışları, moment-eğrilik ilişkileri üzerinden incelenmiştir. Moment-eğrilik ilişkileri ise malzemelerin doğrusal olmayan davranışlarının göz önüne alındığı XTRACT v3.0.9 programı ile elde edilmiş ve grafik halinde sunulmuştur. İncelenen parametrelerin davranışa etkileri, etkin eğilme rijitliği, eğrilik sünekliği ve kesit dayanımı üzerinden değerlendirilmiştir.

Moment-Eğrilik

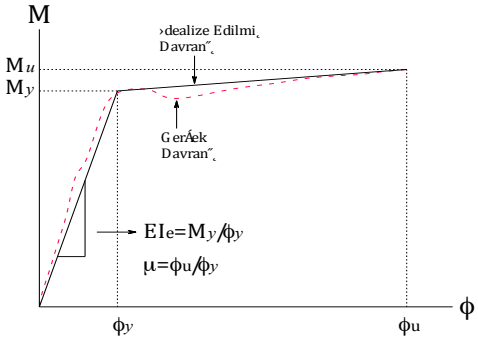
Eğilme etkisi altındaki bir kesitte meydana gelen birim dönme açısı eğrilik olarak adlandırılır. Bir elastik eğri üzerindeki iki nokta arasındaki açının, bu iki nokta arasındaki uzunluğa bölünmesi ile elde edilir. Figure 1'de eğilme etkisi altındaki bir kesite ait deformasyon şekli gösterilmiştir. Bağıntı 1'de ise, eğriliğin matematiksel tanımı yapılmıştır.



Şekil 1. Eğilme ve eksenel yük altında deforme olmuş eleman parçası (Demir & Çağlar, 2013)

$$\text{Eğrilik} = \phi = \frac{d\phi}{dx} = \frac{1}{\rho} \qquad \textbf{(1)}$$

Betonarmeyi oluşturan donatı çeliği ve beton malzemesi farklı davranış özelliklerine sahiptir. Donatı çeliğinin davranışının elasto-plastik olduğu ve çekme ile basınç gerilmeleri altındaki davranışının özdeş olduğu varsayılır. Beton ise doğrusal olmayan bir davranışa sahip olup çekme ve basınç gerilmeleri altında farklı deformasyon özelliklerine sahiptir. Gerçek malzeme davranışını göz önüne alarak elde edilen moment-eğrilik ilişkisi eğrileri, doğrusal değildir. Bu eğriler, akma momenti, akma eğriliği, etkin eğilme rijitliği ve eğrilik sünekliği kapasitesini elde etmek amacıyla iki doğru (bilineer) haline getirilerek idealize edilir.



Şekil 2. İdealize edilmiş moment-eğrilik ilişkisi (Akkaya, 2014)

Betonarme kesitlerde süneklik, kesitin dayanımında önemli bir azalma olmadan (maksimum dayanımının %15'ini kaybetmesine izin verilir) yapabileceği doğrusal ötesi deformasyon kapasitesi olarak tanımlanır. Sayısal olarak ise süneklik, eğrilik süneklik katsayısı ile ifade edilir. Eğrilik süneklik katsayısı, kesitin kırılma anında yaptığı eğriliğin(ϕu), çekme donatısının aktığı anda kesitte oluşan eğriliğe(ϕy) oranıdır.

$$\mu = \frac{\phi_u}{\phi_y} \qquad \textbf{(2)}$$

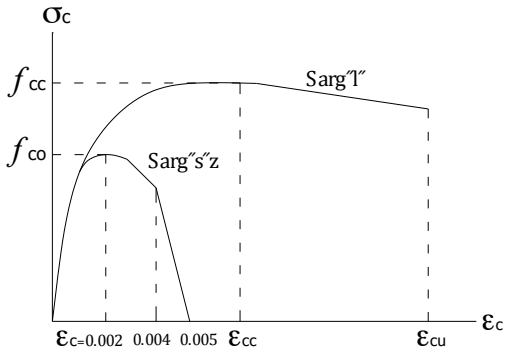
Sunulan bilineer eğrideki ilk doğrunun eğimi, çatlamış kesite ait etkin eğilme rijitliğine(EI_e) karşılık gelmektedir.

$$EI_e = \frac{M_y}{\phi_y} \qquad \textbf{(3)}$$

Malzeme Modelleri

Sargılı ve sargısız beton için tercih edilen model

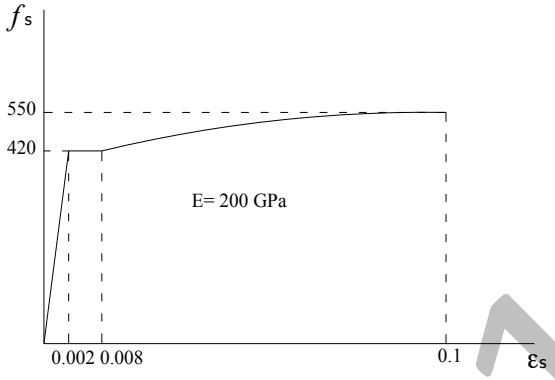
Betonarme malzemesi kompozit bir malzeme olup beton ve donatı çeliği olmak üzere iki ana malzemeden oluşmaktadır. Bu malzemelerden beton, agrega, kum ve çimento şerbetinden meydana gelmektedir. Bu nedenle iç yapısı heterojen olup davranışı da bir çok parametreye bağlıdır. Literatürde beton ile alakalı çeşitli davranış modelleri önerilmiştir. Bu çalışma kapsamında, betonun yatay donatılarla sarılmış çekirdek bölgesi ve sargısız kabuk kısmı için, TDY-2007 Bilgilendirme Eki 7B.1' de verilen Mander (1988) beton modeli edilmiştir(Şekil 3).



Şekil 3. Mander sargılı ve sargısız beton gerilme-birim şekil değiştirme eğrileri (DBYBHY, Deprem Bölgelerinde Yapılacak Binalar Hakkında Yönetmelik, 2007)

Donatı çeliği için tercih edilen model

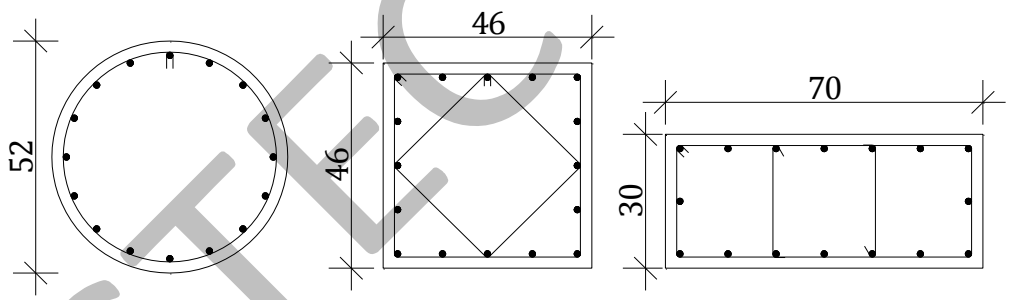
Bu çalışmadaki tüm kesit modelleri için, donatı çeliği olarak S420 seçilmiştir. Donatı çeliği davranış modeli için, TDY-2007 Bilgilendirme Eki 7B.2'de verilmiş olan gerilme-birim şekil değiştirme eğrilerinden faydalanılmıştır (Şekil 4).



Şekil 4. S420 donatı çeliği gerilme-birim şekil değiştirme eğrisi (DBYBHY, Deprem Bölgelerinde Yapılacak Binalar Hakkında Yönetmelik, 2007)

Sayısal Çalışma

Bu çalışmada, betonarme yapıların en önemli bileşeni olan betonun, betonarme kolon davranışı üzerindeki etkisi incelenmek amacıyla, eşit en kesit alanına sahip dairesel, kare ve dikdörtgen kolon modelleri oluşturulmuştur. Oluşturulan bu modellerin moment-eğrilik ilişkisi XTRACT sonlu elemanlar programıyla elde edilmiştir.



Şekil 5. Kolon modellerine ait kesitler

Kesitlerde kullanılan donatı çapları, donatı oranları, kesit boyutları ve kesitlere etkiyen maksimum eksenel kuvvet düzeyi, TS-500 ve TDY-2007 de verilen sınırlamalar dikkate alınarak belirlenmiştir.

Kesitlere etkiyen maksimum eksenel kuvvet aşağıdaki koşulları sağlayacak şekilde belirlenmiştir.

$N_{dm} \leq 0{,}5\, A_c f_{ck}$ (TDY-2007) **(4)**

$N_d \leq 0{,}6\, A_c f_{ck}$ (TS-500) **(5)**

Kesitlere iki düzeyde eksenel kuvvet etki ettirilmiştir. Eksenel kuvvet düzeyleri seçilirken, en düşük basınç dayanımına sahip beton sınıfının taşıyabileceği maksimum eksenel kuvvet ile en yüksek beton basınç dayanımına sahip beton basınç dayanımının taşıması gereken minimum eksenel kuvvet göz önünde bulundurulmuştur. Bu eksenel kuvvetler, basınç dayanımı en düşük olan beton sınıfı için $0{,}5\, A_c f_{ck}$ olacak şekilde ve basınç dayanımı en yüksek olan beton sınıfı için $0{,}1\, A_c f_{ck}$ olacak şekilde seçilmiştir.

Kesitlerde kullanılan boyuna donatı oranları, aşağıdaki koşulları sağlayacak şekilde belirlenmiştir.

$$\rho_t = \frac{A_{st}}{A_c} \quad (6)$$

$$\rho_{tmin} \geq 0.01 \quad (7)$$

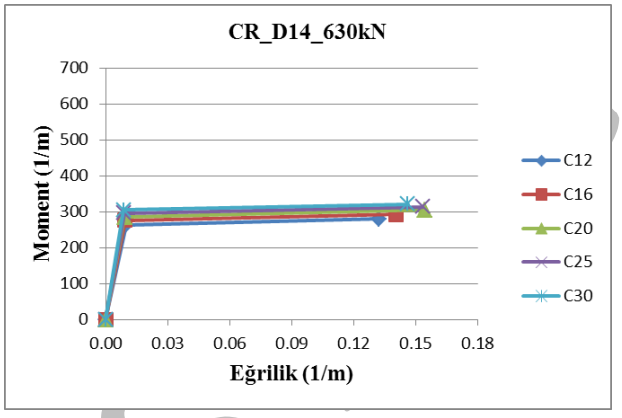
$$\rho_{tmax} \leq 0.04 \quad (8)$$

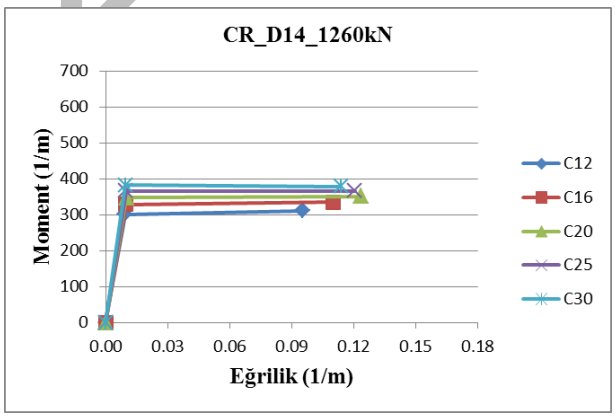
Tablo 1. Kolon modellerine ait kesit özellikleri

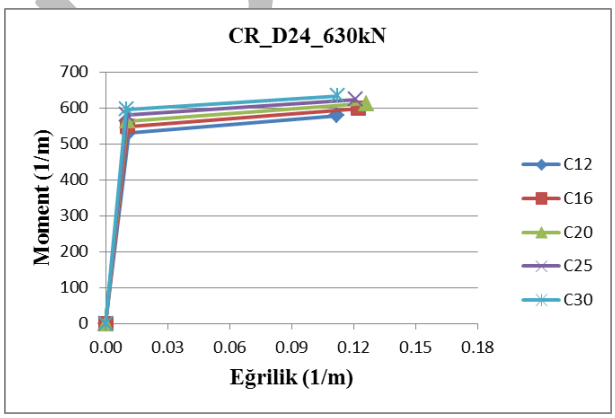
Kesit No	Kesit Boyutları (mm)			En Kesit Alanı (cm^2)	Paspayı Pp (mm)	Boyuna Donatı Sayısı	Boyuna Donatı Çap Aralığı (ϕ) (mm)	Boyuna Donatı Oranı Aralığı (%)	Enine Donatı Çapı (mm)	Beton Basınç Dayanımı Aralığı Fck(N/mm^2)	Eksenel Kuvvet Aralığı (kN)
	d_0	b	h								
CR	520	-	-	2124	25	16	14-24	1.160 – 3.408	ϕ10/80	12-30	630-1260
S	-	460	460	2116	25	16	14-24	1.165 – 3.422	ϕ10/80	12-30	630-1260
REC	-	700	300	2100	25	16	14-24	1.173 – 3.448	ϕ10/80	12-30	630-1260

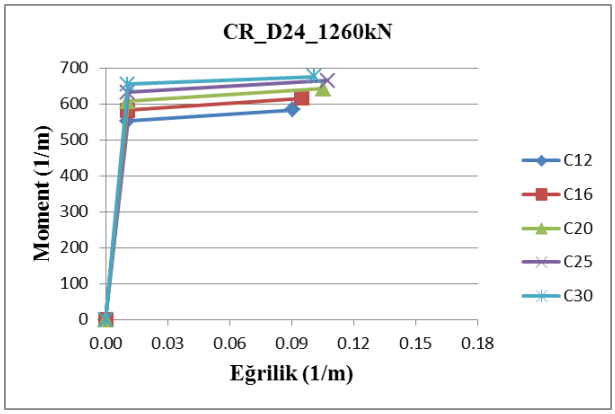
Dairesel kolonlarda beton basınç dayanımı değişimi

Beton basınç dayanımının dairesel kesit davranışı üzerindeki etkisini incelemek amacıyla her bir model 5 farklı beton sınıfı ile tasarlanmıştır(C_{12}, C_{16}, C_{20}, C_{25}, C_{30}). Beton basınç dayanımının bu modeller üzerindeki etkisi, iki farklı boyuna donatı ve iki farklı eksenel kuvvet etkisi altında incelenmiştir. Sonuçlar grafik halinde sunulmuştur.







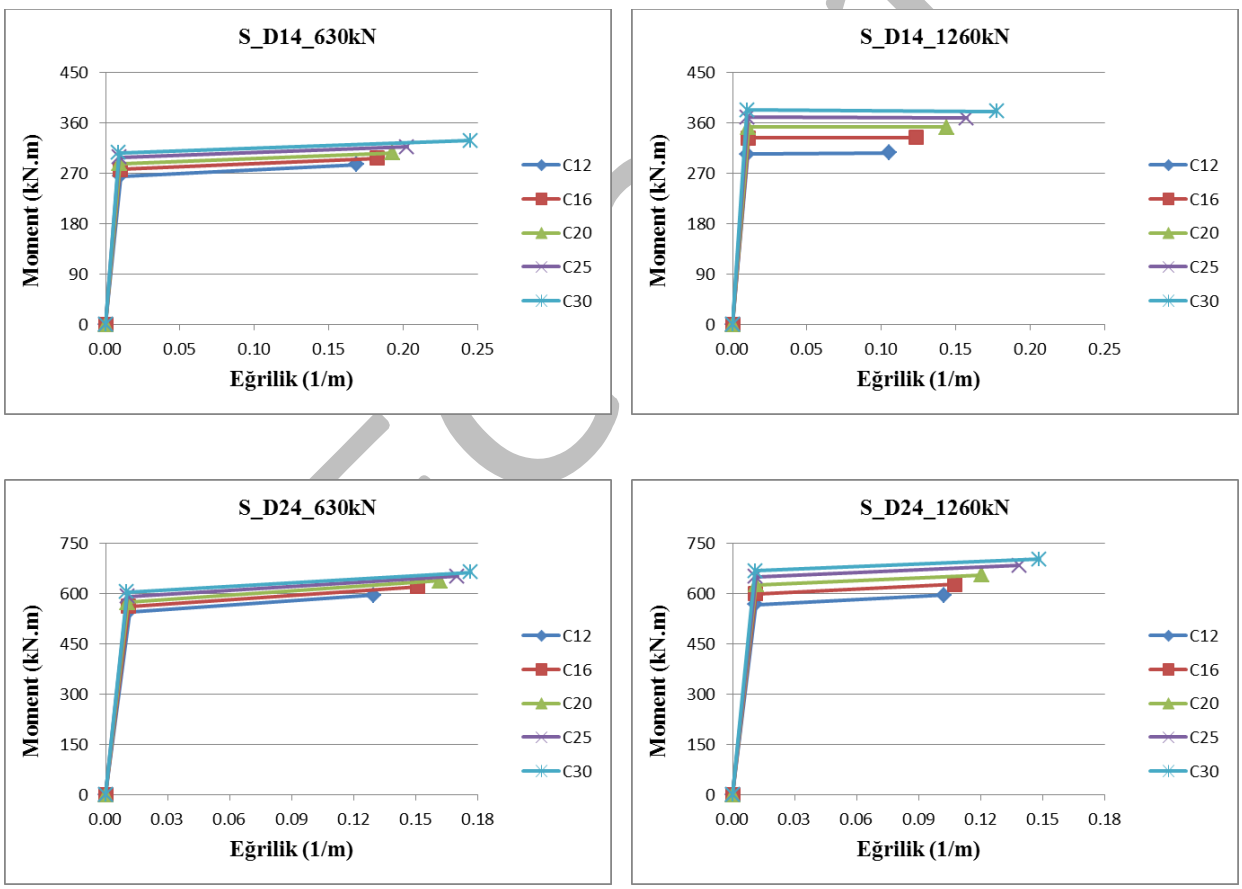


Şekil 6. Dairesel kolonlarda beton basınç dayanımı değişimi

Grafik başlıklarında bulunan D14 ve D24 ifadesi kullanılan boyuna donatının çapını göstermektedir. Grafikler incelendiğinde, eksenel kuvvetin düşük olduğu kesitlerde, beton basınç dayanımı artışıyla birlikte kesitlerin etkin eğilme rijitlikleri ve dayanımlarının arttığı, görülmektedir. Eksenel kuvvetin hakim olduğu kesitlerde ise, bu artış daha da belirginleşmektedir. Süneklik ise önce beton basınç dayanımı ile belirgin bir artış göstermekte, C20 sınıfı betonda maksimum süneklik değerine ulaşmakta ve daha sonra ihmal edilebilecek düzeyde düşüş göstermektedir.

Kare kolonlarda beton basınç dayanımı değişimi

Beton basınç dayanımının kare kesit davranışı üzerindeki etkisini incelemek amacıyla her bir model 5 farklı beton sınıfı ile tasarlanmıştır(C_{12}, C_{16}, C_{20}, C_{25}, C_{30}). Beton basınç dayanımının bu modeller üzerindeki etkisi, iki farklı boyuna donatı ve iki farklı eksenel kuvvet etkisi altında incelenmiştir. Sonuçlar grafik halinde sunulmuştur.

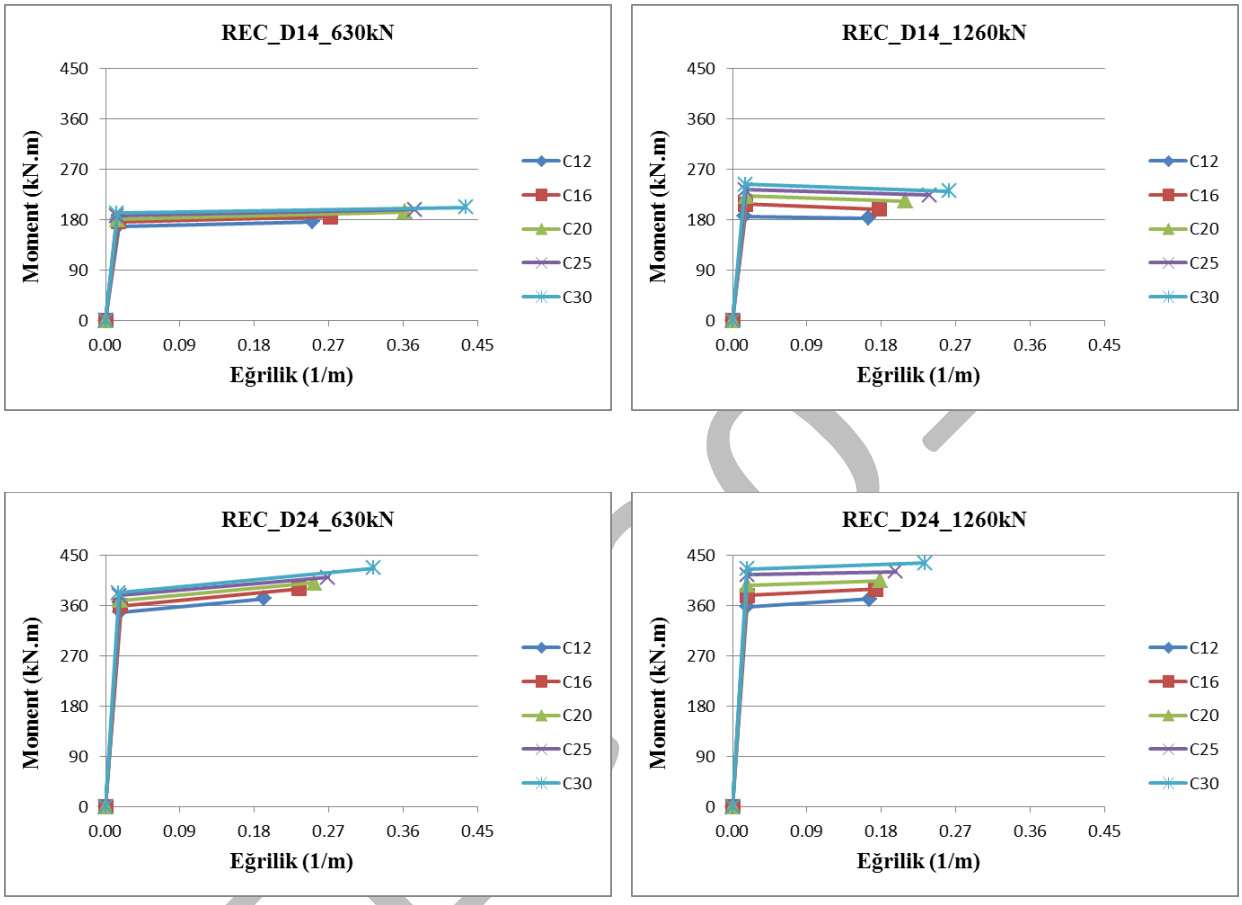


Şekil 7. Kare kolonlarda beton basınç dayanımı değişimi

Grafikler incelendiğinde, eksenel kuvvetin düşük olduğu kesitlerde, beton basınç dayanımı artışıyla birlikte kesitlerin etkin eğilme rijitlikleri ve dayanımlarında artışlar görülmektedir. Eksenel kuvvetin hakim olduğu kesitlerde ise, bu artış daha da belirginleşmektedir. Beton basınç dayanımı artışı kesitlerin eğrilik sünekliğini de olumlu etkilemiştir. Beton basınç dayanımı ile kesitlerin sünekliğinde %35'e kadar artış meydana gelmiştir. Süneklikte meydana gelen artış miktarları, kesitteki donatı oranı ve eksenel kuvvet düzeyine göre belirgin değişiklikler göstermemektedir.

Dikdörtgen kolonlarda beton basınç dayanımı değişimi

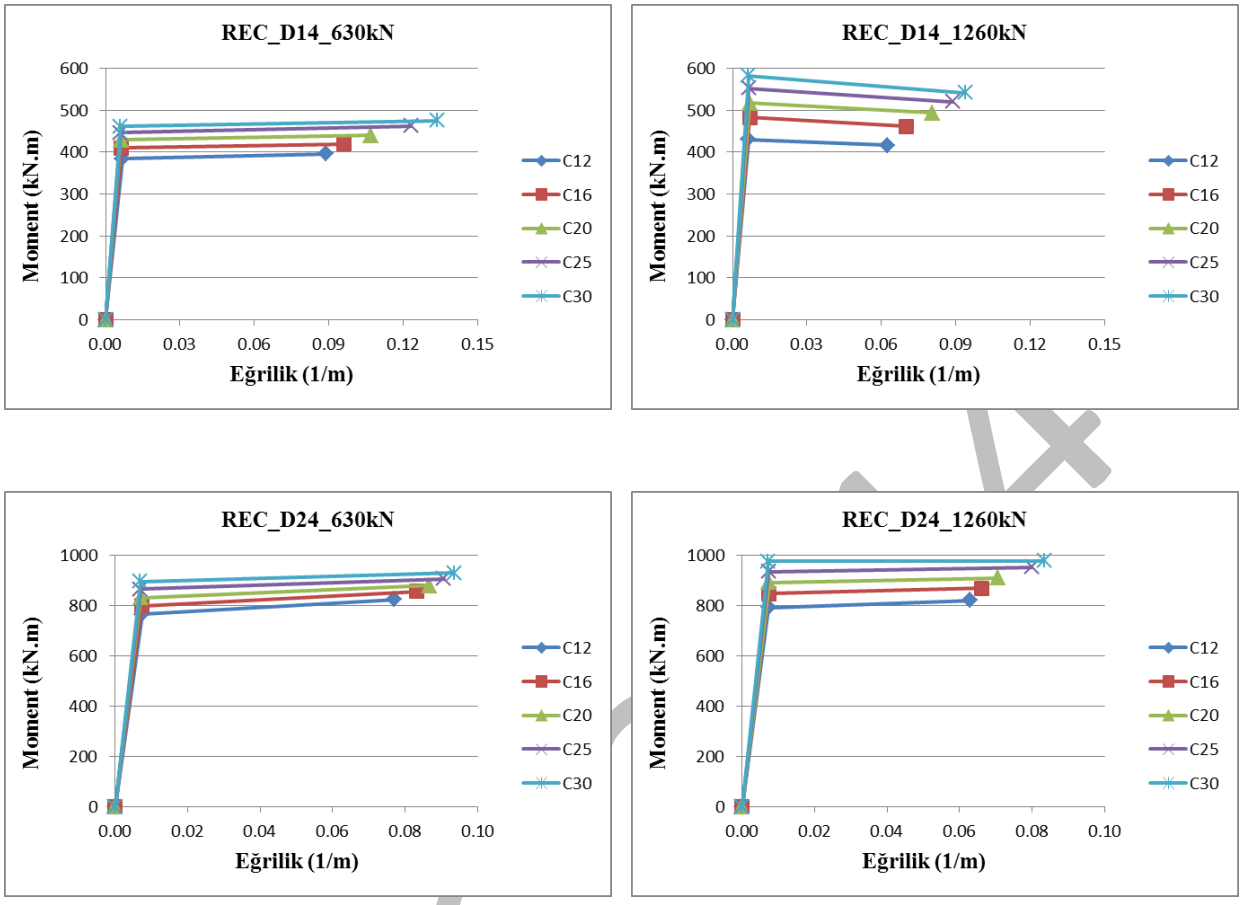
Beton basınç dayanımının dikdörtgen kesit davranışı üzerindeki etkisini incelemek amacıyla her bir model 5 farklı beton sınıfı ile tasarlanmıştır(C_{12}, C_{16}, C_{20}, C_{25}, C_{30}). Beton basınç dayanımının bu modeller üzerindeki etkisi, iki farklı boyuna donatı ve iki farklı eksenel kuvvet etkisi altında incelenmiştir. Sonuçlar kısa doğrultu ve uzun doğrultu için grafik halinde sunulmuştur.



Şekil 8. Dikdörtgen kolonların zayıf doğrultusu için beton basınç dayanımı değişimi

Grafikler incelendiğinde, beton basınç dayanımı artışıyla birlikte kesitlerin etkin eğilme rijitlikleri, dayanımları ve sünekliklerinde artışlar meydana gelmektedir. Etkin eğilme rijitliği ve dayanımdaki artış eksenel kuvvetin fazla olduğu kesitlerde daha belirginken, süneklikteki artış eksenel kuvvetin ve boyuna donatı oranının düşük olduğu kesitlerde daha belirgindir.

Sunulan REC_D14_630kN isimli grafikten görüldüğü gibi, beton basınç dayanımının artışıyla birlikte kesitlerin eğrilik sünekliğinde %100 lük bir artış meydana gelmiştir.



Şekil 9. Dikdörtgen kolonların kuvvetli doğrultusu için beton basınç dayanımı değişimi

Sunulan grafikler incelendiğinde, kesitlerin beton basınç dayanımlarındaki artış, zayıf doğrultuda olduğu gibi etkin eğilme rijitlikleri, dayanımları ve süneklikliklerinde artışlar meydana getirmektedir. Eksenel kuvvetin yüksek olduğu kesitlerde etkin eğilme rijitliğindeki ve kesitlerin dayanımındaki artışların daha belirgin olduğu görülmektedir.

Sonuç

Bu çalışmada beton basınç dayanımının kolon davranışı üzerindeki etkilerini incelemek amacıyla, eşit en kesit alanına sahip dairesel, kare ve dikdörtgenden oluşan kolon modelleri oluşturulmuş ve bunlara ait kesitlerin moment-eğrilik ilişkileri grafik halinde sunulmuştur.
Analiz sonuçları değerlendirildiğinde aşağıdaki sonuç ve önerilere varılmıştır;

-Dairesel kesitlerde:

Beton basınç dayanımı artışıyla birlikte kesitlere ait dayanım ve etkin eğilme rijitliklerinde gözle görülür bir artış meydana gelmektedir. Bu artış eksenel kuvvetin yüksek olduğu kesitlerde daha belirgin hale gelmektedir. Süneklik ise beton basınç dayanımının artışıyla birlikte önce artmakta ve daha sonra ihmal edilebilecek düzeylerde düşüş göstermektedir. Genel olarak beton basınç dayanımı artışının, kesitlere ait süneklikliklerde olumlu etkiler meydana getirdiği söylenebilir.

-Kare kesitlerde:

Beton basınç dayanımı artışıyla birlikte kesitlere ait etkin eğilme rjitliği, dayanım ve süneklik değerlerinde gözle görülür artışlar meydana gelmektedir. Etkin eğilme rijitliği ve dayanımdaki artış miktarları eksenel kuvvetin yüksek olduğu kesitlerde daha belirginken, süneklik değerlerindeki artış miktarları eksenel kuvvetin düşük olduğu kesitlerde daha belirgindir. Eksenel kuvvet artışının sünekliği olumsuz etkilediği bilinmektedir.

-Dikdörtgen kesitlerde:

Hem zayıf doğrultu, hem de kuvvetli doğrultu için beton basınç dayanımı artışı, kesitlere ait etkin eğilme rijitliği, dayanım ve süneklik parametrelerini olumlu şekilde etkilemektedir.

Genel olarak beton basınç dayanımı artışının, kesitlerin davranış parametrelerini olumlu yönde etkilediği görülmektedir. Beton basınç dayanımının davranış parametreleri üzerindeki olumlu etkisi, kesit geometrilerine göre değişiklik göstermezken, kesitteki diğer tasarım parametrelerin etkinlik düzeyine göre değişiklik gösterebilmektedir. Yapılarda kullanılacak betonun üretiminden itibaren nakliyatı, kalıplara yerleştirilmesi ve uygulama sonrası bakımı doğru şekilde yapılmalıdır. Bu aşamaların eksik yapılması ile elemanların beton basınç dayanımında düşüşler meydana gelmekte ve bu düşüşler yapı elemanlarının davranışlarını olumsuz yönde etkilemektedir.

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Fitting the cogeneration plant to energy needs

Francesco Piccininni

Department of Civil Engineering and Architecture

Via Orabona, 4, 70100 Bari, Italy
francesco.piccininni@poliba.it

Abstract: This paper proposes a scheme of cogeneration plant that allows to minimize the surplus of thermal energy and electricity produced. Using the data of consumption of thermal energy and electricity of a hospital in south Italy, it was proposed a cogeneration plant added by compression refrigerators and heat pumps and absorption refrigerators. After analyzing the thermodynamic parameters to assess the energy savings achieved as a reduction of primary energy n passing from conventional energy production to in cogeneration with integration of auxiliary machines.
It was suggest to adapt, according to the type of energy to be supplied, the components added by assessing the reduction of primary energy obtained with a scheme of this type adapted to the energy requirements monthly. The results obtained were assessed with efficiency values lower than those attributed to thermal machines to take into account that these machines are used partialized working because it supplies a power reduced with respect to the maximum possible value, then, with efficiency values lower. The results obtained have confirmed the need to fit the system to the energy requirements for the minimum consumption of thermal plants..

Key words: Cogeneration. Energy saving. Primary energy. Efficiency, Energy conversion.

Introduction

The cogeneration system uses an engine that supplies, in addition to the electricity produced, thermal energy that is rejected in traditional systems. With this kind of power plant is possible arise the efficiency up to '80% of the energy supplied to the system. These high efficiency values are valid only if the two forms of energy are used completely. Their report precise values such as 37% of electricity and 45% of thermal energy while it is hard to find users who are in need of electricity and thermal energy in the same proportion. It must take into account also that the energy needs change during the year requiring the need to heating load in winter and cooling in summer, while the ratio of the two forms of energy produced is, of course, the same. The fitting of the cogeneration plant to actual consumption of energy enables the use of cogeneration high efficiency only if there are no surplus energy. In the analysis of plant performance will not be taken into consideration opportunities, as a heat recovery system that may be not available if the cogeneration system is used in the event of refurbishing and/or the possibility of supplying any surplus of electricity to the grid because these facilitations depend on the place and the economic situation: both solutions, if active, reduce the surplus of energy and thus increase its efficiency.

The main aim is to compare the efficiency of the plant calculated in the design phase with the efficiency of the system in actual operation. It becomes important, therefore, to analyze more deeply the various configurations of the machines involved in a cogeneration plant to evaluate in a more reliable the reduction of energy consumption for the efficient evaluation of the economic convenience of the cogeneration plant.

The use of a PLC to control and manage whole the machines which constitute the cogeneration plant allows to address the energy, heat and electricity, produced to supply energy to heat pumps and

refrigerators, both in compression and absorption, to maximize the reduction of energy produced. The change of the energy needs both in quantity along the hours of the day and in quality along the months of the year requires to analyze the most common configurations in order to evaluate their effects on energy consumption. To analyze the efficiency of various configurations are taken into account, in addition to the internal combustion engine as the primary source of cogeneration, absorption chillers and reverse cycle compression machines, refrigerators and heat pumps. The PLC allows also to monitor the connections of the various machines, the operating times and, therefore, to assess the effective efficiency of the whole plant with the capability to modify the intervention strategy, if necessary.

The average values and the modulation of these parameters are important in the system configuration. The electricity consumption are easily derived from the bills and the thermal one are evaluated through the amount of fuel supplied. The consumption associated with both thermal requirement that the electric ones are differentiated from the point of view of quality. With reference to the way with which the energy is transformed and the temporal variability with which they control the consumption same.

Nomenclature

COP	heat pump efficiency
E_{CCS}	conventional electrical output,
E_{CCU}	cogeneration electrical output,
E_{CoGe}	primary energy demand by the cogeneration plant,
E_E	electricity produced,
EER_{ARS}	absorption refrigerating system efficiency
EER_{CRS}	compression refrigerating system efficiency
E_{HP}	electricity power to driving the heat pumps
E_{CoGe}	electricity actually used.
E_{Tc}	civil heat produced,
E_{Ti}	industrial heat produced,
Q_{ARS}	engine thermal power for absorption refrigerators driving
Q_{EC}	primary energy of conventional cooling
Q_{CoGe}	primary energy for the cogeneration plant,
Q_{CP}	heat power to driving absorption refrigerating system
Q_H	primary energy for conventional boiler
Q_{ICE}	heating capacity,
Q_P	primary energy demand for cogeneration
Q_{UC}	cold actually used,
Q_{UH}	heat actually used,
η_B	heating burner efficiency
η_{EL}	electricity generation efficiency

η_{Tc}	civil thermal production efficiency,
η_{Ti}	industrial thermal production efficiency,

The cogeneration plant

The cogeneration or Combined Heat and Power (CHP) is substantially an engine capable to produce mechanical power and can arrange the recovery of heat from the engine in order to use it for the technological applications for high, medium and low temperatures.

The installation of a cogeneration plant becomes more convenient when you must proceed to the replacement or installation of new heat generators or motors for the production of electricity. it should be specified that in the case of civil users and unlike industrial utilities with energy demands practically constant, the analysis is complex due to the strong variations of thermal loads and electrical and non-coincidence of variation for both energies. In the face of significant changes, the cogeneration plant cannot be sized for the maximum load to avoid incurring the penalties for lower yields at partial load.

One solution is the construction of the cogeneration plant using a group of machines having powers such that their sum is equal to the maximum power. In this way, the reduction of the thermal load is answered by turning off one or more of the units allowing the others machine to operate at the maximum load leaving only one operating in partial load thus reducing losses related to the reduction in yield due to partial load. This, however, leads to an increase in the cost of the system and an amortization period longer.

The achievement of high overall performance typical of cogeneration is subject to the effective use of heat generated from the production of electricity and thus to maintain the relationship between electricity and thermal energy demand. For this purpose it would be necessary diagrams of the electrical power demand during the day type summer and winter. It is possible, then, define the trend of the annual frequency of the power produced and the power absorption. Even at this stage have a fractionation in different machines operating in parallel would help to regulate the production of energy to the request of the same. This would be possible if it remains more or less constant ratio between electricity and thermal energy produced and absorbed.

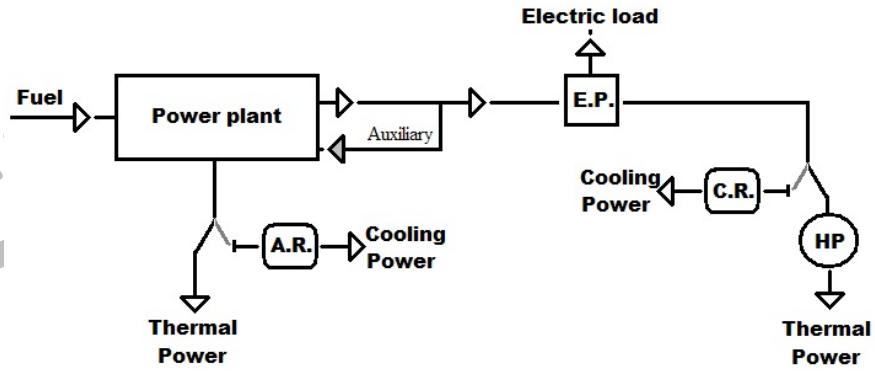

Figure 1: Schematic representation of the proposed cogeneration plant

In hospitals the production of cold is done with compression refrigerators electrically operated. This means that during the hottest hours of summer days there are high demands for electric power, not necessary in the rest of the year, that would not be possible to satisfy. It would be necessary to take such power from the electrical grid undergoing paying high rates normally linked to consumption peaks. The cogeneration plant during the summer days has a surplus of heat that can be suitably converted into cold with the use of absorption machines that can produce the necessary cold to satisfy the summer thermal load. From a thermodynamic point of view there is an increase of the quality of the system because the thermal energy produced in the summer, to be considered completely lost, is recovered in the percentage of the cooling efficiency of the absorption machine.

On cold winter days the increase of the thermal power needed to satisfy the heat load can be reduced using the more electric power produced for driving heat pumps that can provide heat in the percentage amount of the efficiency parameter, COP. Even in this case, the reduction of produced and not used energy increases the thermodynamic efficiency of the plant. Any increase in thermodynamic efficiency results in a reduction of primary energy required by the thermal plant.

To increase the flexibility of the cogeneration plant it is possible to alter the relationship between electrical and thermal energy. is possible to use compression heat pumps (moved by an electric motor) and absorption refrigeration machines. In this way if there is a greater demand of thermal energy, an increase of power supplied by the cogeneration plant would result in a surplus of electrical energy whose disposal may even lead to the disposal environment by reducing the efficiency of the plant. using the most electricity to power a heat pump of sufficient value of the COP, it is possible to reduce the power increase using the surplus of electricity supplying it to heat pump with COP value more of $1/\eta_{EL}$. reducing the power increase without any waste of energy produced. In case of increase in the demand for electricity for air conditioning in summer can be avoided by increasing proportionally the electric power generated. This would result in an increase of heat cannot be used resulting in a reduction in the efficiency of the system.

Parameters for evaluating the cogeneration effectiveness

The evaluation of the efficiency of a plant that produces heat, cold and electricity must be taken into account the efficiency with which these products are energy. The heat produced is directly characterized the performance of the burner, η_B, while the production of cold depends on the efficiency of refrigerators, EER; the obtained mechanical/electrical power is related to the energy supplied to the engine through the thermodynamic efficiency of the engine, η_{EL}. When evaluating the efficiency of energy production in a cogeneration plant production efficiencies are not directly comparable. For this reason the most effective parameter for evaluating any higher efficiency of a cogeneration plant is to evaluate the percentage of the reduction of primary energy when a cogeneration plant is involved to satisfy the heat, cold and electricity needs instead of a conventional one.

The primary energy required by a conventional system designed to produce heat, cold and use electricity is equal to the sum of primary energies required by production of the three types of energy:

$$PE_{Conv} = \frac{\sum Q_H}{\eta_B} + \frac{\sum Q_C}{EER_{CRS} \cdot \eta_{EL}} + \frac{E_{CCS}}{\eta_{EL}} \qquad (1)$$

where

$\frac{\sum Q_H}{\eta_B}$ is the primary energy demand for furnace with performance η_B,

$\frac{\sum Q_C}{EER_{CRS} \cdot \eta_{EL}}$ is the primary energy demand for refrigerators compression with efficiency parameter EER_{CRS} driven by electricity produced with performance η_{EL},

$\frac{E_{CCS}}{\eta_{EL}}$ is the primary energy demand from the production of electricity with performance η_{EL}.

The primary energy of the cogeneration power plant is the energy supplied in order to produce electric and thermal energy; as noted above cooling can be produced using heat to drive absorption refrigerator or electricity to drive compression one.

The real energy savings can be evaluated through the parameter named Primary Energy Savings defined by the following formula:

$$PES = \frac{PE_{Conv} - PE_{CoGe}}{PE_{Conv}} \qquad (2)$$

This parameter represents the reality of the energy consumption for the same meeting the energy needs satisfying; the greater thermodynamic efficiencies and/or management are these involve an actual reduction of primary energy.

European law (DIRECTIVE 2004/8/EC) states that a cogeneration plant can be regarded as a "high efficiency" in order to take advantage of incentives and facilities if the value of the parameter PES is greater than zero for power plants less than 1.0 MW and greater than 10% for power plants greater than or equal to 1.0 MW.

By inserting in the formula the values of the efficiencies of heat and electricity production the PES can be wrote as the following formula also named FERS (Fuel Energy Saving Ratio):

$$\mathrm{PES} = 1 - \frac{\mathrm{Q_{CoGe}}}{\frac{\mathrm{Q_{Tc}}}{\eta_{\mathrm{Tc}}} + \frac{\mathrm{E_E}}{\eta_{\mathrm{E}}}} \qquad (3)$$

The thermodynamic efficiency of a cogeneration system depends on the efficiency of the three components such as heat, cold and electricity. The efficiency values depend on the value of the instantaneous power because the choking of the power produced will reduce the values. The energy produced and not used cannot be taken into consideration to assess its efficiency bearing in mind that the relationship between the thermal power and the electric power generated is constant.

Using all the efficiency parameters and the percentages of the thermal energy produced by the internal combustion engine used to driving the absorption refrigerating system (Q_{EC}/Q_{ICE}) and the percentage of electricity produced by the internal combustion engine used to driving heat pump (E_{HP}/E_{CCU}) it's possible evaluate directly the variation of primary energy achievable with a cogeneration plant.

$$\mathrm{PES} = 1 - \frac{\left[1 + \frac{\mathrm{E_{CCU}}}{\mathrm{Q_{ICE}}}\right]}{\left(\frac{\mathrm{Q_{ICE}} + \mathrm{E_{CCU}}}{\mathrm{Q_p}}\right) \cdot \left[\left(\frac{\frac{\mathrm{E_{CCU}} - \mathrm{E_{HP}}}{\mathrm{Q_{ICE}}}}{\eta_{\mathrm{El}}}\right) + \left(\frac{1 + \left\{\frac{\mathrm{E_{HP}}}{\mathrm{E_{CCU}}} \cdot \frac{\mathrm{E_{CCU}}}{\mathrm{Q_{ICE}}}\right\} + \frac{\mathrm{Q_{EC}}}{\mathrm{Q_{ICE}}} \cdot \mathrm{EER_{ARS}}}{\eta_{\mathrm{B}}}\right) + \left(\frac{\frac{\mathrm{Q_{EC}}}{\mathrm{Q_{ICE}}} \cdot \mathrm{EER_{ARS}}}{\eta_{\mathrm{El}} \cdot \mathrm{EER_{CRS}}}\right)\right]} \qquad (4)$$

The cogeneration plants must be able to meet the heat demand of the technological and heat for heating, electricity for technological needs and for the production of cold necessary for the air conditioning in summer. The formula (4) expresses the possible reduction percentage of primary energy when energy needs are met with the CHP. This formula takes into account the yield at which the various forms of energy are produced. It should be noted that obtaining a reduction of primary energy used is an energy saving even in the presence of surplus energy not directly usable by the user. In this case one can think of using storage systems with regard to thermal energy or to direct any surplus electric power to the overall network.

Case of study

The object of the study hospital has about 850 beds, situated in the south of Italy consumes in a year about 1,750,000 litres of diesel and 5,000 MWh of electricity. The thermal power plant, equipped with traditional boilers, providing steam to 1.0 MPa at about 175 °C to meet the typical hospital services such as laundry, kitchen and sterilizers for both generic services such as hot water and heating in winter. There is no centralized air-conditioning plant but a room small air-conditioning.

The choice to study the application of a cogeneration system for a hospital derives from fairy for this type of users, there is well-known in literature. The thermal requirements related to heating were obtained by subtracting the heat consumption winter the heat consumption of the summer months representing the consumption of thermal energy for hospital purposes.

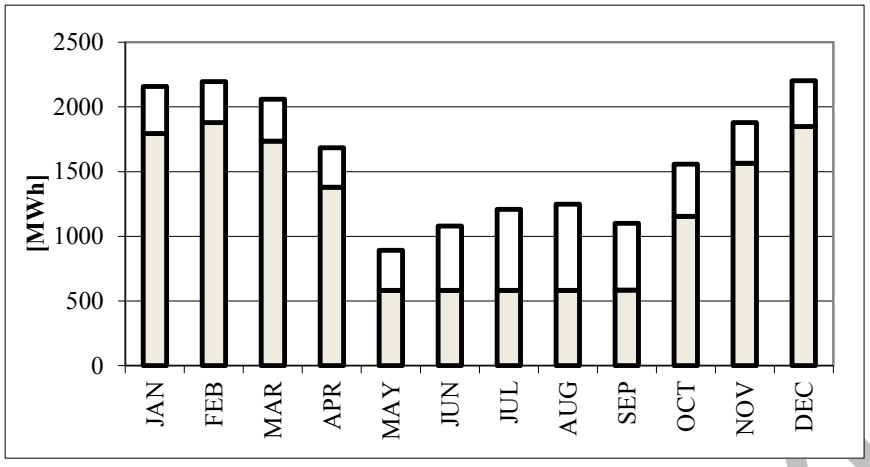

Figure 2: The thermal and electrical consumption of hospital

The monthly average thermal energy consumption (grey) and electrical ones (white) are shown in Figure 3. From the same figure is shown the increase in electricity consumption in the summer months due to the use of air conditioning. The relationship between the electrical power and thermal power is a key parameter to determine the pattern of the cogeneration plant. The plants of this type have a relationship between the two energies fairly constant which can be very different from the relationship of the needs of the hospital.

In the particular case considered is added that for security reasons, a hospital must have an ability to self-production of heat and power for the continuity of emergency services in case of power failure. This involves an economic advantage in buying, and management, the apparatus of self-production.

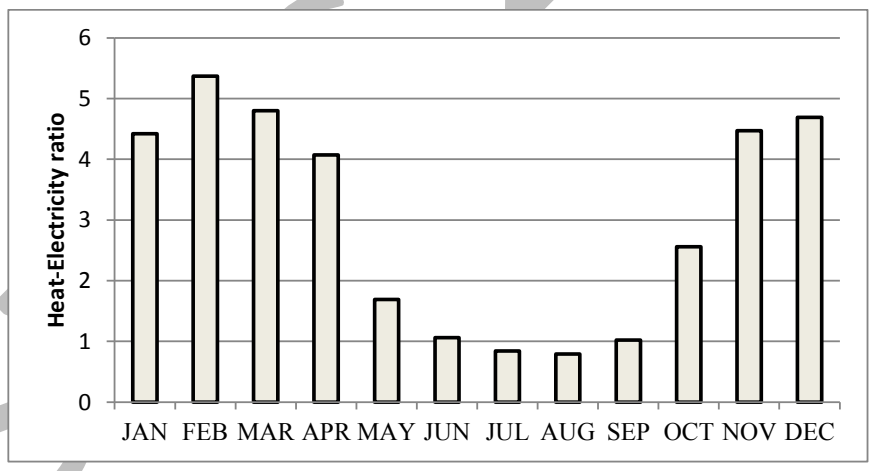

Figure 3: The ratio between the thermal and electrical energy

It is felt important to emphasize that this ability to produce energy is becoming paramount also for office buildings as the spread of the apparatuses TLC (router, wifi, and the computer itself) requires the availability of electricity is no longer available directly on the line telephone as is present on traditional phone lines.

As regards the value of the temperatures at which the heat is supplied as it is energetically more valuable the higher the temperature at which it is supplied. It is recalled that the sterilization requires 140 ° C 190 ° around the ironing, cooking little more than 100 ° C, hot water at 50 ° C and heating to around 80 ° C as well as absorption refrigeration machines. In Figure 4 shows the thermal energy at high enthalpy and the low enthalpy where we see that the heating requirements of high enthalpy is relatively low compared to that of low enthalpy.

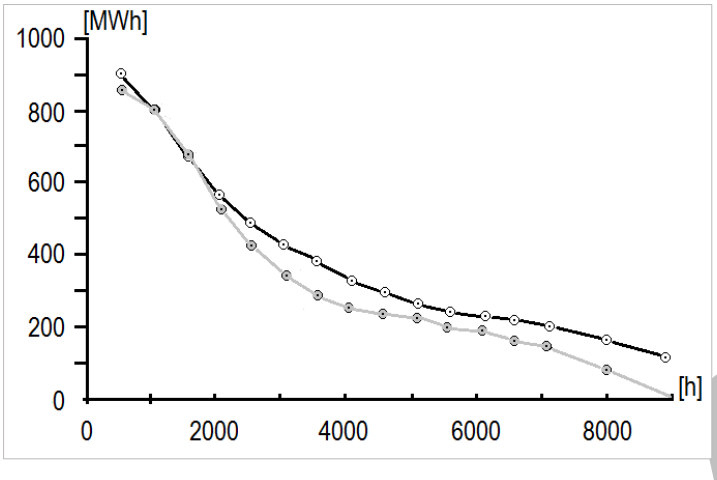

Figure 4: Total heat energy needs (black curve) and the low enthalpy thermal energy needs (gray curve).

On average, the heat consumption is divided in half between the heating and the hot water, for general uses. As regards the hot water, the percentages of utilization and the uses are indicated in the figure below.

CHP gives the ability to produce heat and electricity using about 90% of the energy supplied. The heat produced is about 58% while the electricity produced is about 32% with a ratio heat electricity equal to 1.37:1.

This high efficiency of transformation is only valid if all the electricity and all the thermal energy produced is used. If the energy requirements of thermal energy and electricity have a relationship other than that of cogeneration, the fulfillment of one leads to an imbalance of the other.

The ratio of heat and electricity energy needs required is almost always different from the relationship of cogeneration (surely it is during the day and between days) so it is needs to adapt the system to the energy requirements because the production of not used energy results as a reduction in system efficiency.

Regarding the hospital object of our analysis, in the winter period a part of the thermal power is used for technological purposes (the same throughout the year) and a part for room heating. By adjusting the heat output of CHP in order to satisfy the thermal load can have a ratio greater than the ratio heat-electricity cogeneration thus producing a surplus of electricity. Using the surplus of electrical energy to drive a heat pump would be obtained rate of heat which would reduce the thermal power produced by the motor up to the coincidence of the thermal power produced (engine plus heat pump) with the heat load, minimizing the electricity surplus.

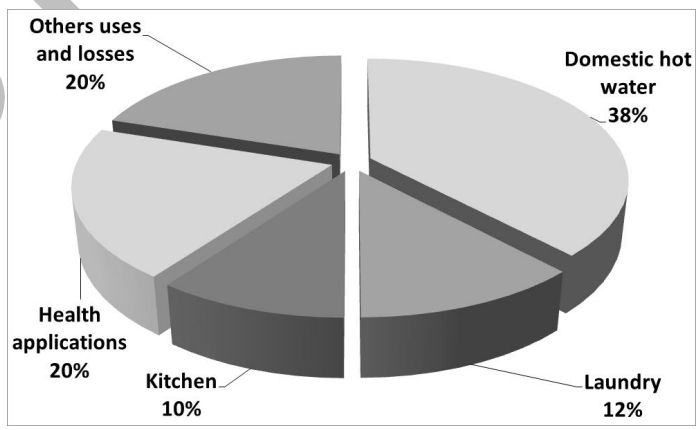

Figure 5: Percentages of the thermal energy needs in hospitals

In summer time the electricity demand is used to meet both the needs of technology (the same throughout the year) and the electrical load to produce cold for room conditioning. By adjusting the thermal power cogeneration to meet the electrical load can have a ratio less than the ratio heat-electricity cogeneration producing a surplus of thermal energy. Using the excess heat to power an absorption refrigerator is possible to satisfy a portion of the refrigeration load. Even in this case, reducing the power produced by the cogeneration engine it's possible to meet the electrical, heat and cold loads minimizing the surplus of produced energy. The primary energy can be reduced leading toward zero thermal energy surplus realizing energy savings

The consumption data collected for technological hospital every month serve 525 MWh of thermal power and 310 MWh of electrical power at a ratio heat and power equal to 1.76:1 ratio already exceeds the cogeneration 1.37:1.

Table 1: Values of the efficiencies used in the assessment of energy consumption.

Name	Symbol	Value
Absorption refrigerating system efficiency	EER_{ARS}	0,60
Heat pump efficiency	COP	3.50
CHP heat generation efficiency	η_{CHP_B}	0.47
Heating burner efficiency	η_B	0.90
CHP Electricity generation efficiency	η_{EL}	0.38
Grid Electricity generation efficiency	η_{EL_TR}	0.49

In the summer time using the same energy source of the conventional unit in a cogeneration plant to meet the electrical load there is an overproduction of heat (over 525 MWh per month). The highest demand for electricity (the part that exceeds 310 MWh per month) is bound to summer conditioning.

In the winter using the same energy source of the conventional unit in a cogeneration plant to meet the thermal load there is an overproduction of electricity (over 310 MWh per month). The reduction of primary energy does not prevent the fulfilment of energy needs. Knowing the monthly consumption of diesel and electricity, considering an efficiency of electricity production (domestic) by 42%, it's possible calculate the primary energy required monthly.

The evaluations of the values of PES was made assuming a classic cogeneration system capable of converting into electricity for 38% of primary energy into heat and 48% of the same. After verifying the satisfaction of the thermal energy and electricity needed to operate the hospital as such were evaluated excess energy produced. As evidenced by the data shown in Figure 2, the hospital for proper operation monthly needs 525 MWh of thermal energy and 310 MWh of electricity. In the winter months it has the majority required to provide heat to heat the building, while in summer the majority request concerns the electricity for the production of cold for the summer cooling of the building. The values of the efficiency of the machines used in the installation of cogeneration, complete with heat pump and absorption refrigerators, are shown in Table 1.

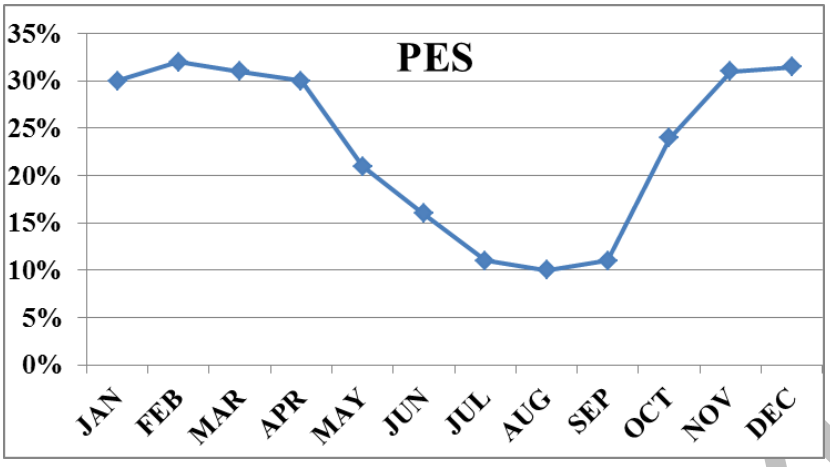

Figure 6: Primary energy savings achievable

In the first case there is a surplus of electrical energy that is converted into heat through the use of a heat pump because of the relatively high value of conversion of electrical energy into thermal energy values of primary energy savings are much higher than the higher the demand for thermal energy with the peak in the month of February.

In the summer months the surplus concerns the thermal energy. A part of this is converted into cold using double-effect absorption refrigerators. Because of the low conversion value, the reduction of primary energy consumption takes values significantly lower than those in winter, reaching the lowest value in the month of August, the hottest month of the year in southern Italy.

Conclusions

The use of a cogeneration system to replace the traditional plant of which you know the monthly consumption of heat and electricity in a hospital in southern Italy has allowed the evaluation of the primary energy savings achievable. Assuming the use of heat pumps and absorption refrigerators has been possible to vary the ratio heat-mechanical power of a cogeneration plant adapting the cogeneration plant to the energy needs of the hospital. Energy saving is verified even in the summer months when it is not dropped below 10%.

In the calculations were assessed excess energy use of which has not been taken into account, but they might find an opportunity to further reduce primary energy consumption by using recovery systems. In the summer months, when the PES reaches the lowest values, it's possible get better results by using photovoltaic panels that produce electricity synchronously with the requirement of the cold.

The possibility of having energy, especially the electric one, even in case of black-out is essential for a hospital that obtains by cogeneration plant the economic savings of purchase of engines for the production of electricity in case of emergency. The availability of self-produced electricity represents a condition of safety for office buildings which make use of a high communications now totally entrusted to the web.

The increasing energy supply in the presence of economic development would avoid loading all the electricity needs on the existing thermal power plants given the enormous difficulties to create new power plants in a densely populated country like Italy.

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From Methodology of the Mother Tongue to Methodology of Slovak as a Foreign Language

Zdenka Kumorová

University of ss. Cyril and Metodius in Trnava, Slovak Republic
zdenka.kumorova@ucm.sk

Abstract: The aim of second language methodology is to control teaching the language which is for minorities a foreign language. If foreign language teaching and learning is to be effective and successful, it needs to be related to a certain agent which functions as a mediator between the subject matter and learners. Teaching – either controlled or not - to minorities with a different mother tongue becomes a subject of interest of bilingualism (or multilingualism), where in the centre of attention various degrees of a mother tongue and second language mastery are.

Key words: Second language methodology, foreign language teaching, bilingualism (or multilingualism).

Introduction

For minorities, staying in a natural foreign language environment means spontaneous uncontrolled learning a target language (second language) – Slovak. Learners are able to absorb their target language through listening to the language which is not their mother tongue without interference of the teacher (or other mediating agent). The object of the Slovak language methodology for minorities living in Slovakia is to control foreign language learning and at the same time to reflect this phenomenon: various degrees of second language mastery in relation to the mastery of their mother tongues. This influence (besides sociometric factors such as age, education, etc.) is due to the stay of minorities in such environment where Slovak as an official language
is used actively. Learners are influenced by a foreign language environment but there lacks the impact of the syllabus on language education. Learners do not learn in an effective and complex way without teacher´s controlled (methodological) intervention. This phenomenon is known as "practising prescription" and attracts attention within specifically different language education. Here we can see many faults related to training of Slovak language teachers in a minority environment (the Slovak language is a state language). The discipline such as Slovak language and literature methodology does not deal with (or only to a very small extend) specific needs of students who study at schools where a minority language is the language of instruction (Píšová, 2013, p. 2). The teacher is therefore trained for such kind of education the same methods as the teacher of Slovak as a mother tongue.

The object of methodology of Slovak for minorities is to study various possibilities how to make Slovak language teaching more accessible for minority groups in Slovakia. Gregorík (2014) says that knowledge of mother tongue – in oral and also written form – is one of the students´ key competencies for successful self-realization not only during the studies but also after the studies. Through analyses of the present situation – how the Slovak language is taught to minorities – a study of Slovak language acquisition is being created. The state language is considered to be a second/target language (L_2) and such education should take into consideration social requirements of the target ethnic group. Therefore the target language functions as a tool of communication among the citizens of Slovak nationality. It is important to build on the bilingual or plurilingual (more languages) concept but not from the multilingual concept. The typical feature of the last one is that learners can speak more languages or language knowledge is gained at school or in other educational environment. Typical phenomenon of multilingualism is present at schools where more than one foreign language is offered to study. The

concept of plurilingualism (as well as bilingualism) exceeds this frame of language education – here we speak about knowledge of more languages or about co-existing of various languages in a certain society. The Common European Framework of Reference (CEFR) of 2002 assumes that this fact is taken into consideration when educational documents in individual countries of the European Union are created. CEFR emphasises the fact that "as an individual person's experience of language in its cultural contexts expands, from the language of the home to that of society at large and then to the languages of other peoples (whether learnt at school or college, or by direct experience), he or she does not keep these languages and cultures in strictly separated mental compartments, but rather builds up a communicative competence to which all knowledge and experience of language contributes and in which languages interrelate and interact" (CEFR, 2002, p. 4). Such a concept of language and culture teaching is based on a relation between two (or more) languages and builds on a received communicative competence. This principle of language education is dominant also in the area of Slovak language as a foreign language education as well as a second/target language for minorities. The discipline of Slovak language and Slovak literature in this specific environment covers all the elements (grammar, conversation, stylistics, literature) which lead to communicative competence acquisition and to the ability to think in the target language. Language practice shows that this may be a functioning mutual relationship when the learner uses all the knowledge about a language. In comparison to teaching more languages at schools, there is a difference: language knowledge and skills gained in a natural multilingual environment overlap and are not isolated, they may influence each other. In a common performance, there is a spontaneous code switching and language changing, while the speaker fluently uses both languages with the aim to communicate in the most effective and understandable way. Code/language switching is very flexible and effective. Its advantage is also the ability to decode quickly international words. Vocabulary is not a dysfunctional isolated set of words used just for communicative purposes but becomes a practical and applicable communicative tool in a foreign language environment. That is why if there is an international word or a word of a similar format in more languages, the listener can (at least to certain extend) decode a communicative purpose and thus reach a certain degree of communication, even though his language abilities are limited.

Such a premise needs to have specified the description and control of Slovak language teaching to minorities as well as defining lingua-didactics of Slovak for minorities. Similarly, based on general methodology of the Slovak language, it is also necessary to create methodology of the Slovak language for minorities with the background of the theory of methods used within this educational environment. This is how we could eliminate basic conceptual faults in the teacher training programme of the Slovak language in such environment where minority´s language prevails. At present, such methodology is absent and what comes into being is "uniform training of Slovak language and literature teachers – those who are preparing to teach at schools with Slovak language of instructions and those who are going to teach at schools with minority language of instructions" (Píšová, 2014, p. 3). If we were to rely on methodology of foreign languages which is in many aspects very close to methodology of Slovak for minorities it is essential to build on the fact that this science is very practical and most of all applicable and all conceptual documents should be based on this fact.

When creating a concept of methodology of the Slovak language for minorities, it may be based on two different lingua-didactics concepts: methodology of the Slovak language as a mother tongue and as a foreign language – however, their penetration should reflect the needs and specifics of language education. The methodological concept of Slovak as a foreign language takes into consideration sociolinguistic and ethno-cultural specifics that need to be implemented in curricula. The methodological intention of foreign language teaching is reflected in the forms of language education. The aim is very specific and that is why the syllabus is modified to the creation of study materials. This is very similar in case of teaching Slovak through methods of foreign languages in a minority environment. It is also necessary to take into account the needs of language learner training with other language base and a reached level of acquired Slovak language. Methodology of the Slovak language needs to be narrowly specified and determined by an adjective in order to be clear that it is methodology of the Slovak language for minorities living in Slovakia.

Choděra (p. 24) states seven crucial factors (criteria) that identify foreign language methodologies. Those criteria may be applied when differing Slovak language methodology for teaching Slovak in which a minority language participates. According to aiming a target language teaching we differ:

- target language, or a taught language (however, not a language of instructions) – Slovak;
- mother tongue = languages of minorities in Slovakia (Hungarian, Ukrainian, Polish, Czech, Roman, Ruthenian, German, Russian);
- a target language or a mediating language when learning a target one is the Slovak language;

- natural language environment (minority language in a majority language environment);
- characteristics from the point of view of age in educational institutions: children and adolescents, students of primary and secondary schools who pass gradual development of language levels from beginners to intermediate ones;
- the language environment in this type of education may be called multidimensional as education of a minority language runs together with a second (target – Slovak) language.

Language syllabus of a second target language represents only a selected syllabus and a narrowed range of language units of the system which is described by linguistics. This selected set of syllabus is the so called language minimum, however, many authors of foreign language methodologies agree on the fact that it is more appropriate to call it "optimum" (the aim is to educate average students not those who are least language educated). In Slovak language classrooms where the language of instruction is a minority language, the selected optimum is widened – in comparison with foreign language education in multilingual teaching. Such widening is related to a bilingual environment of students and the syllabus is extended at all language levels. According to that we speak about selected phonetic, grammar, lexical, vocabulary or syntactic minimum or optimum. Those aspects of curriculum cover three parts of language education in the National educational programme within subjects of the Slovak language and Slovak literature. That means that the curriculum (educational programme) is oriented on optimal (average) achievement of language abilities while optimum is clearly highlighted down to minimum – well defined and visibly bounded. Within the lexical part, it tackles vocabulary which is selected as passive and active. Its classification depends on either productive or receptive use of language phenomena in education. It is obvious that the set of passive vocabulary is more extensive because of receptiveness (understanding) of broad-spectrum types of texts during a learning/teaching process. Active vocabulary represents words which are more frequently used and activated and mostly in other types of texts, e.g. in various productive types of exercises. The same it is with grammar optimum/minimum, defined as didactic grammar. These are grammar structures selected out of the language system and its description from the point of view of teacher´s needs and student´s needs. Here we can also see a certain restriction of the grammar range in learning texts in the line from activeness to passiveness. We speak about productive (active) grammar and passive (receptive) grammar. How frequently they are going to be taught depends on curriculum-formal characteristics of language units. A term "lingua-realia" is related to disclosing target language structures. Choděra (2004) defines the term as realia which are closely linked to the language and jointly define what is being referred to and what is marked. In language practice it means learning/teaching a foreign language in comparison with a mother tongue (comparing target language units with native language units – as a tool for better understanding in the process of explanation – with the aim to achieve a certain goal).

Methods of teaching target language units

Methods could be classified as activities that help learners to acquire knowledge or develop their abilities. In a narrow sense, they may be considered tools to educate and make learning/teaching more effective, dynamic and vital. They are of a great priority – educational results depend on the teacher´s choice of a teaching method and the choice depends on certain teaching conditions. In a broad sense, we may consider methods as methodological approaches towards teaching – direct or indirect known also as grammar-translation method. Language education prefers a (direct) communicative method that leads to pragmatic goals of education, functional use of language units related to different communicative needs (thematically presented parts) and moreover concentration on language skills in language practice (tasks and exercises aimed at lexical, morphological and syntactical training). Nowadays, communicative approach has been manifested in activating methods that cover problem solving teaching and teaching through experience and didactic games. Frequently used and most common and preferred ones within Slovak language teaching are: problem solving teaching → a creative dialogue (in a closed circle, students speak, react, respond teacher´s motivating questions related to a recently read text); "Six thinking hats" (different attitudes towards a problem – from various perspectives); project method (creating a project means solving issues of a certain topic). Experiental learning/teaching (based on learning through a direct experience) → role plays (simulating a certain situation); brainstorming (producing ideas even though they sometimes – in the beginning - seem to be unrelated); "accuse – advocate – judge" (argumentations of people as if on the court); "Cinquain" (a five-verse poem on a certain topic with a defined process of creation – form the point of view of form and content). Opposing those methods, there are non-direct ones: when in a foreign language education a target language is compared to a mother

tongue and grammar explanation is present. The result is the prime achievement of a language competence which does not always need to be a communicative competence (especially when foreign language acquisition). " ...to be communicatively competent does not cover only accurate and grammatically, stylistically and lexically correct expressions – moreover, the use of other devices is important, such as non-verbal communication (mimics, gestures, body language, haptics), distinction between formal and informal language according to a setting in which a conversation is carried out, according to participants of the conversation, or the topic/content of communication. It is essential to distinguish between oral and written discourse and keep in mind many other elements in various interactive situations. Here we also count the ability to pass information and express it with the use of graphs, symbols (numbers, musical notes), pictures and drawings; ability to communicate through information technologies, to present information, explain and clarify it in an understandable way; ability to listen actively; to read with comprehension and the skill to process facts/information" (Smetanová, 2012, p. 98).

The border between direct and indirect methods is not clear and is mostly defined by frequency of a preferred symbol according to Hellmich´s bipolarity of couples (1968) of methods direct and indirect. For instance, in a direct method there is a preference of a sentence to a word. Also it is preferred a situation, function and intention to the system (strauctures), speech to language and syntagmatics and paradigmatics, synthesis to analysis, induction to deduction, a spoken language to a written one, avoiding translation and comparison with mother tongue. Other preferences are: working with texts, practice (pragmatically oriented teaching) to the theory, content to form. Such bipolarity does not exclude preferences of direct methods in second language education, on the contrary, it confirms the need and necessity of existence and application of both of the methods in the educational process. Such a compromise could be a mix of the methods that ingrates both parts of direct and indirect methods: communicative-functional and situational-thematic parts and at the same time a part of system-structure. The parts of direct method prevail also in mixed methods.

The aim of training teachers of the Slovak language and Slovak literature with a minority language of instruction is to show the bipolarity of preferred symbols and signs within a certain teaching method and the uniqueness of a current pedagogical-methodological situation. The selection of a method must be modified to the content, students, teachers (and their experience) and last but not least to teaching aids and technology that the teacher has to their disposal as well as to the form of teaching because without a carefully chosen and used teaching method the teacher cannot achieve the goals that are set (Hincová – Húsková, 2011, p. 25).

The possibilities to learn languages have contributed and visibly changed and developed advance information-communication technologies. We may speak about the so called digital books and e-learning/teaching. These forms support an idea of language education: to be able to learn a language in a flexible and effective way, to gain a communicative competence to react when in interaction with others. ICT are essential when teaching Slovak, however only when their implementing is not purposeless and that the teacher respects the requirement of certain extend and balance when choosing methodological processes (Luptáková, 2013, p. 3; source: http://www.jazyk-literatura-komunikace.cz/index.php/2-2013/category/23-clanky). Another method is connected with the usage of ICT in language education – audio-oral or audio-lingual method. This one prefers listening to oral performances in order to gain new communicative habits through presented language sources. Most often the teacher – who acts as a native speaker – becomes a model, however, other technologies, such as CDs are used as well – those are parts of textbooks for schools with minority language of instruction. The aim of such oral performances is to help students understand texts that are not spoken by their teacher.

Application of teaching methods when teaching Slovak as a mother tongue or as a second language is crucial. Those methods are modified and changed according to growing requirements and needs of learners when acquiring the language. This is the reason why Slovak language and literature teacher training becomes uniform – those who are going to teach at schools with Slovak language of instruction and those who are trained to be teachers at schools with minority language of instruction. As those languages are very specific and typologically different from Slovak, it is necessary to take a completely different approach to creation of school curricula that cover basic goals and structures of selected syllabuses. These documents also serve as a base for textbooks and methodological guides for teachers who apply and use them in the educational process. When creating didactic tools and aids, partly principles for creating textbooks for foreign language education and generally principles for managing foreign language education are used. Those meet the requirements to reach the goal of foreign language education: to be able to use a target language in various language environments – it means to gain a communicative competence. That is why methods which support oral communication are preferred which

leads to weaken formal grammar and do not prefer isolated written translations into a mother tongue. The direct method is the centre of teachers´ attention – focused on communication – to grammar-translation method focused on form and structure. When Slovak is taught to foreigners, a modification of the direct Berlitz method is used, the one which has a system of ready-prepared communicative models of acquisition, grammar knowledge is not a direct part of teaching, rules are acquired based on imitation (Pekarovičová, 2004). Because this type of language education is very specific – the target language is a majority group language, learners are those whose mother tongue is a minority language and their levels of the target language differ from one to another – the most natural and effective method we suggest is the mixed (eclectic) method. It consists of the direct communicative method and grammar-translating method based on grammar rules explanation and acquisition of grammar structure through reading and translating texts in a target language and analysis of language phenomena that are present in the texts. Learners gain a grammar competence. In a communicative direct method, work with various types of texts is preferred – and those ones become topical for discussions and dialogues. Through role plays and imitating/simulating various communicative situations learners acquire the language and gain a communicative competence. As this is a mixed method, grammar structures in presented texts play their key roles. Textbooks for secondary schools are designed isolated in three separate/individual blocks: conversation – grammar – composition writing. They assume that secondary schools minority students already have a certain level of the target language. When textbooks are created, mother tongue methodology as well as a foreign language methodology uses the inductive-deductive approach and grammar phenomena are applied in basic texts. The authors of the textbook "Slovo za slovom" (translated: "Word by word") Tibenská and Zatkalíková (2007) have applied a specific way of processing individual topics and units. Their textbook focuses on Slovak as a target language and it is based on mutual linking of lexical and grammar elements and on their development and fixing through the method of gradual steps (confirmation of gained knowledge and adding new one as a spiral). In the beginning, learners are aware of a communicative purpose of the text, later they acquire model communicative situations in interactive exercises. Only after that they are aware of individual language phenomena applied and used in the texts and could practise them in their own language structures or full texts or in grammar focussed exercise and tasks.

Conclusion and summary

Because of a specific form of the Slovak language, it is necessary to devote a special attention to morphology when teaching Slovak to foreigners. Many pedagogical research and studies show deficiencies in creating grammar structures in language practice but also insufficiencies to use vocabulary appropriately to a communicative situation and incorrect sentences from stylistic and formal points of views. This reflects the fact that teachers – mediators of foreign language education – do not have enough experience with teaching Slovak using foreign language teaching methods. It is also because of the fact that teachers have many times problems to explain a language issue in the Slovak (target) language and use their mother tongue (language of their students) instead. However, this kind of code switching does not correspond with requirements connected with a target language acquisition. It is because languages (taught and learnt) are typologically and genealogically different and very specific. That is why it is necessary to process and create methodology of the Slovak language and Slovak literature with minority language of instruction that would serve as a subject of applied linguistics. Here, the need to teacher training will be highlighted – especially through methods of foreign language teaching. The principle of forms and working methods application, typical for foreign language education, is not the only postulate when teaching Slovak as a second language. The change should be related to making the whole educational process more effective – regarding goals, methods and forms of teaching and their usage in language education.

Minority languages in Slovakia could be arranged into two categories according to typology of languages: in Slavic languages (Czech, Ukrainian, Ruthenian, Polish and Russian) and non-Slavic languages (Hungarian, German, Roman). The Slavic languages have inflections in their grammar forms, on the contrary the Hungarian language (which is mostly spread in Slovakia) does not inflect at all and that is why this phenomenon is absolutely new for Hungarian learners of Slovak. This is the reason we ask to strengthen a formal-grammar approach not only in textbooks but also generally in the teaching process. Exercises focus on determining, selection or creation of a grammar structure. After communicative-grammar knowledge acquisition learners learn general knowledge (in the process of deduction). This step is strengthen in textbooks for primary schools through the final (formal-grammar) text called "Čo ja viem" (translated: "What I know"). Here are rules, principles and definitions of language terminology formulated. Without such formulations, learners would not be able to create (analogically) texts necessary for language practice. Or perhaps their texts would be incorrect and

communicatively non-functional. That is why the presence of a mediator in the language education is crucial and a natural bilingual environment is not sufficient.

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Global Stability Analysis of a Monoclonal Tumor Growth with piecewise constant arguments

Fatma Bozkurt

Erciyes Üniversitesi

Email : fbozkurt@erciyes.edu.tr

Abstract: This study is based on a brain tumor growth that is modeled such as

$$\frac{dx(t)}{dt} = x(t)r\left(1 - \alpha x(t) - \beta_0 [\![t]\!] x([\![t]\!]) - \beta_1 [\![t-k]\!] x([\![t-k]\!])\right) + \gamma_1 [\![t]\!] x(t) x([\![t]\!]) + \gamma_2 [\![t-k]\!] x(t) x([\![t-k]\!]),$$

where the parameters α, β_0, β_1 and r denote positive numbers, γ_1 and γ_2 are negative numbers and $[\![t]\!]$ is the integer part of $t \in [0, \infty)$ and $k \in N$. γ_1 is embed to show the effect of the treatment on the tumor and γ_2 is a rate that causes a negative effect from the immune system to the tumor population. To investigate the global behavior of this equation, the discrete solutions have been investigated.

Keywords: logistic differential equations; local stability; global

Hasır Donatı İle Güçlendirilen Yığma Yapıların Düzlem Dışı Davranışı

Melda Alkan Çakıroğlu[1*], Hamide Tekeli[2*], Gülhan İnce[3*], Murat Gökhan Çakıroğlu[4*] Uğur Demirtaş[5*]

[1]Süleyman Demirel Üniversitesi, Teknik Eğitim Fakültesi, Isparta, Türkiye

[2]Süleyman Demirel Üniversitesi, Mühendislik Fakültesi, Isparta, Türkiye

[3]Mehmet Akif Ersoy Üniversitesi, Mühendislik ve Mimarlık Fakültesi, Burdur, Türkiye

[4]Duru Mühendislik, Isparta, Türkiye

[5]Süleyman Demirel Üniversitesi, Fen Bilimleri Enstitüsü, Isparta, Türkiye

meldaalkan@sdu.edu.tr

Özet: Bu çalışmada, yığma yapıları püskürtme beton ile güçlendirme yönteminin etkinliği deneysel olarak incelenmiştir. Bu amaçla 1/1 ölçekli iki adet numune üretilmiştir. Bu numunelerden birincisi yalın halde bırakılmıştır. Diğeri ise çelik hasır üzerine kuru karışım püskürtme beton uygulaması ile güçlendirilmiştir. İki numunede düzlem dışı tersinir yükler altında deneye tabi tutulmuştur. Deneyler sonucunda, güçlendirilmiş numunede, yalın numuneye göre hem taşıma gücü yükü hem de enerji tüketme kapasitesi açısından önemli bir artış sağlandığı görülmüştür.

Anahtar Kelimeler: Kuru karışım püskürtme beton, hasır çelik, yığma yapı, güçlendirme.

Giriş

Dünya üzerindeki farklı deprem bölgelerinde bulunan çok sayıda yığma bina mevcuttur. Bu binaların çoğu deprem yükleri dikkate alınmadan tasarlanmıştır. Geçmiş depremler incelendiğinde bu

binaların deprem tarafından etki eden yatay yüklere karşı koyamadığı ve genellikle gevrek bir şekilde hasar gördükleri gözlenmiştir (Bhattacharya, vd., 2014). Gevrek kırılmanın nedeni yığma binayı oluşturan malzemelerin çekme dayanımlarının çok düşük olmasından kaynaklanmaktadır.

Yığma yapılar da standartlara, yönetmeliklere uygun olarak yapıldığı ve mühendislik hizmeti gördüğü takdirde sağlam ve emniyetli olabilirler (Çöğürcü, 2007). Mevcut yığma binaların çoğunluğunun genellikle yönetmelik-şartname kurallarına uyulmadan tasarlandıkları bilinen bir gerçektir. Bu durum olası bir depremde bu binaların hasar görme riskini artırmaktadır. Bu nedenle, bu tür yapıların iyileştirilmesi deprem mühendisliği alanında bir öncelik haline gelmiş ve güçlendirme stratejileri sürekli olarak güncellenmiştir (Gilstrap ve Dolan, 1998). Bu yöntemler ile genellikle yığma yapıların enerji tüketme kapasitelerini, sünekliğini ve dayanımını arttırmak amaçlanmaktadır (Sivaraja, vd., 2013).

Son yıllarda tuğla duvarların düzlem içi ve düzlem dışı yüklemede davranışını incelemek için çok sayıda deneysel ve teorik araştırmalar yapılmıştır. Bunların bazıları yığma duvarın düzlem dışı kırılması (Kanıt vd., 2005; Kanıt vd., 2006; Kanıt, 2007; Kanıt vd., 2008), CFRP şeritlerle güçlendirme (Anıl, vd., 2012), karbon fiber, bazalt fiber, bitüm kaplı cam fiber, bitüm kaplı polyester fiber, polipropilen ağ, cam elyaf takviyeli polimerler (GFRP) kompozitler gibi güçlendirme malzemeleri (Papanicolaou, vd., 2011; Zhou, vd., 2013; Sivaraja vd., 2013), doğal liflerle (Olivito, vd., 2014), kompoze çimento esaslı püskürtme beton kullanılarak düzlem içi güçlendirilmesi (Lin vd., 2014), donatılı püskürtme beton ile güçlendirilmesi (Kalkan, 2008), sargılı yığma duvarların düzlem dışı davranışı (Varela-Rivera, vd., 2011), mikro beton ve çelik hasır kullanılarak güçlendirilmesi (Kadam vd., 2014) ile ilgili çalışmalardır.

Görüldüğü üzere deprem yükü etkisindeki yığma binaların davranışını araştırmak için deneysel ve analitik çalışmalar yapılmış ve yapılmaktadır. Ancak bu çalışmaların çoğu düzlem içi kayma yükü altında duvarın kapasitesi ve tepkisi üzerine yoğunlaşmıştır. Bu çalışmada yığma numunelerin düzlem dışı dayanımı arttırmak ve püskürtme betonun etkisini değerlendirmek için deneysel bir çalışma yapılmıştır. Çalışmada üretilen tuğla duvar numunelerinin bir tanesi güçlendirme yapılmayarak yalın halde bırakılmıştır. İkinci tuğla duvar numunesinin ön yüzeyine Q188/188 tipi çelik hasır yerleştirilerek 10 cm tabaka kalınlığında kuru karışım püskürtme beton uygulanmıştır. İki numunede düzlem dışı tersinir yükler altında deneye tabi tutulmuştur. Çalışmada yalın ve kuru karışım püskürtme beton ile güçlendirilmiş yığma numunelere ait yapılan deneylerin sonuçları sunulmuştur. Deneyler sonucunda, güçlendirilmiş ve yalın numunelerin taşıma gücü yükü ve enerji tüketme kapasitesi karşılaştırılmıştır.

Numunelerin Hazırlanması ve Güçlendirilmesi

Çalışmada dolu harman tuğlasıyla örülen duvarların altına 100 cm x 220 cm ebatlarında ve 15 cm yüksekliğinde betonarme temel üretilmiştir. Temel betonlarında hazır beton kullanılmıştır. 19cm×9cm×5cm boyutlarındaki tuğlalar, 1 cm derz aralığı olacak şekilde şaşırtma örgü tipinde örülerek, 220cm eninde ve 245 cm yüksekliğinde iki adet tuğla duvar numunesi üretilmiştir. Şaşırtma örgü tipi ile örülen tuğla duvarlar Şekil 1'de görülmektedir.

Şekil 1: Tuğla duvar numunelerinin örülmesi

Örülen duvar numunelerinin üzerine 20cm x 20 cm ebatlarında duvar üstü hatılı ve 10 cm kalınlığında döşeme yapılmıştır. Şekil 2'de tuğla duvar numunelerinin genel bir görünümü verilmiştir.

Şekil 2: Tuğla duvar numuneleri

Üretilen tuğla duvar numunelerinin bir adedi yalın halde bırakılmıştır. İkincisinin ön yüzeyine Q188/188 tipi hasır çelik yerleştirilmiş ve bunun üzerine 10 cm kalınlığında kuru karışım püskürtme beton uygulanmıştır. Tuğla duvar numunelerine hasır donatıların montajının yapılabilmesi için, duvar

yüzeyine ankraj çubukları epoksi yardımıyla yerleştirilmiştir. Numunenin dış yüzüne hasır çelik ankraj çubuklarına bağlanarak yerleştirilmiştir (Şekil 3).

Şekil 3: Hasır çelik yerleştirilmiş numunenin görünümü

Tuğla duvar numunelerine TS 11747 standardı esas alınarak kuru karışım püskürtme beton uygulaması yapılmıştır. En büyük agrega dane boyutu 8 mm olarak seçilmiştir. Agrega mikserde % 4 civarında nemlendirilmiştir. Püskürtme betonun çimento miktarı 500 kg/m^3 olarak seçilmiştir. Agreganın % 70'i 0-5 mm, % 30'u ise 5-8 mm arasında olacak şekilde düzenlenmiştir. Su/çimento oranı hortum ucundaki vana vasıtasıyla operatör tarafından ayarlanmıştır. Uygulamada kullanılan çimento CEM II 42,5 olup Göltaş Çimento tarafından üretilmiştir. Sigunit Toz AL katkısı çimento dozajının % 5,5'u olarak kullanılmıştır. Püskürtme beton uygulamasında kullanılan su içilebilir sudur. Kuru karışımın hazırlanmasında ağırlık esas alınmıştır.

Uygulama öncesinde basınçlı hava ve su ile temizlenen tuğla duvar numunelerinin yüzey hazırlığı tamamlandıktan sonra hava basıncı kontrol edilerek püskürtmenin düzgün ve uygun hızda uygulanmasına dikkat edilmiştir (Şekil 4).

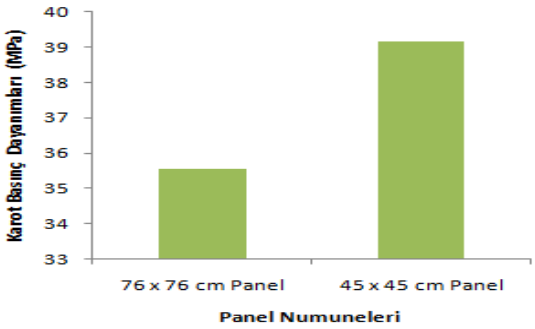
Şekil 4: Tuğla duvar numunesine püskürtme beton uygulanması

Püskürtme beton uygulaması esnasında karışım oranlarını denemek, püskürtme betonun basınç dayanımını belirlemek için TS 11747 standardına uygun olarak; kare şeklinde her bir kenarı 45 cm olan ve ACI 506 standardına uygun olarak 76 cm olan ahşap panellerden toplamda 2 adet numune hazırlanmıştır. Deney panellerine püskürtülen beton kalınlığı 12 cm dir. (Şekil 5). Oluşturulan paneller numunelerle aynı şartlarda kür edilerek muhafaza edilmiştir.

Şekil 5: Deney panellerine püskürtme beton uygulanması

Kuru karışım püskürtme betonun basınç dayanımını belirlemek amacıyla hazırlanan panellerden narinlik oranı $\lambda = 1$ olacak şekilde toplam 4 adet karot numune alınmıştır. Karot numunelerin basınç deneyi öncesi ve sonrası görünümü Şekil 6'da verilmiştir. Karotlara ait elde edilen 28 günlük basınç dayanımı değerleri Şekil 7'de görülmektedir.

Şekil 6: Karot numunelerin basınç deneyi



Şekil 7: Karot numunelerin 28 günlük basınç dayanımı değerleri

Duvar numunesinin temeli, deney sırasında uygulanacak olan yatay yükleme esnasında hareketini engellemek amacıyla rijit döşemeye sabitlenmiştir (Şekil 8).

Şekil 8: Numune temelinin rijit döşemeye sabitlenmesi

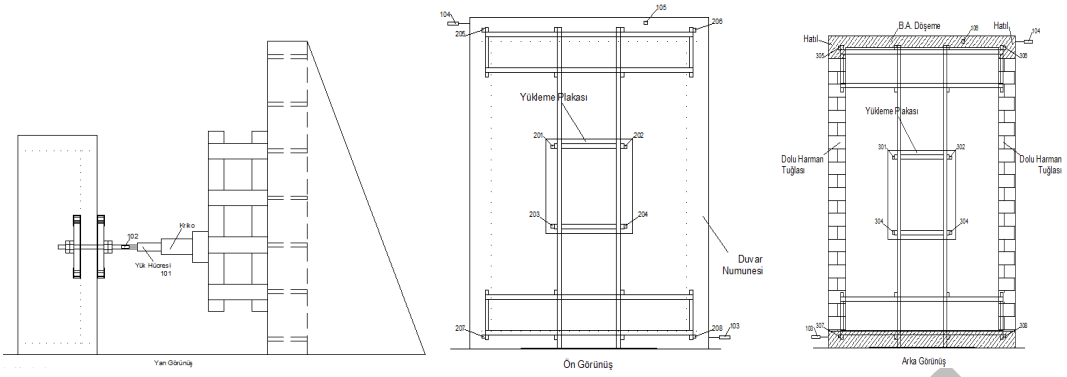
Çalışmada, yığma numunelerin yatay yükleme altındaki düzlem dışı davranışları incelenmiştir. Düzlem dışı zorlanan duvarda deprem kuvvetleri duvar düzlemine dik olarak etkimektedir. Bunun sonucu duvar bir plak döşeme olarak davranmaktadır. Duvara düzlem dışı etkiyen deprem kuvvetleri duvar kenarındaki mesnetlere aktarılmaktadır. Bu davranışı yansıtabilmek amacıyla çalışma kapsamında deprem yüklemesine maruz duvarda oluşacak atalet kuvvetlerinin bileşkesinin duvarın tam ortasında oluşacağı düşünülerek, deney sırasında yükleme duvarın tam ortasından yatay olarak uygulanmıştır. Numunenin hatıl seviyesinden reaksiyon duvarına sabitlenmesi detayı Şekil 9'da gösterilmiştir.

Şekil 9: Deney numunesinin döşeme ve hatıl seviyesinden sabitlenmesi

Deney numunesine yükleme itme ve çekme şeklinde çevrimsel olarak uygulanmıştır. Yüklemenin yapılacağı deney düzeneği reaksiyon duvarına sabitlenmiştir. Deneylerde kullanılan yükleme düzeneği Şekil 10'da gösterilmektedir.

Şekil 10: Yükleme düzeneği

Tuğla duvar numunelerinin deney sırasındaki ölçümleri, tamamen elektronik olarak yer değiştirme ve yük ölçerler kullanılarak gerçekleştirilmiştir. Yüklemenin her adımında yerdeğiştirmelerin ölçülmesi ve kontrolünün sağlanmasında potansiyometrik pozisyon algılayıcılar çeşitli yön ve doğrultuda numune üzerine yerleştirilmiştir. Yerdeğiştirme ölçerlerin konumları şematik olarak Şekil 11'de verilmiştir.

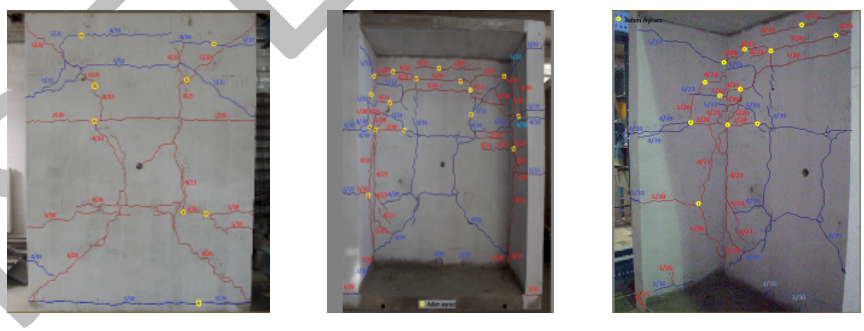


Şekil 11: Potansiyometrik pozisyon algılayıcıların ve yük hücresinin yerleşimi

Deney Sonuçları

Yalın Numune

Yalın numunede ilk çatlama 20 kN yük değerinde duvar yan yüzlerinde yatay doğrultuya paralel olarak ortaya çıkmıştır. Yüklemenin artırılmasıyla duvar ön yüzüne doğru bu çatlaklarda ilerleme gözlenmiştir. Çekme yüklemesinin 23 kN değerinde duvar ön yüzünde kılcal olarak X şeklinde çatlak oluşmuştur. Taşıma gücü yükü olarak itme yüklemesinde 39 kN, çekme yüklemesinde ise 26 kN değerine ulaşılmıştır. Numunede çevrimsel yüklemede %15 yük düşüşü elde edildiği anda deney bitirilmiştir. Güç tükenmesine X çatlakları ile değil, duvar ortasında oluşan yatay çatlağın genişlemesi ile ulaşılmıştır. Yalın duvarda oluşan çatlaklar, çekilen fotoğraflar üzerinde işaretlenmiş ve duvar numunesinin hasar röleveleri oluşturulmuştur (Şekil 12).



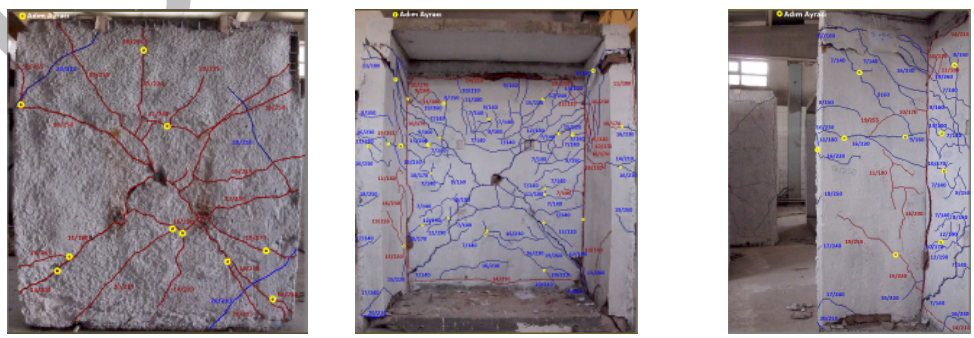
Ön görünüşü Arka görünüşü İç sağ yan görünüşü

İç sol yan görünüşü Ön sağ yan görünüşü Ön sol yan görünüşü

Şekil 12: Yalın duvar numunesinin hasar rölevesi

Güçlendirilmiş Numune

Hasır çelik ilaveli 10 cm kalınlıkta püskürtme betonla güçlendirilmiş duvar numunesindeki ilk çatlama, itme yüklemesinde 130 kN değerinde oluşurken, çekme yüklemesinde 150 kN değerinde oluşmuştur. Bu çatlamalar daha sonraki adımlarda X şeklindeki hasara dönüşmüştür. İlerleyen adımlarda kılcal seviyede çok sayıda çatlak oluşumu gözlenmiştir. Hasar, itme yüklemesinin 160 kN değerinde çatlakların genişlemesi ile ilerlemiştir. İç duvarda X şeklinde başlayan çatlama zamanla ilerleyerek yan duvarlarda da devam etmiştir. Yük artışı ile duvar ve temel arasında ayrılma çatlakları başlamıştır. Buna ilave olarak, duvar ile üst hatıl arasında ayrılma gözlenmiştir. Numune güç tükenmesi sırasında yan duvarlarda ortaya çıkan düşey çatlamalar ve duvar ile püskürtme beton arasındaki ayrılmalar dikkati çekmiştir. Deney sırasında itme yüklemesi için 230 kN, çekme yüklemesi için ise 230 kN taşıma gücü değerlerine ulaşılmıştır. Hasır çelikli 10 cm kalınlıkta püskürtme betonla güçlendirilmiş duvarda oluşan çatlaklar, çekilen fotoğraflar üzerinde işaretlenmiş ve duvar numunesinin hasar röleveleri oluşturulmuştur (Şekil 13).



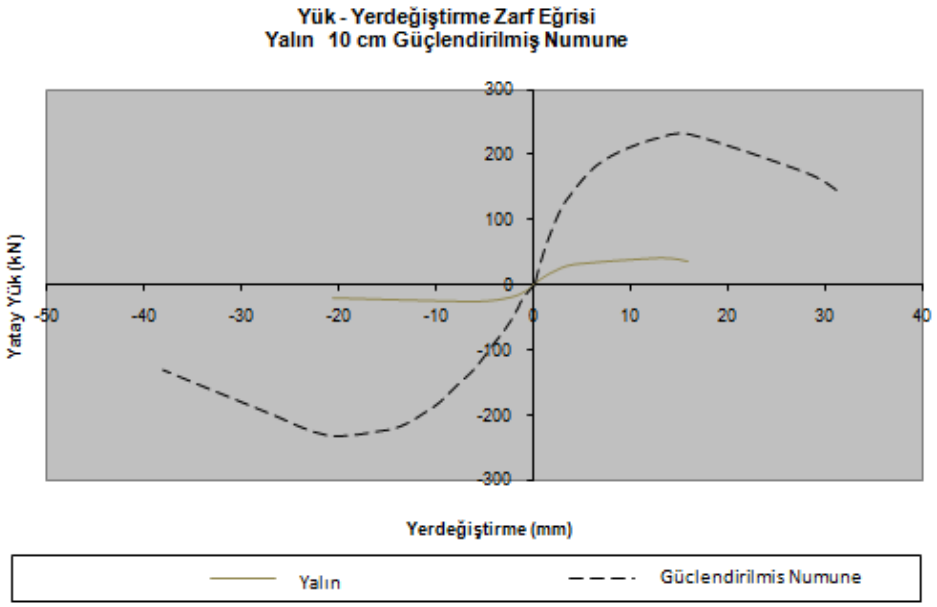
Ön görünüş Arka görünüş İç sağ yan görünüş

İç sol yan görünüş Ön sağ yan görünüş Ön sol yan görünüş

Şekil 13: Güçlendirilmiş duvar numunesinin hasar rölevesi

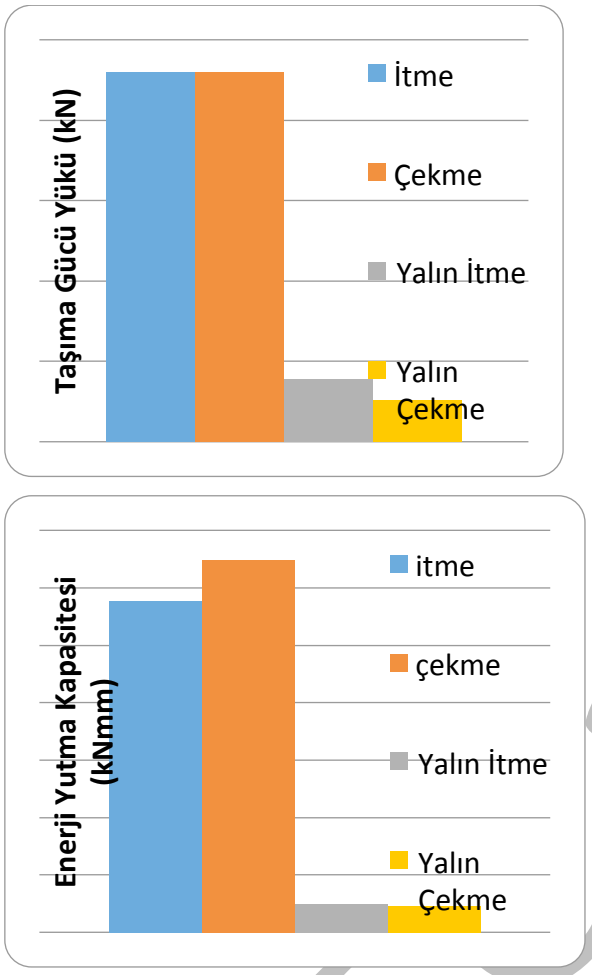
Deney Sonuçlarının Değerlendirilmesi

Yalın ve güçlendirilmiş numunelerin yatay yük-yer değiştirme grafiklerine ait zarf eğrileri Şekil 14'de verilmiştir.



Şekil 14: Yalın ve güçlendirilmiş numunelerin zarf eğrisi

Deneylerden elde edilen taşıma gücü yük değerleri ve enerji tüketme kapasiteleri Şekil 15'de karşılaştırmalı olarak verilmiştir.



Şekil 15: Güçlendirilmiş numunenin yalın numuneye göre taşıma yükü ve enerji tüketme kapasitelerinin karşılaştırılması

Hasır donatı ile güçlendirilen numunede taşıma gücü yükü yalın numuneye oranla itme yüklemesi için % 490, çekme yüklemesi için ise % 785 artış göstermiştir. Hasır donatı ile güçlendirilmiş deney numunesi yalın numuneyle enerji tüketme kapasitesi bakımından kıyaslandığında, itme yüklemesi için % 1086 çekme yüklemesi için ise % 1308 artış sağlamıştır.

Sonuçlar

Bu çalışmada yalın ve hasır donatı ilaveli püskürtme beton ile güçlendirilmiş numunelerin düzlem dışı davranışı deneysel olarak incelenmiştir. Deneylerde aşağıdaki sonuçlar elde edilmiştir.

- Yalın numunede güç tükenmesi, duvar yan yüzlerinde yatay doğrultuya paralel olarak ortaya çıkan çatlakların ani ilerlemesi ile meydana gelirken hasır çelik ilaveli püskürtme beton ile güçlendirilmiş numunede, hem duvar arka hem de ön yüzeyinde çok sayıda kılcal çatlak oluşmuş ve güç tükenmesi, X çatlaklarının genişlemesi ve ilerlemesi ile meydana gelmiştir.

- İlk çatlama yalın numunede 20 kN yük değerinde ortaya çıkarken güçlendirilmiş numunede 130 kN yük değerinde ortaya çıkmıştır.
- Yalın numunede taşıma gücü yüküne itme yüklemesinde 39 kN, çekme yüklemesinde ise 26 kN değerine ulaşılmıştır. Güçlendirilmiş numunede bu değerler 230 kN olarak elde edilmiştir. Dolayısıyla hasır donatı ile güçlendirilen numunede taşıma gücü yükü yalın numuneye oranla itme yüklemesi için % 490, çekme yüklemesi için ise % 785 artış göstermiştir.
- Hasır donatı ile güçlendirilmiş deney numunesi yalın numuneyle enerji tüketme kapasitesi bakımından kıyaslandığında, itme yüklemesi için % 1086 çekme yüklemesi için ise % 1308 artış sağlamıştır.

Elde edilen sonuçlar değerlendirildiğinde çelik hasır donatı ilaveli püskürtme beton ile güçlendirilmiş numunede yalın numuneye göre hem taşıma gücü yükü hem de enerji tüketme kapasitesinde artış sağlanmıştır. Dolayısıyla bu güçlendirme yönteminin dikkatli bir işçilik ile yığma binaların güçlendirilmesinde kullanılabileceği söylenebilir.

Teşekkür

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Heart Attack Prediction System Based Neural Arbitration

Abdulkader Helwan

Near East University, Biomedical Department, Near East Boulevard, Lekosa, Mersin 10, Turkey
Abdulkader.helwan90@gmail.com

Abstract: Heart attack is an asymptomatic and epidemic medical condition that may suddenly occur and causes "death". Therefore, it is a life-threatening condition and it should be detected before it occurs. Heart attack is so far predicted using the conventional ways of doctor's examination and by performing some medical tests such as stress test, ECG, and heart CT-Scan etc. The coronary vessels constriction, the cholesterol levels in the arteries, and other attributes can be good indicators for making effective decisions. In this paper, a neural network based support decision system is developed for the prediction of heart attack. The proposed system uses 14 medical attributes, obtained from the Cleveland database such as sex, heart rate, and vessels narrowing etc. Two attributes have been emphasized in order to distinguish the heart attack from other heart diseases; the vessels constriction rate and the chest pain type. The testing results show high efficiency and capability for the designed system to predict heart attack and diagnose the three medical conditions: normal, abnormal, and imminent to heart attack.

Key words: Heart attack, asymptomatic, epidemic

Introduction

Heart is the basic part of the body. Heart-failure is a serious medical situation in which this vital organ doesn't operate properly. The malfunctioning of the heart may impact the whole body organs since it is affiliated with all the body parts through its arteries and veins. One of the most dangerous and insidious heart diseases is the heart attack. It can be delineated as a chest pain aligned with a constriction in the coronary vessels which is called atherosclerosis. The two main indicators for heart attack that/ have been focused on in this work are the type of chest pain and the coronary vessels clogging rate. The centre of disease control and protection (CDC) has estimated that about 720,000 Americans have a heart attack every year. 525,000 of these are a first heart attack and 190,000 happen in people who have already had a heart attack ("Every year about **720,000 Americans** have a heart attack", n.d.). Due to these dangerous upshots, there should be a way to predict a heart attack. The heart diseases can be diagnosed by their signs and symptoms. Heart attack is one of the riskiest heart diseases and it has the same signs and symptoms of other heart diseases, in addition to the plaques buildup in the coronary arteries which rupture inside of arteries, and the unstable angina which may be a warning sign for a heart attack.

Data mining is the automatic study (analysis) of stored data to elicit the results and find patterns beyond these data. Nowadays, various diagnostic and patient medical records devices which may store a huge amount of data are found (Nabeel Al-Milli, 2013). Therefore, these medical data that may indicate a heart attack must be stored and processed using data mining technique based neural network; in order to spring up a decision making system for the prediction of a heart attack.

The overall structural format of the paper is as follows. The first section is an introduction. The section 2

is a literature review which lists some studies related to the topic. The section 3 discusses the neural network and backpropagation algorithm. The section 4 discusses the data representation. The section 5 discusses the training and performance of the created neural network. Finally the section 6 is a conclusion of the whole work.

Litterature Review

Nabeel Al-Milli (Nabeel Al-Milli, 2013) developed a heart disease prediction system using neural network. 14 parameters were used in this work with 4 output classes. The backpropagation algorithm was used for training the network and the experiments conducted in this work have shown the good performance of the proposed algorithm. Heart diseases dataset is analysed using Neural Network approach by Dr. K. Usha (K. Usha Rani, 2011). In this work a parallel approach is adopted in the training phase in order to increase the efficiency of the classification process.

Heart Disease Prediction system (HDPS) using neural network has been proposed by Chaitrali S. Dangare, Mrs. Sulabha S. Apte (Chaitrali S. Dangare, Sulabha S. Apte, 2012). The authors used 13 medical attributes such as sex, cholesterol level, and stress test in addition to two other attributes which are the smoking and the obesity in order to get a better accuracy. The HDPS system predicts the likelihood of patient getting a Heart disease. The accuracy of this designed system was nearly 100%.

Dilip Roy Chowdhury, Mridula Chatterjee R. K. Samanta (Dilip Roy Chowdhury, Mridula Chatterjee R.K. Samanta, 2011) applied an artificial neural network model for neonatal disease. The authors proposed a technique with a backpropgation algorithm for recognizing a pattern for the prediction of neonatal diseases. This proposed system was capable to predict and enhance the diagnosis accuracy of 75% of the neonatal diseases.

Artificial Neural Network (ANN)

Artificial neural network is a remodelling of the human brain information processing system. It is a multilayer system in which each layer is composed of multiple nodes which represent the neurons. Each node is connected to the others by means of edges represent the weights which are the information transmitted (Adnan Khashman, 2011). ANN is principally composed of multilayers: input layer, one or more hidden layer, and output layer. The input from the previous layer is multiplied by the adjusted weights. At each node or neuron the weighted inputs are added and then the combined inputs pass through a non-linear transfer function in order to produce the desired output (K. Anil Jain, Jianchang Mao and K.M. Mohiuddi, 1996). ANN is basically developed to solve data mining applications. It is an adaptive learning technique in which it has a different and specific learning methodology; the learning by examples. Therefore; some complex tasks can be handled using neural networks such as prediction, recognition, and classification (R. Rojas, 1996). Various learning and training algorithms can be used to train the network. One of the most public used algorithms is the backpropagation algorithm. In order to produce the desired output, the input weights should be adjusted and the correction-error should be reduced. The most popular used learning algorithm for updating the weights and correcting the learning error is the backpropagation algorithm. Backpropagation is a learning technique for the feedforward multilayer neural networks. It has two passes through the different layers; the forward pass and the backward pass. In the forward pass the weights are summed and then combined in the output layer. In the backward pass the weights are corrected. The actual output is subtracted from the desired one in order to produce the error. The error is then propagated back to all previous layers in order to update the weights and get the desired output (Nabeel Al-Milli, 2013).

Heart Attack Prediction System (HAPS) based neural network

In this paper, we develop a heart attack prediction system based neural network using backpropagation learning algorithm. 14 parameters are used as inputs for the network such as sex, heart rate, and cholesterol level. The main parameters that have been emphasized on to predict heart attack are

the chest pain type and the coronary vessels constriction rate. The dataset is obtained from Cleveland database. It is a well-known database available on the internet (Bache, K. & Lichman, M., 2013). 300 records are taken. They are classified as 3 output classes: Normal, Abnormal, and imminent to heart attack. The 300 records are divided into 2 sets: 150 for training and 150 for testing. The training set is also divided into 3 sets: 50 for normal, 50 for abnormal and 50 for imminent to HA. The testing set is divided into 3 sets also: 50 for normal, 50 for abnormal and 50 for imminent to HA.

Data Representation

Most research papers related to heart diseases prediction used these 14 parameters according to their description provided by Cleveland database. Here, we use the 14 attributes; however, we focus on two main parameters in order to distinguish heart attack from other heart diseases. Table 1 illustrates the medical data used as inputs for the networks. Table 2 illustrates the output classes according to our proposed system.

Table 1: Cleveland Parameters (Bache, K. & Lichman, M., 2013).

Parameters	Description	Range
Age	Age in years	Continuous
Sex	1=male,0=female	1,0
cp	Value 1: typical angina Value 2: atypical angina Value 3: non-anginal pain Value 4: asymptomatic	1,2,3,4
trestbps	Resting blood pressure(in mm Hg)	Continuous
Chol	Serum cholesterol in mg/dl	Continuous
fbs	(Fasting blood sugar .120mg/dl) (1=true; 0=false)	0, 1
ECG	electrocardiography results Value 0: normal Value 1: having ST-T wave abnormality(T wave inversions and/or ST Elevation or depression of >0.05mV) Value 2: showing probable or definite left	0, 1, 2
Thalach	Maximum heart rate achieved	Continuous
Exang	Exercise induced angina (1:yes; 0:no)	0,1
Oldpeak	ST depression induced by exercise relative to rest	Continuous

Slope	The slope of the peak exercise ST segment Value 1: up sloping Value 2: flat Value 3: down sloping	0, 1, 2
Ca	Number of major vessels(0-3) colored by fluoroscopy	Continuous
Thal	Normal, fixed defect, reversible defect	3, 6, 7
Num	Number of major narrowed vessels: 0:<50% narrowing 1:>50% narrowing	0, 1

Table 2: Output Classes

Classes	Description
Class 1	Normal
Class 2	Abnormal
Class 3	Imminent to HA

Normal: all parameters are normal
Abnormal: all parameters are out of their normal ranges (abnormal) except the chest pain type and vessels constriction in which they don't indicate a heart attack
Imminent to HA: all parameters are not normal, as well as the chest pain type and the vessels constriction rate which indicate heart attack. For instance, for a case, the chest pain type is typical angina and the coronary vessels constriction rate is greater than 50%.

ANN Topology

The network was created on matlab software using the back propagation algorithm. The first step was to create a basic network and train it for simple operation such as 'AND" or 'OR' in order to reduce the mean sum error value to 0.01. All training is done using backpropagation with both adaptive learning rate and momentum; with the function 'traingdx' and with the transfer function 'logsig'. The network was fed with the normalized datasets for the three sets and their output targets respectively. Figure 2 illustrates a multilayer neural network with 14 neurons in the input layer, 5 neurons in the hidden layer, and 3 neurons in the output layer. We ran the experiments for 10000 iterations.
Table 3 represents 5 records data of the 14 attributes before normalization. Table 4 represents the same data after normalization.

Table 5: Attribute values for 4 patients before normalization

Attributes	Patient 1	Patient 2	Patient 3	Patient 4
1	28	29	32	34
2	1	1	0	0
3	2	2	2	2
4	130	140	105	130
5	132	135	198	161
6	0	0	0	0
7	2	0	0	0
8	185	170	165	190
9	0	0	0	0
10	1.3	0.5	0.2	0.8
11	1	1	1	2
12	0	0	0	0
13	3	3	3	6
14	0	0	0	0

Table 4: Normalized attribute values for 4 patients

Attributes	Patient 1	Patient 2	Patient 3	Patient 4
1	0.4308	0.446	0.492	0.523
2	1	1	0	0
3	0.5	0.5	0.5	0.5
4	0.4667	0.35	0.583	0.5
5	0.396	0.383	0.457	0.398
6	0	1	0	1
7	1	0	0	0
8	0.45	0.533	0.6	0.633
9	1	0	0	0
10	0.475	0.25	0.3	0.7
11	0.5	0	0.25	0.25
12	0	0	0	0
13	0.4286	0.857	0.428	0.428

14	0	0	0	0

Figure 1 illustrates the designed neural network architecture for our proposed system. (x1,…x14) represent the medical parameters which are the inputs of the network. The connections between the neurons called the weights. Each neuron in the input layer is connected to the succeeded neurons in the hidden layer. Moreover, each neuron in the hidden layer is connected to the three output neurons. Sigmoid function is used as a transfer function for the network.

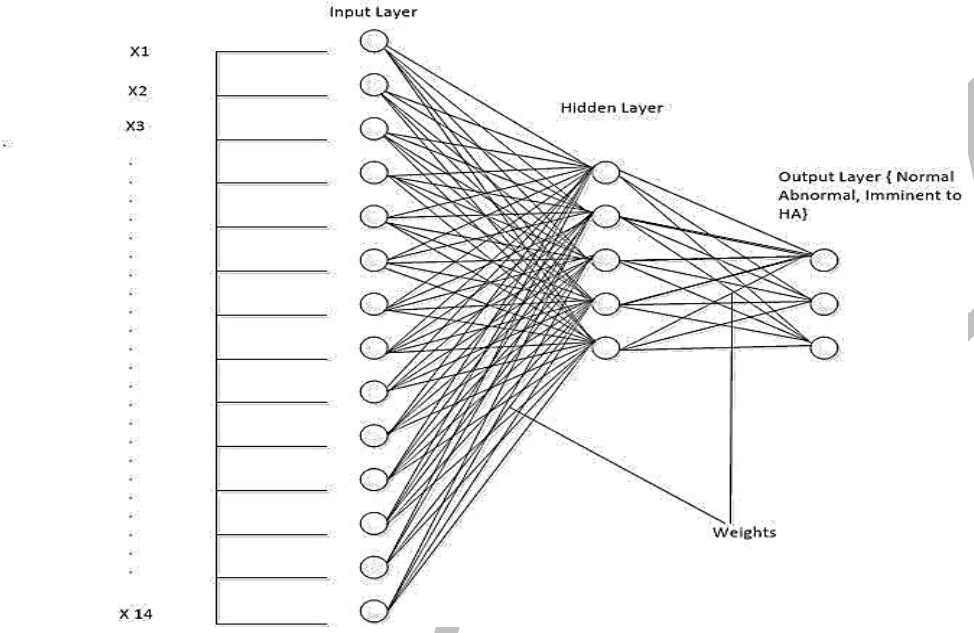

Figure 2: ANN Model

Table 3: ANN Parameters Setting

Parameters	Value
Number of neurons in input layer	14
Number of neurons in output layer	3
Number of neurons in hidden layer	5
Iterations number	10000
Learning rate	0.001
Momentum rate	0.5
Error	0.001
Activation Function	Sigmoid

Table 3 shows all the parameters used when training the network. The network ran for 10000 iterations with a learning rate of 0.001, a momentum rate of 0.5 and a minimum error of 0.001 since it is a medical application.

System Training

The network was trained on three different sets; first set is for the normal values and it contains 50 records, second set is for the abnormal values and it contains 50 records and the last set is for the imminent to HA values and it contains 50 records. The following is the training results of the three sets (learning curve).

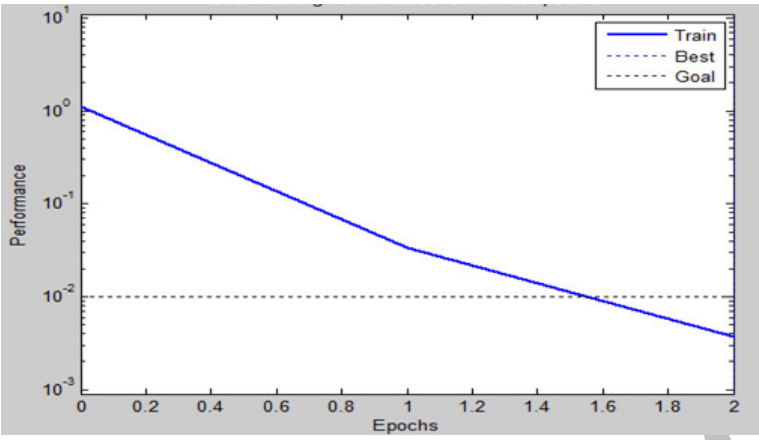

Figure 3: Variation of the MSE with the iteration number.

This curve below represents the regression plot of the desired output (dotted line) and the actual output. As the actual output is far from the target as the error is increased. In this figure, it is remarked that the target and the actual output are very close which means that the error is minimized and the network well trained (training ratio = 96%).

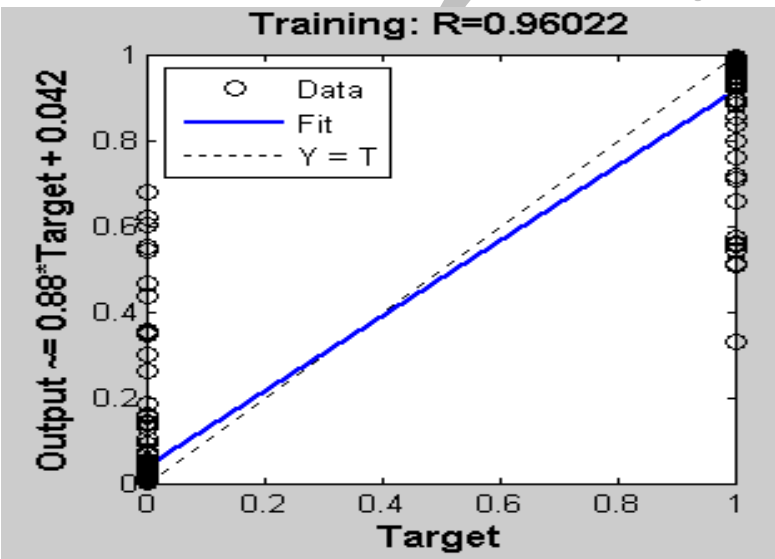

Figure 4: Actual versus target output

Network Performance

The network was tested on a dataset of 150 records; 50 for normal, 50 for abnormal and 50 for severe cases. Table 4 represents the results obtained from two runs for the three different classes (Normal, Abnormal and imminent to HA). This table below represents the number of records that were recognized by the network in the training and the testing phase. The number of recognized records was divided by the total number of records with respect to each case set (Normal, Abnormal, and imminent to HA). The

result of this fraction is called the recognition rate.

Table 4: Recognition rate

	Runs	Classes	Training Sets (150)	Testing Sets (150)	Total
Recognition rate	1	Normal	99%	95%	97%
		Abnormal	96%	91%	94%
		Imminent to HA	97%	90%	93%
	2	Normal	94%	94%	94%
		Abnormal	97%	90%	95%
		Imminent to HA	97%	92%	93%
		All classes	96%	92%	94%

The total recognition rate for the training set is 96% and for the testing set is 92% which means that some records were not recognized correctly. The difference of training results of both runs is due to the changes in the set learning and momentum rate. As a result, the total recognition rate is 94% and it is a satisfying result for such medical application. Table 6 presents some recognized records of three different cases (Normal, Abnormal, Imminent to HA) during the testing phase.

Conclusion

In this study, a heart attack prediction system based neural network was developed. Data mining technique was used to discover knowledge beyond a simple analysis of some medical data related to heart attack. The designed system was capable of diagnosing the three medical conditions: Normal, Abnormal and imminent to HA. The developed system used 14 medical parameters that may indicate heart attack if their values are out of normal ranges. The experimental results of the neural network were satisfactory for such prediction task and they can be furthermore improved.

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Icons and icons: new paradigms in interface design

Elisabetta Zuanelli

University of Rome "Tor Vergata", Italy
elisabetta.zuanelli@uniroma2.it

Abstract: The use of icons in the visual communication of computer languages has recently increased in quantity and complexity with the widespread proliferation of icons in mobile dispositives such as smart phones, ipads, etc. Icon designers and analysts, however, seem to underestimate the semiotic and rhetorical implications in the representation of icons, the subsumed syntax leading to easy or difficult dialogue in iconic communication, the need for an architectural representation of iconic contents. I shall analyse terminological phallacies and conceptual limitations of present interpretations in icons usability and provide a possible further interpretation on the basis of semiotic, linguistic, rhetorical assumptions and related syntax. In particular I shall propose a syntactic interpretation based on the relation between metaphors and metonymies in iconic representation needed to validate the results of comprehension tests.

Key words: metonymic and metaphoric icons, semiotic and rhetorical interface design, iconic syntactic structures.

Introduction

The pioneering analysis of interface design by Nadin has put forward a number of basic issues of the semiotic perspective as he declared that "design principles are semiotic by nature" (Nadin, 1988, p.270). We leave aside the debate on the distinction between 'concrete' and 'abstract' in philosophy and linguistics, and turn to Nadin who introduced the opposition of concrete versus abstract icons.The visual representation may vary from the 'concrete' (namely pictograhic) representation of computer objects/functionalities to the abstract representation of the same (Nadin, 1988, pp. 283-284). The representations, moreover, can be realized as iconic, indexical or symbolic signs following Peirce's triad (Nadin, 1988, pp. 270-271). In this perspective, an object can be represented iconically, if the representation is based on resemblance, likeness; indexically if the representation is causally influenced by the object and symbolically when representation is based on convention (Nadin, 1988, p.270).

Concrete versus abstract, iconic versus symbolic signs

A first terminological check questions the definitions of concrete versus abstract icons and the related quality of iconic representation, as we shall see later on.

The Neozelandese school has widened Nadin's analysis of visual communication in the computer language (Ferreira, 2004, Ferreira, Noble, Biddle, 2005) according to semiotic and rhetoric criteria.

On the one hand, they apply the peircian triadic articulation of signs in icons, indexes and symbols to the analyses of icons in computer interaction using the distinction between iconic and symbolic icons.

On the other hand, they propose the interpretation of visual representations in interface design by applying the typology of language metaphors as cognitive devices put forward in 1980 by Lakoff and Johnson (2007) to graphic interfaces (Barr, Khaled , Noble & Biddle, 2005).

Dormann (1994) recalls Nadin's interpretation and proposes a typology of mechanisms of construction of compound icons to be considered as the 'syntax'of the iconic language.

These and other analyses, however, do not allow for an explanation of why certain icons in computer and mobile interfaces are understood better than others by users (Ferreira, Noble, Biddle, 2006; Gatsou, Politis, Zevgolis 2012).

The common generalization of the results of intuitive tests as administered to diverse targets of users in different studies on the basis of the concrete/abstract and the iconic/symbolic opposition seems to confirm a better usability of 'concrete' icons against a loose usability of 'abstract' ones with the only debatable specification that concrete and iconic signs would be closer to the object/function they represent, in a sort of tautological loop. The degree of likeness of the icon to the represented object is called articulatory distance and implies the obvious consideration that the designer's intended meaning should coincide with the user's comprehension. What is not explained is the correspondence of an 'object' (?) with a 'function' and their translation into an iconic representation: in other words why should the icon of a printer stand for 'printing' or that of scissors fo 'cutting'.

In the above mentioned assumptions the assimilation of the notion of'concrete' to that of 'iconic' icons as well as the correlation of 'abstract' with 'symbolic' signs to be tested for comprehension is proposed. However the choice of the tested visual items appears as an arbitrary option. The assumption goes together with the obvious consideration that familiarity and previous knowledge of icons, both abstract and concrete, by users is an important variable in comprehension results: a statement that coincides with Nadin's view that the user must understand the computer language in order to use it.

Computer language is a specific language with rules such as the association of certain actions with certain icons, their syntax or else the logical structure underlying the interface.

The diffusion of fuzzy concepts such as concrete versus abstract, iconic versus symbolic signs does not help to detect specific rules in iconic communication and is not justified by the corpora of icons proposed to illustrate them. The use of these concepts explains the unsatisfactory and conflicting results in intuitive tests of icons comprehension as stated above (Ferreira, 2004, Ferreira, Noble, Biddle 2006, Gatsou, Politis, Zevgolis, 2012).

I believe the reason lies in a limited exploitation of semiotic and rethorical mechanisms involved in visual communication that specify the syntactic iconic structure underlying images.

The overall question concerns the feasability of iconic communication through new icons, whether concrete or abstract, whose meaning be not specified by linguistic means, namely the labelling of intended meaning, in order to be memorized and conventionally recalled by users.

This implies the differential ease in intuitive recognition and memorization of new icons and whether or not the verbal language is always needed as a metalinguistic support to visual communication (Zuanelli, 2012).

In order to identify the phallacy of simplified interpretations I shall briefly recall approaches, analyses and solutions to pass on to a different position. I shall first recall Nadin's distinction between concrete and

abstract icons and the triadic peircian articulation of signs in icons/indexes/symbols as applied to the analysis of interface design.

According to Nadin and the peircian triad of signs, the representation of iconic entities may be articulated as follows. The example concerns the representation of a pocket 'calculator'.The image seems to maintain certain visual features of the object in the real world, namely some quality of the physical object to which the image is related according to Peirce's assumptions.

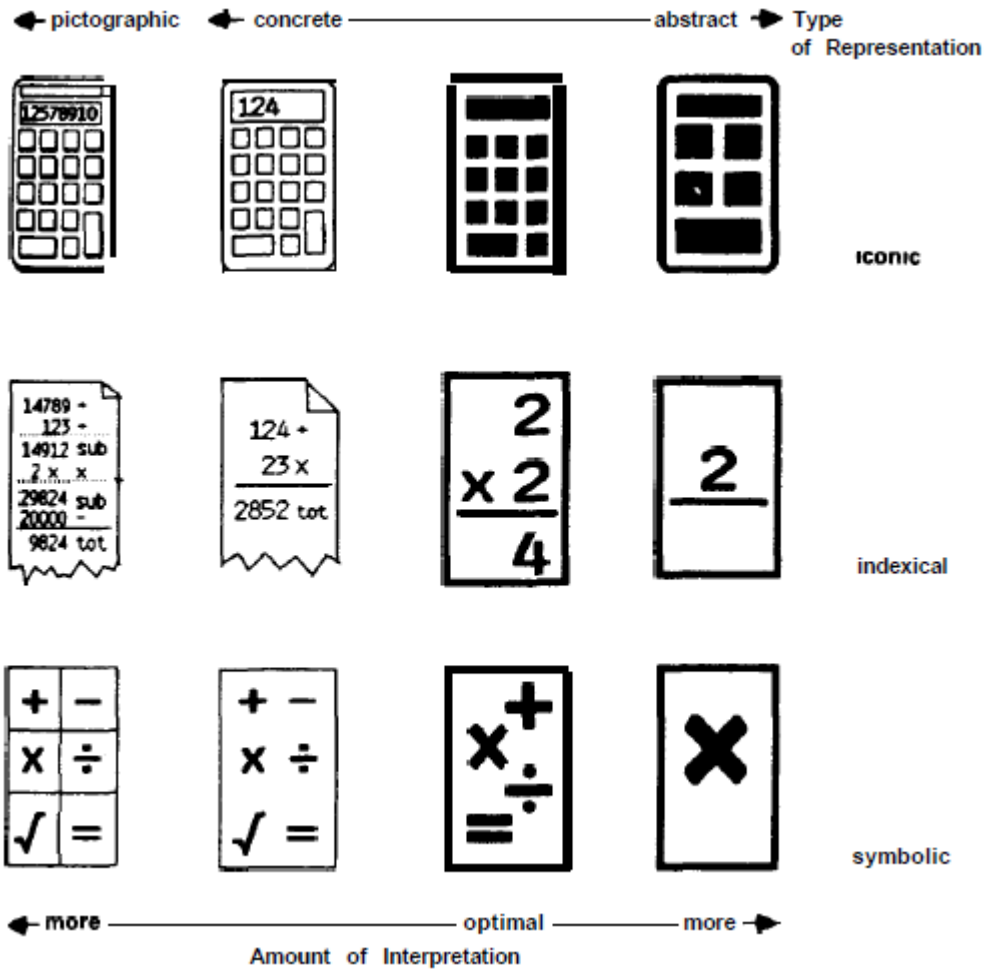

Figure 1: Nadin's representation of visual signs (1988)

The range of visual representations of the same virtualized object/function proposed by Nadin goes from a pictographic representation which is considered to be concrete and iconic to a gradual simplification of the graphic rendering of the same object down to a so called abstract representation which is considered to be symbolic. The same concrete/abstract distinction applies to the indexical and the symbolic representation of the object. Nadin's interpretation elicits a number of questions.

First, we can observe that the reduction of graphic details in the four items of the first row from concrete to abstract in the iconic representation still releases a concrete, almost figurative realization in the abstract icon too. In the abstract iconic representation, in fact, we can still guess the identification of the virtual object 'calculator' through essential features such as the rectangular shape, the proportion of lines and the articulation of square boxes/buttons inside the rectangular figure. A possible ambiguity is present in items three and four of the row where the lack of numbers that refer implicitly to operations might elicit other interpretations of the object/functionality if the icon were taken outside a specific context, namely the reference to a TV remote control dispositive or a cellular phone. Therefore, beside the shape and the boxes, the third visual information clue seems to be the presence of numbers and their metonymic/indexical relation as referred to operations in a calculator: 'if numbers on an object then digital operations through a calculator' since numbers are metonymically implied in operations and the tool for this action is a calculator.

Visual metaphors and metonymies

At this point, let me introduce, the concept of visual metonymy to explain the correlation of icons with the intended meanings.

In the essay on translation Jakobson evokes the semiotic nature of the verbal language, indirectly quoting Peirce by referring to the fact that the meaning of a word is its transposition into another sign that can replace it more completely (Jakobson, 1966 a, p. 57). He defines the intersemiotic translation as the interpretation of verbal signs by means of non verbal sign systems.

In another famous essay on aphasia (Jakobson, 1966 b) he introduces the semantic distinction between the metaphorical and the metonymic orientations in language constructions referring to the relation of one theme with another by similarity (typical of metaphors) and contiguity (typical of metonymy). The verbal metonimy presents a semantic contiguity with the verbal item it stands for, for instance the part for the whole, the tool for the action, the container for the content. The contiguity concerns position that is the syntax/combination of words. If we accept this analysis we can define a metonymy as the replacement of an expression with another semantically related to it by contiguity that is by means of a syntactic relation. What is implied is that the meaning of a metonymy requires a syntactic analysis that specifies the relation.

Let us apply these assumptions to the intersemiotic translation namely from words to icons through the metaphorical (substitution) and the metonymic (combination) relations and return to the calculator example.

The visual component,'numbers', is a doubly indexical/metonymic clue, meaning 'if numbers then mathematical operations' and 'if mathematical operations then the tool calculator'. The conclusion would be that the first and the second image are 'concrete' as far as the iconic metaphor of a calculator is accomplished through the presence of an additional clue, numbers, that is not available in the third and the fourth items of the row, being insignificant the number and the types of boxes inside the rectangular shape for an unambiguous interpretation. A direct implication would be that in concrete representations of interface design for a virtual calculator, essential and distinctive graphic clues are needed as compared with a general photographic or pictographic miniaturized iconic representation.

A second observation concerns the indexical representations in the second row. The first three items are really indexical, 'if mathematical operations on a sheet then an implicit activity of calculus and a virtual tool for operations' that is a virtual calculator, whereas the last item of the row would very doubtedly be understood as an operation and could only be considered a symbol for operations through a visual convention. Two further details are offered for items one and two of the indexical row, namely the sheet/file. The sheet adds an indexical detail: the virtual sheet for operations is the indexical realization of the 'concrete' sign/function, operations written on a piece of paper, to be virtualized in a further metonymic assumption namely the translation from the virtualized sheet to the implicit tool/calculator display. This indexical clue is not present in the two other images.

The third row poses a different question consisting in the arbitrary nature of symbols as historically discussed by Peirce and Saussure (Peirce, 1998, Saussure, 1972, Zuanelli, 2012). If a symbol is originally arbitrary and can be interpreted only by means of convention, the four images are not properly symbols, unless they be conventionally used as such. In fact, the three items are rather indexical whereas the 'abstract' quality of the image should be originally unmotivated and conventional in order to be a symbol, at least according to Saussure. The different nature of symbols is the basic distinction between the verbal and the iconic language.

The complex relational structure of iconic semes, defined here as the pertinent and distinctive graphic components of the icon, becomes evident and blurs the notion of concrete representations as opposed to abstract ones of the types we have examined. Either we accept the fact that abstract icons coincide with an originally arbitrary representation of symbolic icons that only communicative digital conventions can turn into symbols or admit that a symbolic sign may be as concrete as an iconic one and this assumption would blur the distinction between iconic and symbolic signs, given the fact that both must be conventionally recognized as such. In other words, we must accept the fact that iconic symbols are not necessarily

arbitrary at their origin as words are. The symbol of justice, a humanized female figure that holds a scale, has an undoubtful metaphoric and metonymic meaning that was conventionally assumed whereas the symbol/word 'justice' does not present inherent properties of the concept of justice in its signifiant that could have been originally a totally different string of phones/sounds. We must also face the problem of the introduction of new icons whose not 'figurative' quality does not correspond yet to a conventional meaning. In other words 'figurative' signs related to objects/functions seem to elicit complex semantic structures that lead to comprehension through metaphoric and metonymic translation, which is not the case with 'abstract' non figurative signs. If this is the assumption, we can revisit the results of intuition tests formulated according to the opposition of iconic versus symbolic signs, concrete versus abstract ones, as we shall see. In order to do that, we must deal with another problem: the syntactic difference between single and compound icons. Finally, we need to distinguish among typological sets of computer functionalities recalled by icons to be interpreted in different ways according to context, namely their being system icons or application icons or state icons. In order to anwer these questions we formulate the hypothesis of the existence of an implicit verbal syntax under the iconic representations that mediates and conditions their comprehension. Let me come to the point.

Single and compound icons: a syntactic analysis

In a previous analysis of mine, I had recalled the fact that icons as present in graphic user interfaces (GUIs) inform us of two basic things.

First, icons and words define both the context of interaction and the actions suggested for interaction to users in the computer dialogue. The context is generally rendered through visual environment metaphors and verbal labelling as in menus and functionalities/actions are conferred to visual metaphors/metonymies usually verbally defined. Second, graphic interfaces use different functional typologies of visual information: graphs, icons, colors, space, etc. with the implication that concrete icons, which I had rather called figurative icons, as we have seen, are better understood than abstract or new ones (Dormann, 1994, Ferreira, 2004, Zuanelli, 2012, 2013).

As a second assumption, both single and compound icons imply a verbal syntax where the verb/action, as in a prefix rule, is evocated by an iconic metonymy: the visual tool 'printer' for the action of printing, the visual object 'sheet' for the action of opening a file. The implied iconic verbal linear syntax would appear as follows:

Verb (either iconically implicit or explicit) + **Object** or **Complement**

The synopsis of Microsoft Windows Word and Outlook Express presents a linguistic syntactic typology that refers to the conceptualization of contents identifying digital functionalities.

Types of icon	Iconic metaphors	Syntactic relations in icons	Linguistic syntactic relations	Abbreviated syntactic relations
TYPE 1 	single concrete icon **iconic metaphor** FILE	object (file) for action (open) **(syntactic metonymy)**	verb ellipsis +object	**(V) O**
TYPE 2 	single concrete icon **iconic metaphor** SCISSORS	tool (scissors) for action (cut) **(index/syntactic metonymy)**	verb derived from name/iconic metonymy+object ellipsis	**N® V (O)**
TYPE 3 	single abstract icon **(conventional iconic orientation metonymy)** ARROW	graphic **symbo**l (arrow) for action (cancel) **(symbol/syntactic metonymy)**	verb+object ellipsis	**V (O)**
TYPE 4 	composite abstract icon **(conventional orientation metonymy)** ARROW + concrete icon (envelope)+ abstract composite icon (electronic address symbol over paper/email) **(conventional orientation metonymy/composite icon)** ENVELOPE and EMAIL	graphic **symbol** (arrow) for action (**symbol/ sintactic metonymy** + **object** and **modifier** (electronic envelope) (web address symbol)	verb+object	**V NN →VO**
TYPE 5	same concrete icons/duplication **(metaphors)** WRITTEN SHEETS	**duplicated icon** for action (copy) **(sintactic metonymy) +** object	verb and iconic object coincide	**NN®VO**

		(sheets/**iconic metaphor)**		
TYPE 6 	abstract icon and concrete icon (**metonymy/metaphor**) ARROW + FOLDER	**graphic symbol** for action (open) object of action (**iconic metaphor**)	verb and object	**V O**

Figure 2: Iconic syntax (Zuanelli, 2013)

The functionalities are translated into the iconic language by means of rhetoric-semiotic mechanisms. In the synoptic table, types correspond to 'concrete' and/or 'abstract'/conventional icons, single and compound, namely two or more visual signs.The composition of icons, two or more, is realized through a horizontal or a vertical spatial location, juxtaposition or superimposition of iconic signs. Even when superimposed, the compound icons correspond to a linear syntactic sequence mutuated from the English language.

In Type 3 we can observe that the 'symbolic' icon arrow for the verb 'delete', as stated above, contains a double metonymy: the 'return' action that implies the action of 'deletion' in an indexical causal extension: 'if virtual return then delete'. Moreover the semiotic value of the arrow varies as related to the implied syntactic context and composition: in Type 4 the arrow means 'send' whereas the doubly oriented arrow in email means 'send and receive'.

As a conclusion, the intersemiotic metaphor from the verbal to the iconic code by means of a 'concrete' or an 'abstract' icon coincides with a specific structure where the concrete image is an icon that in Peirce's approach has a physical qualitative resemblance to the virtual object it represents, as well as an index/metonymy based not only on the causal relation (if...then) but also on the semantic contiguity (Jakobson, p.40) typical of the metonymic relation, in general.

We may also assume that abstract concepts (such as 'justice', 'peace' or 'Internet', 'phone call') imply originally a verbal metonimy that is translated into a 'concrete' symbolic visual metaphor, the symbol for justice, peace, Internet, etc. and a visual metaphor of the verbal metonymy as in 'phone call' or 'message'.

Single versus compound icons: predicative or modifying structures

Among problems to be faced in this analysis we should now deal with the following issues: are single icons easier to understand then compound ones and concrete icons better then conventional or new abstract ones; are photographic iconic representations better than pictographic ones and do compound icons subsume the same syntactic structure as single ones? An overall question to be posed could be whether different subsumed syntactic structures imply different degrees of comprehension, namely if a Verb+Object structure is easier than a Verb+Complement structure. Now we can address these issues. Let me start with the first question concerning the structural quality of compound icons.

In her proposal of compound icons Dormann theorizes the existence of an 'iconic' syntax where the term syntax coincides with different ways of combining icons: combination (superimposition, conjunction, concatenation, juxtaposition), transformation, derivation and inheritance, duplication.

Figure 3: Examples of iconic combination (Nadin, 1994, p. 82)

These techniques, as she calls them, for creating compound icons are 'the syntax' (Dormann, 1994, p. 81).The visual techniques for different types of combination are represented above. Whilst examples of superimposition let understand that two icons are put together, one on top of the other, to create a new concept, concatenation can be described as the multiple duplication of the same icon on a vertical superimposition. Juxtaposition appears to be the composition of an icon with another one on a spatial coexistent area.

Whatever the combination, the important observation is that compound icons 2, 3 and 4 create a new conceptual entity: 'modem', 'stack', whereas items 1 and 5 correspond to a compound icon of a second type where one icon is the modifier of the other: idea 'of a stack', 'world wide' network according to the verbal syntax of the English language with left and right modification. In these cases, there is no predicate syntax but only a word composition. According to my analysis, the substantial matter is that different compound icons correspond to different syntactic functions: a modifying function and a predicative function. One way of considering icons and their functionalities would then be that the identification of different verbal structures subsumed by different types of compound icons is needed for comprehension.

In other words, we can make the guess that the meaning of compound icons is more difficult to retrieve, given the need to understand a different underlying syntactic structure: a predicative structure straightly related to the functionality as different from a modifying structure having to do with an adjectival/appositional and specificational property attributed to the object/function. Secondly, as evidentiated by various analyses, the specific context of icons (static, system, application functions) would determine their proper comprehension, having to do as well with the familiarity/previous knowledge of the icons by users.

Predicative and modifying structures

Let us come to this point and have a look at system icons, both single and compound, to put forward examples of their different structure and check the double, often semantically ambiguous value of compound ones.

In the Control Panel of Microsoft Windows 98, the system icons are rendered through single and compound icons that correspond all to an implied generic function of 'management of programs' and have to do with the thematic contents of the implied function. Only a few verbal labels specify the kind of actions explicitly proposed to users even though the verbal labelling of functionalities does not correspond to an imperative/directive function but has to be considered as a false imperative, standing for a title of the function (Zuanelli, 2009). See, for instance **Add new Programs, Add and Remove Programs, Find Fast.** In these cases, the verbs represent thematic functionalities as confirmed by all the other nominal formulations of contents. They are thematic labels performing the titling function that includes a number of internal actions related to system, network and Internet functionalities.

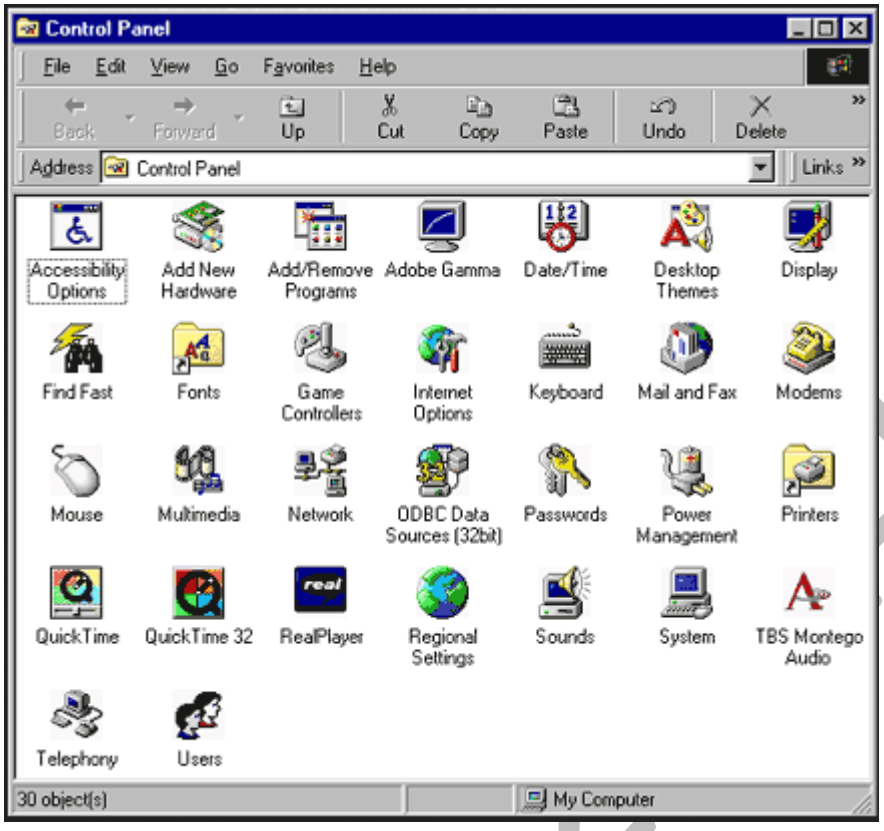

Figure 4: Microsoft Windows 98 Control Panel

In the iconic presentation of the programs of the control panel, predicative structures and modifying syntactic structures are present. Let us comment a few cases.

In **Desktop Themes**, we can see the juxtaposition of four metaphoric/metonymic icons: the metonymic capital **A** standing for 'graphic letters', the metonymic **palette** standing for 'colours', the metonymic **megaphone** standing for 'sound', the background **computer screen** meaning the literal metaphorical concept of a computer screen.

In a syntactic iconic analysis we can interpret the three superimposed icons on the fourth one as 'manage the screen script, colour and sound'.The syncretic comprehension of the icons is facilitated by their concrete metonymic meaning and by a simple (V) + O relation, the object being the appositive modifying structure we have postulated ('screen script, colour and sound'). An intuitively simpler structure (V) + O is the case with **Mouse** whereas **Regional Settings** could hardly be understood iconically as such, due to the use of the globe as a conventional concrete symbol for the Internet, metonymically meaning instead 'geographic areas as part of the globe'. A slightly more complicated analysis would be applied to **Find Fast** that presents an iconic modifying structure (Verb + Adverb) that would loosely correspond to the iconic representation that is proposed in a reverse order as 'fast find' (first the 'lightning' for 'fast' then the 'binocular' for 'find'). The iconic structure presents a rather complicated visual metonymy: the lightning icon standing for quick, 'fast' and the binocular virtual tool for 'finding'. A double metonymy is implied: 'a binocular for a magnified vision' as related to a 'tool for search' and 'if search then (possibly) find'. In this analysis we could wonder how many of the iconically synthesized functions represented in the table could have been interpreted without a verbal labelling. We could also wonder if the compound icons, as the case is with **Find Fast,** corresponding either to a verb (find), however placed iconically in a reverse position (fast find) and a modifying adverb (fast) or to an adjective + noun (iconically 'fast find') as applied to virtual contents, can be more intuitively understandable than a single object icon as the case is with **Mouse**, a literal iconic metaphor. The complex syntactic iconic structure for **Find Fast** as compared with **Mouse** would appear as follows.

Find Fast: the reverse order in the iconic representation

V + **Modifier** (adverb) + (**Object** implicit)

Fast Find: iconically correspondent

Modifier (adjective) + **Noun**

'fast search'

Mouse

(Verb) + **Object**

('manage') mouse'

Our conclusion, to be tested, is that compound icons subsume conceptually complex and at times ambiguous structures that require more processing time for the detection of their meaning as compared with the comprehension of single ones. Further difficulties derive from the creation of 'abstract contents' such as 'settings' rendered through a concretization of 'regional' into a globe metaphor and a misleading icon combination that implies a poor or unsatisfacory iconic rendering as the case is with **Regional Settings.** Moreover, the overall menu testifies the lack of an iconic logical architecture if compared with local menus of programs such as Word or Outlook express. In subsequent Microsoft examples the problem is faced by grouping icons according to a labelled content categorization.

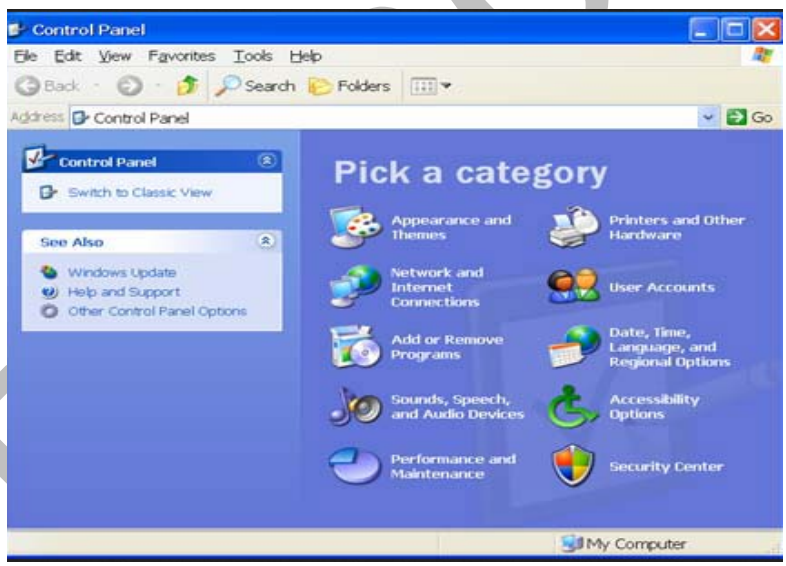

Figure 5: Microsoft Microsoft Windows XP Control Panel

The need for an architectural cognitive and functional iconic display and the choice of iconic solutions is dramatically evident if we pass on to mobile devices (smart phones, ipads, etc.) where the iconic mania is furiously fighting against the need for a simple comprehension of contens by users.

In the following example, the iconic language appears more and more as a mixture of conventional icons taken from other types of contents representations, new single and compound icons, and a multilingual combination of icons, verbal language, numbers.

Figure 6: Iphone 4

A quick look at this menu leaves us puzzled, both with single and compound icons, when labels are missing and system or network applications are not displayed in a structured scheme.

Let us conclude the analysis with a redefinition of the results of an intuitive test of mobile icons identification in order to verify our position.

A redefinition of results of mobile icons comprehension

In the application of the concrete/abstract opposition for mobile icons recognition, Gatsou, Politis, Zevgolis (2012) propose the following test and results.

Given a multiple representation of the same functionalities, according to different technological brands, tested through gender and age diversity as well, the authors offer results whose interpretation is given according to the concrete/abstract opposition.

Assuming as a reference parameter the percentage of correct guesses equal to 66% in order to consider icons as accepatable by ISO, according to their analysis, the results display a various range of comprehension problems, ranging from a poor visual rendering of the function to the assumed better performance of 'concrete' icons as compared with abstract ones.

No	A1	A2	A3	A4	A5	A6	A7	A7	
Phone book									
Recognition	56.7	63.3	78.3	30.3	56.7	56.7	40.7	70.0	
No	B1	B2	B3	B4	B5	B6	B7	B8	B9
Phone call									
Recognition	75.0	50.0	60.0	20.0	53.3	21.7	55.0	60.0	60.0
No	C1	C2	C3	C4	C5	C6			
Message									
Recognition	98.3	93.2	88.3	86.7	95.0	96.7			
No	D1	D2	D3	D4	D5	D6	D7	D8	
Setting									
Recognition	65.0	91.7	90.0	68.3	95.0	58.3	58.3	91.7	
No	E1	E2	E3	E4					
Camera									
Recognition	78.3	96.7	96.7	100.0					
No	F1	F2	F3	F4					
Clock									
Recognition	60.0	100.0	61.7	61.7					
No	G1	G2	G3	G4	G5	G6	G7	G8	G9
Internet									
Recognition	40.0	68.3	93.3	45.0	95.0	91.7	95.0	85.0	65.0
No	H1	H2	H3	H4	H5	H6			
Games									
Recognition	78.3	40.0	30.0	81.7	85.0	93.0			

Figure : 7 Gatsou, Politis, Zevgolis (2012)

In all cases we can observe that single icons score best. The same is true of concrete versus abstract conventional icons as the case is with the conventional 'abstract' **double arrow** in phone call and **the tools** (concrete and metonymic) in setting.

The best score is for **camera** and **clock** (100.0) where the implied syntactic structure is **(V) + O,** a literal metaphor of the type 'manage camera', 'manage clock' with no metonymic extension.

Summing up the results of our analysis, we can draw the following conclusions for new improved parameters in icons design.

Conclusions

In my analysis I have tried to demonstrate that the opposition concrete versus abstract icons and iconic versus symbolic icons needs redefinition. The following are the summarized lines of analysis that are needed to define new paradigms in interface design.

'Concrete' icons may refer to:

i. a physical object as a literal metaphoric transposition from the verbal referent to the iconic code as the case is with 'camera', 'clock', etc.;
ii. a physical object that is metonimically related to its referent as in 'file', 'scissors';
iii. an abstract concept metonymically related to a physical referent as the concrete envelope for 'mail' or the concrete telephone for 'telephone call'.

Abstract icons correspond to:

i. a conventional arbitrary graphic representation as in 'games' (H1);
ii. a conventional Logo such as the Microsoft, Apple, etc. symbols;
iii. a conventional symbol in the computer language: the 'globe' for Internet, the @ for the 'at' of email;
iv. conventional computer symbols belonging to other codes as the X for 'closing' or the arrow for 'orientation';
v. a totally new non conventionalized/arbitrary icon to be acquired as a symbol.

As a consequence, iconic and symbolic icons can both be 'concrete' according to the metaphoric and/or metonymic reference they imply.

As for single versus compound icons we may state that single icons imply a simpler predicative structure (Verb+Object, Verb+ Complement) whereas compound icons may imply an ambiguous modifying structure that possibly requires more processing time to be understood.

Finally, iconic concrete metaphors seem to guarantee a simpler translation when they do not require a further metonymic analysis as the case is with 'camera'or 'clock' that imply a (V)+O sintactic structure as compared with 'file', iconic metaphor of a phisycal sheet and metonymic syntactic extension for 'open file' (V)+ O or scissors for cutting (V)+C.

I consider this analysis a new prospective paradigm for interface design in iconic digital communication.

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Implementation and Dual Loop Control of Two Phases Interleaved Boost Converter for Fuel cell Applications

Ramzi Saadi [1], Mebarek Bahri[1], Mohamed Yacine Ayad[2] ,

[1]Department of Electrical Engineering MSE Laboratory, Mohamed khider University

Biskra, Algeria

[2]Industrial Hybrid Vehicle Applications, France

Abstract : A fuel cell is usually a low-voltage with hybrid voltage/current source characteristics. So that their output voltage must be increased to approximately a few hundred volts to be suitable for vehicles power trains or for any industrial application. Therefore a dc-dc power converter is required to set up the fuel cell voltage to high voltage DC bus. In this paper, analysis, implementation and control of a dc-dc converter structure called two phases interleaved Boost converter (IBC) will be presented. This topology is widely used to reduce the input current ripples and reduce the size of passive component with high efficiency for fuel cell applications. The control of the IBC converter is designed by dual loop control that contains a voltage loop with a linear PI controller and a fast current loop with a non-linear sliding controller to ensure excellent performance results. The control loop has been validated by experimental results using small-scale test bench with dSPACE-1104 card .
Keywords : component; DC/DC Converter; IBC; fuel cell; PI; sliding mode control.

Introduction

The fuel cell (FC) currently attracts a new interest so much on the industrial level than on the research one. Industrialists of various sectors (electronics, cellular phones, vehicle, power generation, heating,...) invest in the development of this technology with high-density characteristics and weak harmful gas emissions (Jin, K., 2009; Kishinevsky, Y., 2003; Shahin, A., 2010).

Fuel Cells (FCs) produce an electrical energy from an electrochemical reaction between a hydrogen-rich fuel gas and an oxidant (air or oxygen). The main by-products are water, carbon dioxide, and heat. FCs are similar to batteries since they both produce a DC voltage by using an electrochemical process (Ayad, M., 2011). Unlike batteries, FCs do not release storage of energy; instead they convert energy from hydrogen-rich fuel directly into electricity.

Among the various FC existing technologies, the Proton Exchange Membrane Fuel Cell (PEMFC) is considered as the suitable technologies for the distributed generation and transport applications (Saadi, A., 2013) thanks to its produce water as a residue, high efficiencies for powering vehicles, solid electrolyte and favorable power-to-weight ratio offer an order of magnitude higher power density than any other fuel cell type. It has also low corrosion, low temperature operation and it needs less time for starting and reaching its nominal operation .conditions(Emadi, A., 2004). All these characteristics are needed for vehicular applications.

However, some constraints are still of concern, especially its slow dynamic and low output voltage characteristic. To go over these two particular constraints, several cells should be stacked to attain the required output voltage that is often fixed close to 100 V and a DC/DC converter is then added to boost the output voltage of the FC to a high voltage DC bus. Such DC/DC converter is required not only for the voltage boost, but also for the voltage conditioning as the FC output voltage varies strongly with the load

and for reducing the current ripple(Kabalo, M., 2013). these DC/DC converters must respond to challenging issues in transportation applications such as (Kabalo, M., 2012) :

1) High efficiency;
2) decrease the input ripple current for prolonging fuel cell lifetime.
3) Weight and volume reduced;
4) High power density;
5) Low cost;

The interleaved boost converter (IBC) (El Fadil, H., 2011) is considered a good solution for fuel cell application with respect to efficiency and current distribution. The concept of interleaving allows reducing the input current ripple which is one of the most important required characteristics from DC/DC converters for fuel cell electric vehicle (FCEV) application and provides high power capability, modularity and improved reliability. In this paper implantation and control of two phases interleaved Boost converter coupled PEMFC with resistive load is presented, the control of the converter is assured by dual loop initially contains a linear PI voltage loop controller and a fast current loop with a nonlinear sliding controller. Experimental results with small power test bench will be presented to validate the efficiency of the proposed control method.

Presentation of two phases interleaved boost converter

The interleaved boost dc-dc converter is proposed to deal with the high current problems at high power applications. Fig. 1 shows the schematic diagram of the interleaved boost dc-dc converter, consisting of a two identical elementary boost converters connected in parallel and sharing a common DC bus. The two identical parallel cells provide half of the total power each, where elementary Boost is controlled via the same duty cycle D and control signals are shifted by a half period. It's important to note that for a given duty cycle, this structure gives an output voltage same as in classical Boost structure and its major use advantage is(Kabalo, M., 2010):

1) Increasing the overall converter efficiency;
2) Increase the input and output ripple frequency without increase the switching frequency;
3) Decrease the input ripple current;
4) Enhance the system reliability by paralleling phases.

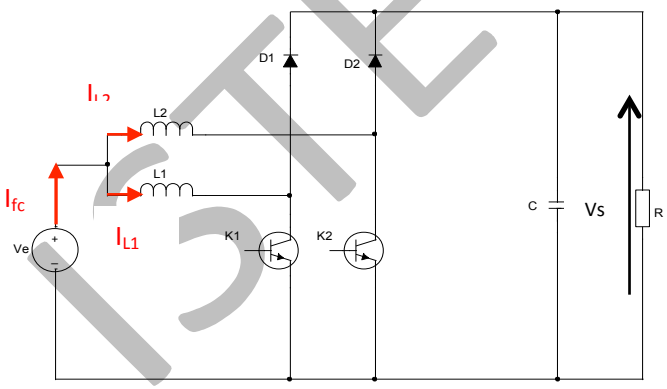

Figure 5: Interleaved 2-phases boost DC/DC converter.

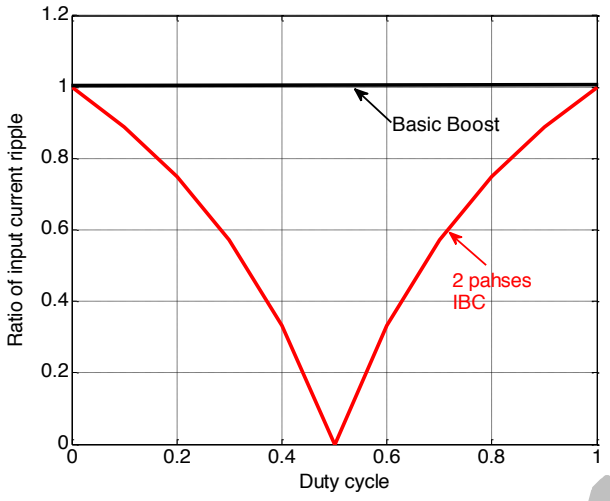

Figure 6: Ratio of input current ripple to phase inductor current ripple according to duty cycle.

Another reason for this choice of topology is the cancellation of the ripple current for specific duty cycles. For the two phases IBC converter the input current ripple becomes zero for one specific values of duty cycle equal to 0.5. Fig. 2 shows the variation of the ratio of FC current ripple, Δifc to phase inductor current ripple, ΔiLx according to the duty cycle for basic boost topology used usually for FC applications (Yu, X., 2007) and IBC two phases converter.

Modeling of the ibc converter

Fuel cell modeling

The output voltage of a single cell VFC can be defined as the result of the following equation(Larminie, J., 2003):

$$V_{FC} = E_0 - A\log\left(\frac{i_{FC} - i_n}{i_0}\right) - \left\{R_m(i_{FC} - i_n) + B\log\left(1 - \frac{i_{FC} - i_n}{i_{Lim}}\right)\right\} \quad (1)$$

where E is the thermodynamic potential of the cell representing its reversible voltage, iFC is the delivered current, i0 is the exchange current, A is the slope of the Tafel line, iLim is the limiting current, B is the constant in the mass transfer, in is the internal current and Rm is the membrane and contact resistances. Hence VFC = f (iFC).

The second term of the voltage FC equation is the voltage drop due to the activation of the anode and of the cathode. The third term is the ohmic voltage drop, a measure of the ohmic voltage drop associated with the conduction of the protons through the solid electrolyte and electrons through the internal electronic resistances. The fourth term represents the voltage drop resulting from the concentration or mass transportation of the reacting gases.

The fuel cell static model is compared with experimental results using PEMFC Nexa Ballard 1.2KW in fig. 4. As it can be observed in fig. 4, the static model equation (1) allows giving an excellent fit with the experimental results of polarization curve.

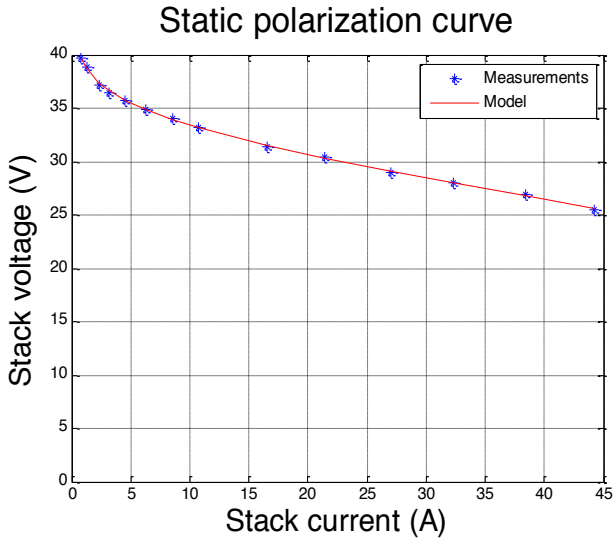

Figure 7: Experimental polarization curve and model.

Two phases IBC modeling

To design the appropriate controller with required performances, it's important to do not neglect the dynamic considerations. Thus, A number of ac equivalent circuit modeling techniques have been presented in the literature, such as state-space-averaged modeling and PWM switch method for modeling DC-DC converters(Kassakian, J. G., 1991). Among these methods, the PWM switch method is the widely used one to model DC-DC converters. The transfer functions for duty-cycle to inductor current Gix(s) and inductor current to the output voltage Gvx(s) of IBC topology are obtained from averaged small-signal model are:

$$G_{ix}(s) = \frac{\hat{i}_{Lx}}{\hat{d}} = \frac{2V_1}{R(1-D)^2} \frac{1+\frac{RC}{2}s}{1+(\frac{L}{R(1-D)^2})s+(\frac{LC}{(1-D)^2})s^2} \quad (2)$$

$$G_{VX}(s) = \frac{\hat{v}_o}{\hat{i}_{Lx}} = \frac{R(1-D)}{2} \frac{1-(\frac{L}{R(1-D)^2})s}{1+(\frac{RC}{2})s} \quad (3)$$

Where $\hat{i}_{Lx}, \hat{d}, \hat{v}_o$ are small increments around of their operating points.

Control strategy of the two phases ibc converter

The correct design of the controller is a difficult task because according to equations (2) and (3), the transfer functions of IBC converter are of the 1st and 2nd order and its parameters vary strongly with the load. to design properly the controller, it is essential to establish the control objectives, which can be formulated as following:

1) Maintain the output voltage constant under load change.
2) Equal current sharing between phases. The input current waveforms must be equal in order to avoid overloading one of the phases, particularly for heavy loads. Furthermore, the phase currents

must be correctly shifted from each other in order to minimize the input current ripple which is undesirable in fuel cell applications;

3) Guarantee always the stability and dynamic performances of the closed loop system.

Dual Loop Control

The two phases IBC converter is controlled by dual loop control that contains a linear PI outer loop (or voltage loop). This allows usefully comparing the output voltage reference with the measured output voltage of the two phases IBC converter. Hence, the total current reference is obtained from PI controller and then is shared out between each phase of the IBC converter. For the IBC topologies, the total current is divided by 2 (number of phase). Then, the inner loop (or current loop) allows us obtaining the duty cycles (D1, D2,) from nonlinear sliding mode controllers. Hence, a control strategy architecture related to the presented converter is derived. Its schematic is presented in Fig. 4.
The PI controller (PI-1) is defined as follow:

$$PI_1 = K_1(1 + \frac{1}{T_1 s}) \qquad (4)$$

The PI controller have been designed in order to satisfy the control objectives and some design requirements such as phase margin (PM), gain margin (GM) and settling time. In summary, they lead to the satisfactory performance, namely PM=45° and GM=10dB.

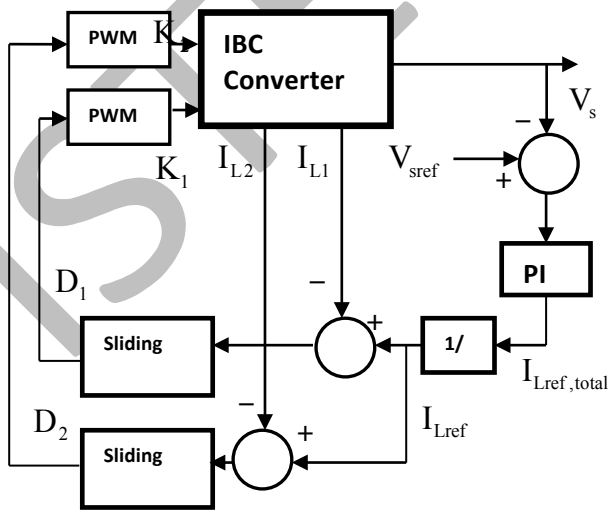

Figure 8: control strategy architecture.

Current sliding mode controller

To ensure the stability and the robustness of the system, one has to control the inductive current. A nonlinear sliding mode controller is used to pilot the current control loop applying the large signal model of DC-DC converters(El Fadil, H., 2013; Ayad, M., 2007; Ayad, M.-Y., 2007). Thus, its stability is not restricted to be around the operating point (as it is often in small signal modeling).The following equation define the large signal model of the two phases IBC :

$$\begin{cases} L_1 \cdot \dfrac{dI_{L_1}}{dt} = V_e - (1-D_1)\cdot V_s - r_{L_1}\cdot I_{L_1} \\ L_2 \cdot \dfrac{dI_{L_2}}{dt} = V_e - (1-D_2)\cdot V_s - r_{L_2}\cdot I_{L_2} \\ C \cdot \dfrac{dV_s}{dt} = -I_{ch} + (1-D_1)\cdot I_{L_1} + (1-D_2)\cdot I_{L_2} \end{cases} \quad (5)$$

Where D1 and D2 correspond to the duty cycles for controlling the switches K1 and K2 respectively.

The sliding surfaces, then the control laws, of the IBC are defined by the following expression:

$$S_{IL_i} = \left(I_{L_i} - I_{L_{iref}}\right) + k_{IL}\int_0^t \left(I_{L_i} - I_{L_{iref}}\right)dt \quad (6)$$

Where i= [1, 2], ILi is the average value of the inductors currents, ILiref is the desired inductors currents, KiL is the damping coefficients, which ensure that the sliding surface equal zero by tracking the inductor current to its reference is defined as follows:

$$\dot{S}_{iL_i} = -\lambda_{iL}\, S_{iL_i} \quad (7)$$

where λ_{iL} is the convergence factor.

To design the controller, it is necessary to combine (5) with (6) and (7) for the two phases IBC. This will result in the equation for control inputs in terms of the state variables and the system parameters. The duty cycle of each phase of the IBC is:

$$D_i = 1 - \frac{V_e - r_i.I_{Li} + L_i\left(\lambda_{iL}S_{iLi} - \dot{I}_{Li,ref} + K_{iL}\cdot\left(I_{Li} - I_{Li,ref}\right)\right)}{V_s} \quad (8)$$

Equation (8) shows that the control inputs are irrelevant with the value of load resistance R. Therefore, this controller will not be perturbed by the variations of the load.

By injecting the values of duty cycles in the average model one can define the dynamics of the current error as follows:

$$\dot{z}_i + (\lambda_{iL} + k_{i1})\cdot z_i + \lambda_{iL}\cdot k_{iL}.\int z_i.d\tau = 0 \quad (9)$$

Where $z_i = I_{Li} - I_{Liref}$.

After derivation the previous equation is given by

$$\ddot{z}_i + (\lambda_{iL} + k_{iL})\cdot \dot{z}_i + \lambda_{iL}\cdot k_{iL}\cdot z_i = 0 \quad (10)$$

These equation is used to define the coefficients KiL and the convergence factors λ_{iL} to ensure the desired performance. The coefficients are positive this signifies that all of roots of the system have strictly a negative real part. This involved the stability of the regulator.

Experimental Result

In order to validate the control proposed for the two phases IBC structure, a small-scale test bench (150W) of the system is implemented in our laboratory. Fig. 5 shows the photograph of the used experimental bench converter. The fuel cell was replaced by programmable Dc source and the converter is coupled with resistive load .The control is realized with Matlab-Simulink-RTW software and implemented owing to the DSPACE-1104 real-time control card.
This experimental result has been done with the system parameters presented in Table I.

TABLE 1: SYSTEM PARAMETERS

Parameters	Value
Input voltage	25V
Output voltage	100V
Inductor value	10mH
Capacitor value	2200uF
ESR of the inductor	0.8 mΩ
Load resistor	75Ω
Switching frequency	10 KHZ

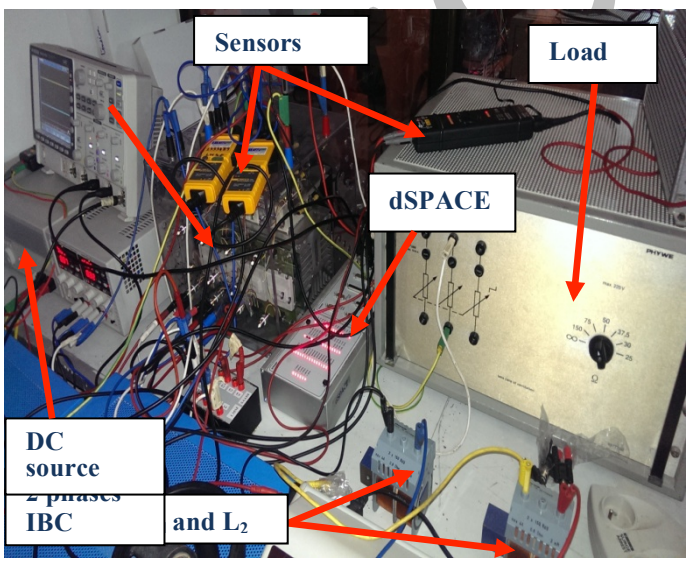

Figure 9: Loboratory test bench.

To test the two sliding mode current regulators of the two phases IBC converter , the reference current is varied to observing the behavior of the currents of each phase .
Fig.6 and fig.7 represents the evolution of the inductor current after variation of reference inductor

current from 2 to 1A and from 2 to 4A and inversely respectively , one can see that the currents perfectly follow the reference signal with a fast settling time and with no noticeable ringing or overshoot. This indicates that the sliding mode current regulator has excellent dynamic performance.

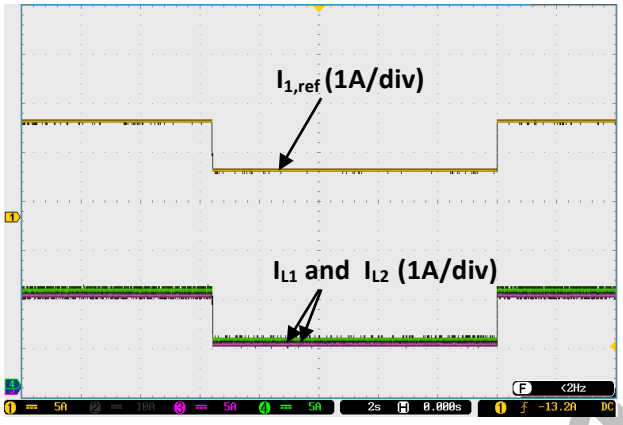

Figure 10: Sliding-mode controller dynamic response for a variation of inductor current from 2 to 1 A and inversely.

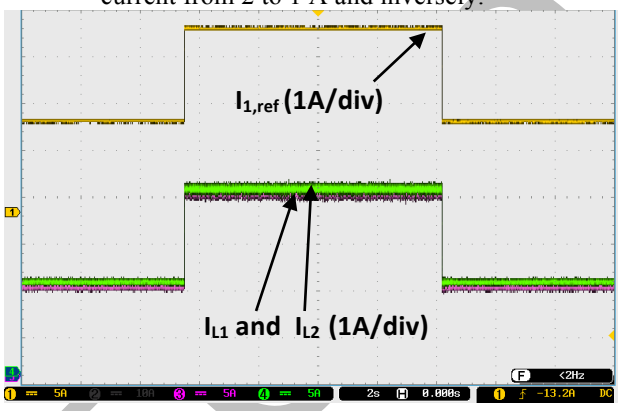

Figure 11: Sliding-mode controller dynamic response for a variation of inductor current from 2 to 4 A and inversely.

Fig.8 to Fig.10 shows the system response under the dual loop control for load stepping up to 100 % of the rated condition. Analysing this figure is possible to observe that the output voltage overshot and oscillations are negligible, and the inductors current controlled by the sliding mode regulators responds very quickly and follows their reference perfectly and without any overshot and oscillations. Fig.11 to fig.13 represents the response of our system for load stepping down to 60 % of the rated condition. From this curves one can deduce that the output voltage set to its reference perfectly and the inductors current follow their reference without any ringing and overshoot.

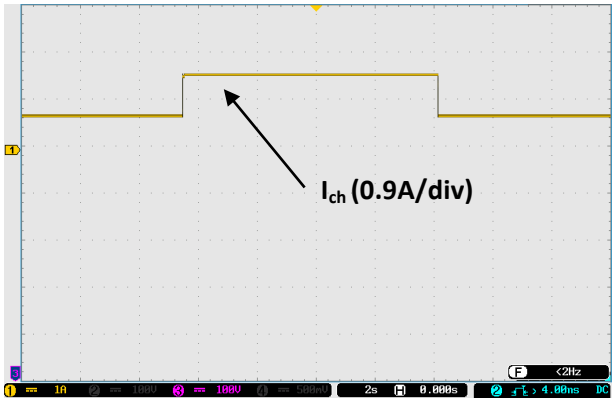

Figure 12: Load increasing with 100% and then coming back to rated load.

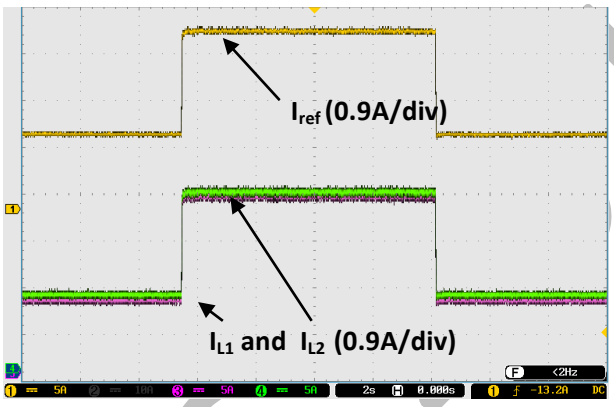

Figure 13: Reference Inductors current and inductors current after load increasing and then coming back to rated load.

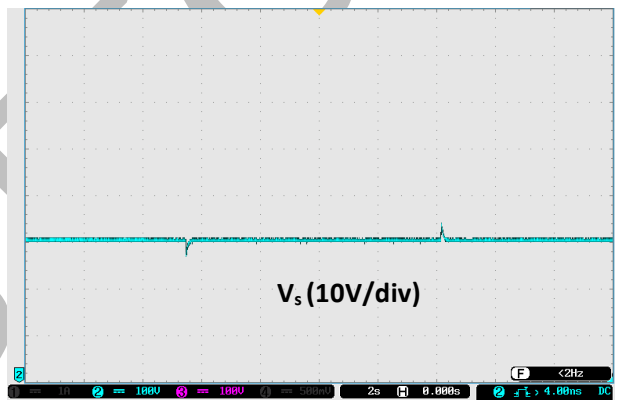

Figure 14: Output voltage after load increasing and then coming back to rated load.

Fig.14 and fig.15 shows the behaviour of the output voltage after changing the reference of output voltage from 100 to 120V and from 100 to 80V and inversely respectively. From this results and the previous results one can prove that the proposed dual loop control contains voltage loop with PI regulation and non-linear sliding mode current regulator has high dynamic performance for load stepping up and down and reference changing with negligible oscillations, overvoltage and fast settling time.

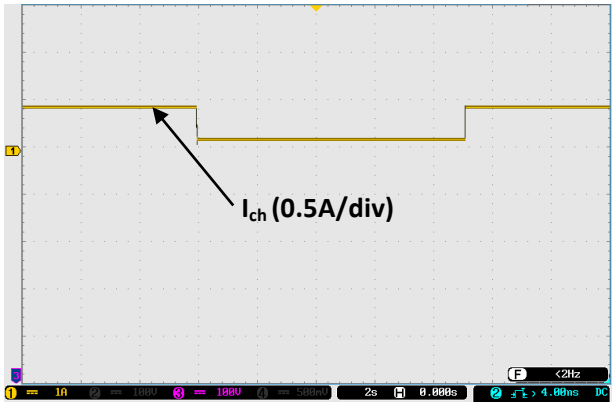

Figure 15: Load decreasing with 60% and then coming back to rated load

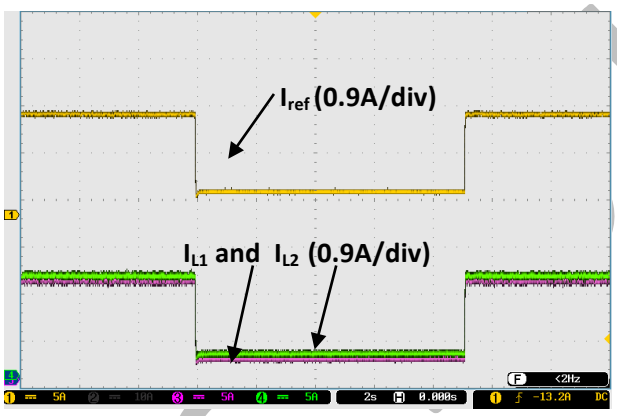

Figure 16: Reference Inductors current and inductors current after load decreasing and then coming back to rated load.

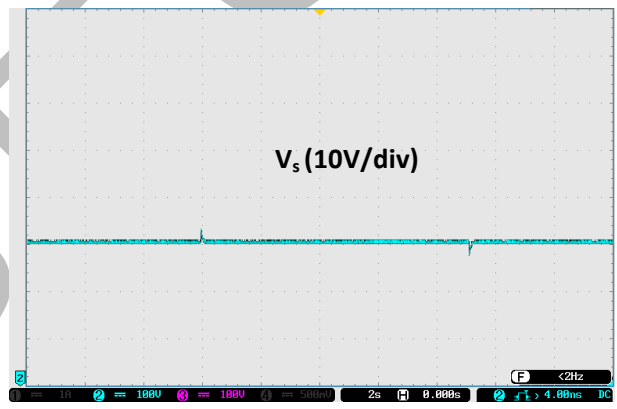

Figure 17: Output voltage after load decreasing and then coming back to rated load.

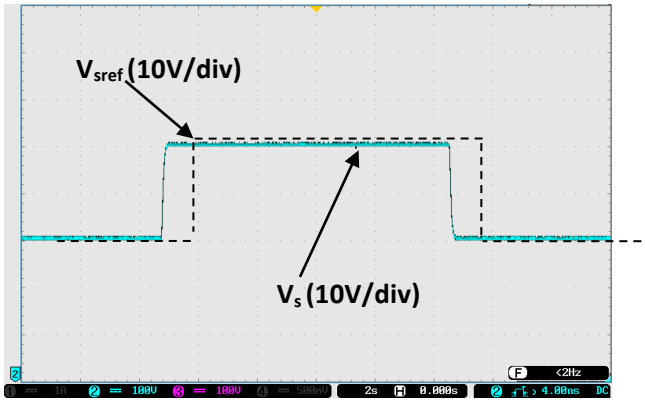

Figure 18: Output voltage after changing refernce voltage from 100 to 120V and inversely.

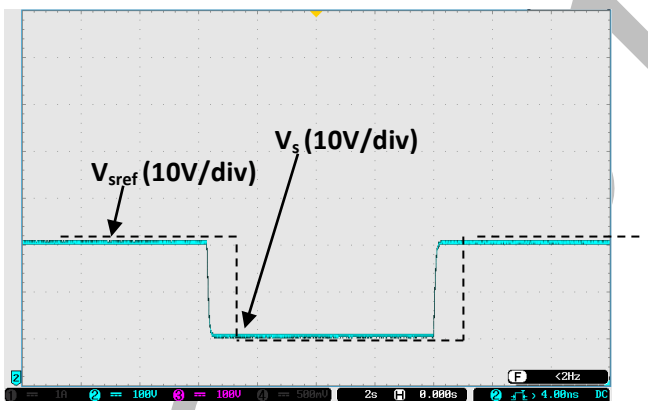

Figure 19: Output voltage after changing refernce voltage from 100 to 80V and inversly.

Conclusion

This paper, presented an interleaved non-isolated DC/DC converter designed for fuel cell applications. This converter ensure a high attenuation of the input current ripple, reduce the size of passive component and allows decrease semiconductor stresses, improving the converter efficiency and reliability. a dual-loop control strategy contains a voltage loop with a linear PI controller and a fast current loop with a non-linear sliding controller is used and designed using PWM switch method in order to achieve a very good performance for a wide range of load variation and a robustness to parameter variations. The dual loop control has been validated by experimental results improving an excellent response under different tests.

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Information Acquisition System and sensitive position detector for atmospheric muon prospecting

Tomas Oceguera-Becerra[a], Eduardo de la Fuente[a] , Ruben Alfaro[b], Lucia Pedraza[b]

[a]Doctorado en Tecnologías de Información, Departamento de Tecnologías de Información, CUCEA, Universidad de Guadalajara. Periférico, 44100 Guadalajara, Jalisco, México.

[b]Instituto de Fisíca, Universidad Nacional Autónoma de México, México D.F.
tomas.oceguera@cucea.udg.mx

Abstract. When subatomic particles pass through a material, their flux is reduced by the interactions with the atoms of the medium. This attenuation is directly related to the density and composition of the material. Measuring the absorption of particles passing through a volcano, a density distribution of the interior can be derived, e.g., allowing to know the internal channels of the structure (Tanaka 2003, 2005, 2007). In order to implement these measures, a detector sensitive to its position, as well as a robust Information Acquisition System (IAS) is required. It needs low power consumption and the possibility of remote monitoring, because the IAS will be placed too far and with non-optimal environmental conditions for this type of electronic equipment. Currently, commercial electronics that allow us to implement such systems exist, able to operate under standard CAMAC (Computer Automated Mesurament And Control) or VME (Vesa Module Europe). This paper presents the IAS as a prototype detector used to detect muons. An IAS-detector similar but larger could be used later to observe the volcano Citlaltepetl, Puebla, Mexico.

Keywords: Instrumentation Technologies: CAMAC -- VME; Particle Physics: Muons; Information Adquisition Systems: Photomultiplier Tubes -- C/C++ -- CAEN – LECROY – ROOT.

Introduction

Due to the interaction of cosmic rays with the Earth's atmosphere, a shower of subatomic particles called muons occurs. This rain is nearly constant, with an approximate flux (at sea level) of one muon per square centimeter per minute, with no preference in its direction of arrival. In addition, a muon of high energy (> 100 GeV) can travel several hundred feet through solid matter before losing all its energy (Marteau 2012; Nagamine 1995). In general, it will lose energy at a rate of 2MeV/cm medium density (Stefaan 2010). These muons have proved to be useful for prospective studies in monumental structures. Tanaka and colleagues (Tanaka 2003, 2005, 2007) have demonstrated the possibility of using an X-ray muon type technique using quasi-horizontal muons to study the internal structure of volcanoes. Developing this technology in Mexico is important because it is a country with large mountain chains, with volcanoes that have different forms of activity and are relatively close to urban centers.

Therefore, the first part of this article explains the design, construction and operation of a prototype detector of atmospheric muons, as well as the necessary instrumentation to monitor Mexican volcanoes. This prototype can be the basis for a larger sensor that can be installed on the slopes of Citlaltépetl or Pico de Orizaba volcano, since the infrastructure (electricity, fiber optics) generated by the observatory HAWC is already in place, and would facilitate operating the detector and learn about potential problems that could arise when operating a remote sensor on the slopes of a volcano, as shown in Figure 1.

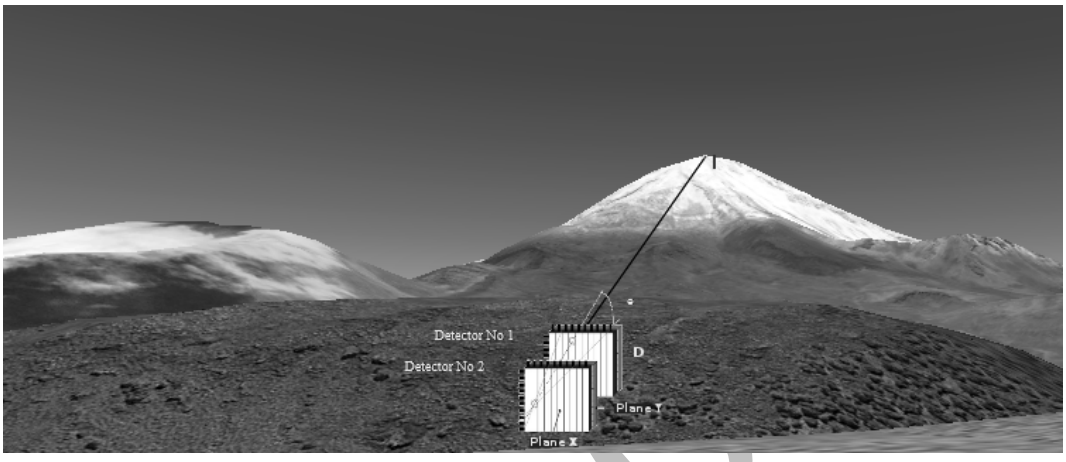


Figure 1: Experimental setup of the detectors at the observing site.

It continues with a description of the equipment that was used and the basis of the programming for the acquisition system of the prototype, which was developed in C and C ++ with the protocol CAMAC, originally developed in the 1960´s for the nuclear research industry (CERN). It is followed by a brief explanation of the possible use of the protocol VME, European Version Modules for its acronym in English, and the basic similarities of the electronic interconnection systems between modules.

Muon Detector

The detection system will comprise two counters (detectors), placed as shown in the example in Figure 1. Each counter is composed of two planes of scintillator plastic, aligned and spaced 1.6m. Each scintillator plane will consist of 20 bars of 45 x 4.5 cm and 1.5 cm thick, 10 vertically positioned (x´s plane) and 10 placed horizontally (y´s plane), whose intersections form a matrix of 10x10 (100) pixels with 4.5 x 4.5 cm^2 of sensitive area each. A photomultiplier will be placed in each scintillator bar, taking 40 electronic channels in total for two counters. A muon passing through both detectors will generate two nearly simultaneous signals, a signal in a pixel of the first counter and a second signal in a pixel of the second counter, so that the muon path could be reconstructed and therefore its direction can be traced.

The detector will be placed where the HAWC Gamma Ray Observatory is located, at 5327m of the volcano, which has the necessary infrastructure for its operation already in place. The Pico de Orizaba volcano is within the territorial limits of the states of Puebla and Veracruz, has an altitude of 5715m above sea level. Its crater is elliptical with major axis of 478m and minor axis of 410m, and depth of 300m. See Figure 2.

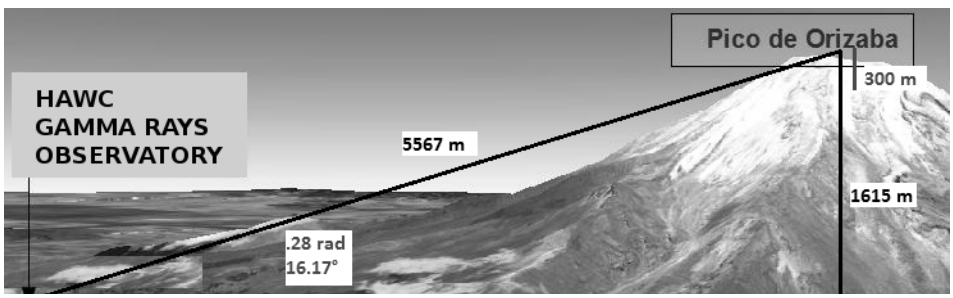
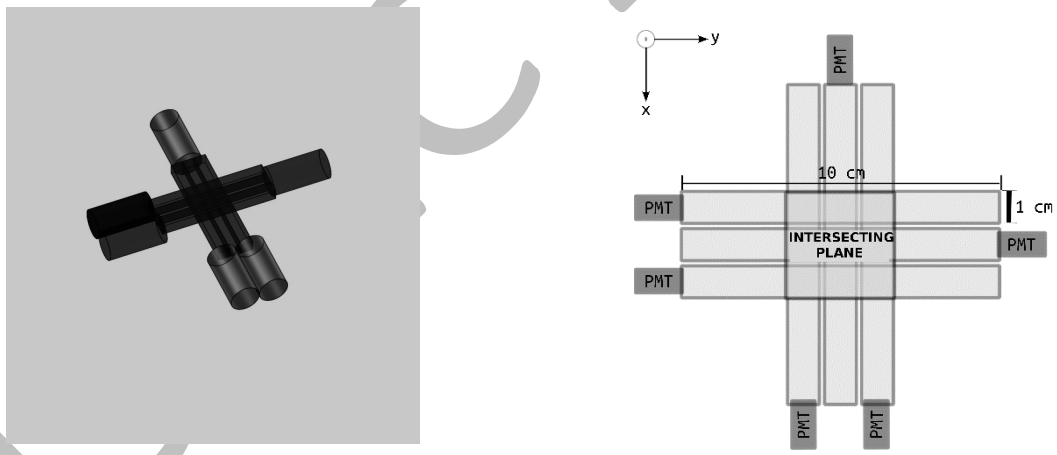


Figure 2: Dimensions of the volcano and separation distance between the observation point and the observed object.

The detector is inspired by the work of Tanaka et. (2003), in which the internal structure of Mt. Asama volcano, located on the island of Honshu Japan, was studied, and intends to compare their results with ours, since they are expected to be very similar.

Prototype

To begin the testing in the lab, six plastic scintillator bars Eljen, EJ-208 of (10 x 1 x 1) cm^3 each, were used. The bars were covered with teflon tape, which acts as a reflector and with black electrical tape to keep out the light. At the end of each bar a photomultiplier tube Photonis XP3112 / 03 (PMT) was coupled. Reading and information processing is done independently for each photomultiplier, so this first prototype has 6 channels, although all the developments of electronic and data acquisition system should be able to be scaled to at least 20 channels to be used in the final version of the detector. Figure 3 shows the detection system used, a 3D model (a) and the coordinate system with dimensions (b)



(a) (b)

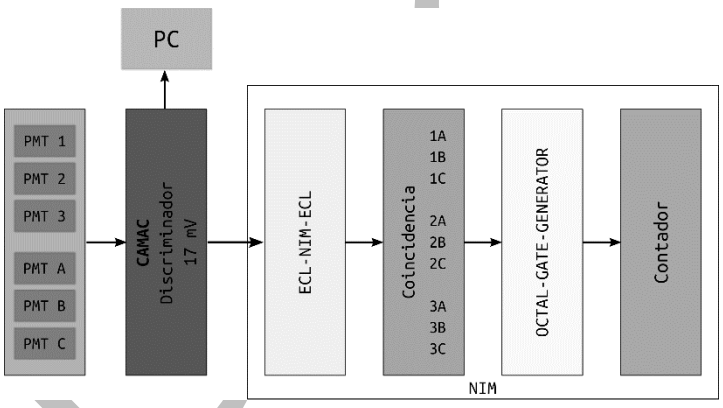
Figure 3: Muon Detector. (a) muon detector in three dimensions, (b) coordinate system and dimensions of scintillating bars.

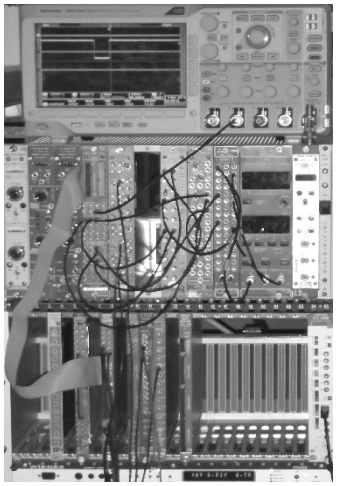
Three of the scintillating bars were placed and oriented in the X direction and three were directed in the direction Y, forming a plane with 9 intersections of (1 x 1) cm^2 sensitive area. Cells or pixels were appointed to the nine areas of intersection of the detector. The 3 PMT´s rods positioned in the X direction, were assigned the numbers 1, 2 and 3; the three PMT´s of the positioned bars in Y direction were assigned the letters A, B and C. To determine the operating voltage of the PMT´s, each plateau´s curve and gain were measured. For this first phase of measures, reading and data acquisition electronics the standard NIM (Nuclear Instrument Measurements) was used, in particular the units to 4-FOLD GATE

LOGIC LRS model 364AL, LED CAEN N841, 662 LRS COINCIDENCE, QUAD ORTEC COUNTER model 772, DUAL HV CANBERRA 3125 SUPPLY, POWER SUPPLY CAEN Mod. N471, QUAD COUNTER / TIMER ORTEC 872 see Figure 4. In a second step, a system for information reading acquisition was developed, which will lead us quickly to digital stages and could be controlled by a computer, with the data stored into a computer.

Information acquisition system and analysis

In a second step, the standard protocol CAMAC (Knoll 2010) that communicates with the computer through a USB-II cable and two drives discrimination LECROY 4413 and CAEN C257, were used and tested. The controller used was WIENER CC-USB and the access and communication with the computer were made using the library of programs provided by the manufacturer to control his units, but can also be used to control other brands like Lecroy. For graphical interfaces ROOT-Cern libraries was used. This libraries provide us with graphic and mathematical skills to acquire and process the data. The purpose of this information acquisition system is to minimize the amount of electronics necessary in order to perform the measurements. In this particular case, the PMT is connected directly to the discrimination unit (making it unnecessary to use NIM units) and the rest of the processing can be performed by software. The first tests were conducted using a CAMAC system and to evaluate the efficiency of this system (it must be capable of processing similar rate counts to those registered with the NIM electronics of the first stage). The counts recorded on the computer were compared to counts obtained by NIM units, as in the first part. This was possible, because the CAEN C257 unit has a mode of operation that allows it to function as a NIM discriminator. However, given that it performs a digitization process and ECL standard is most commonly used, it was necessary to add a level adapter to ECL-NIM. In Figure 4 (a) diagram of how these measures are carried out is shown. The communication software and information processing control was implemented by using libraries provided by the manufacturer in C language, as mentioned above.





(a) (b)

Figure 4: (a) Logical diagram of the system, (b) CAMAC, standard NIM and complete electronic system used.

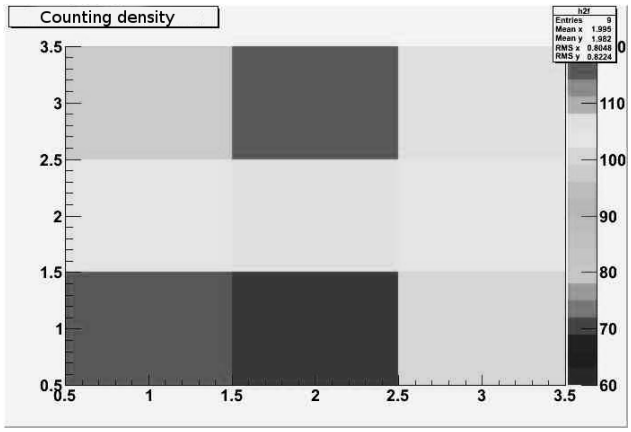
Although this system worked well (we can reproduce the measurements made with the NIM system) it has the disadvantage that the rack or crate which was implemented and shown in Figure 4 (b) requires a high energy consumption and, in case of diagnosing a possible malfunction, a NIM crate with NIM available units would be required. One solution to this problem has been to migrate the system to the VME standard.

This was decided on the basis that CAEN recently fabricated a hybrid rack, NIM VME-low power consumption. With a maximum power of 350 Watts, the CAEN Create NV8020A allows us to have up to seven units VME. In the VME standard it is possible to manipulate the devices with functions of standard low-level, for example in the case of a high voltage source, after locating the base address the device can be opened through memory addresses. Another advantage is that it has an asynchronous signaling scheme, which means that the transfer of information is independent from the timing synchronization on the transmission lines. This makes handling and transmitting of information better than CAMAC. Figure 5 shows the implementation that has initialized with the VME standard sample. In this case both the high voltage and the level of discriminators can be controlled remotely from the computer. This is important because the entire operation and monitoring can be done remotely, while having the possibility of diagnosing problems on site with NIM electronics.

Prototype operation and data acquisition system.

After determining the operating voltage of the PMT´s, the output signal of each PMT was sent to the discriminator scheduled to have a threshold of 17mV. The count data was recorded individually in each bar, forming a flat bar X and a flat bar Y (see Figure 3 (b)). Every time there was a signal in a bar (X or Y), all were read, which was called an "event". The signals produced in events stemmed from muons and background radiation (electrons and low energy atmospheric range), making it necessary to perform an event identification derived exclusively from muons. To identify muons from background radiation it was taken into consideration that, by having high energy levels and close to lightning speed, muons are the most likely particles to leave signals in both the X and Y bars for the same pixel within 20 nsec time window. Therefore, it was determined that, for the same event, signals had to appear in both bars forming the plane X and Y. In fact, the intersecting plane forms a 3x3 matrix with 9 pixels and an active area of 1cm^2 per pixel, that matrix by itself already represents a screen or image of the arrival of the muon detector. Depending on the muon energy and the kind of materials passing through before reaching the detector, the events measured in each pixel can be interpreted as a map of uniform densities (Figure 5 (b)) (as long as the changes have sufficiently contrasting density, as in the case of an image taken with X-rays).

(a)



(b)

Figure 5: (a) Hybrid rack, NIM VME-low power consumption, (b) muon rate as function position.

Discussion

Although this prototype is small when compared to the final size of the detector, it has been used to start developments that can be scalable, such as data acquisition system and control. About data acquisition system performance, test runs were performed with the help of a function generator. In order

to do this, the electrical signal produced by the PMT was simulated and the frequency was gradually increased, ensuring that the number of registered events coincided with the frequency of the simulated generator. Up to 10 KHz, no appreciable difference between the pulse generator and the data acquisition system was found. Based on the flux of muons at sea level and making a height correction, it was estimated that, for a $1m^2$ detector, the counting of muons (without restricting the angle of incidence) would be around 1 kHz, meaning that the implemented acquisition system and information could be used in the final size detector. As for monitoring and control, the high voltage power supply can be controlled, programmed and monitored via computer. The system for transmission and monitoring of information, although it can be improved, is a true basis for the implementation of the detector. It is missing stability tests of voltage or potential communication failures between computer and VME. The graphical interface using ROOT-CERN has also proven its feasibility, building and deploying C ++ code that controls the VME with respective ROOT libraries and, finally, a GUI easy to operate could be implemented. As far as the prototype is concerned, in the 10 % of pixels the same registration event was found. This 10% of uncertainty may stem from the fact that, in this case, there was no restriction on the direction angle of arrival of the muon detector, so that a muon with an angle> 45 ° (relative to the normal of the detector plane), may leave a signal in two or more pixels, which can cause confusion. This can be improved by placing a detector background separated by a distance D (Figure 1). The muon incident angle and the solid angle subtended by each pixel depends on the distance D. For 1.6m it will be approximately 16 degrees (relative to the normal of the detector plane).

The number of muons incidents in the detector combined with the ability to capture, analyze and display it with a format suitable for experts in various fields (astrophysics, geophysics, high energy physics, etc.), provides of important and useful information that helps to reveal the internal structure of a volcano by using cosmic rays. Information that is not only interesting in the field of science but also in social areas, because it also helps to assess risks and impact of a possible eruption especially when the volcano is close to a urban center as in the case of several volcanoes in Mexico.

Conclusions

A information acquisition system and analysis, which can control and monitor a position sensitive detector was implemented. This arrangement can detect atmospheric muons and give us information about the position and number of incident muons. This arrangement is the basis for building a large scale development, which can be used as a survey tool to provide information on the study of mountains and volcanoes, relevant studies in Mexico due to the large number of volcanoes, particularly those located close of urban centers.

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Internationalization of New Ventures and the Central Role of The Nascent Entrepreneur

Piotr Tomski, Arnold Pabian, Felicjan Bylok

Czestochowa University of Technology, Faculty of Management, Poland
tomskip@wp.pl

Abstract: This paper contributes to the understanding of the background conditions of the internationalization of new ventures in the context of entrepreneurial intentions of Polish students' focused on entering foreign markets. The aim of the study is to examine undergraduates' entrepreneurial intentions concerning international activity on the example of students of Faculty of Management of Czestochowa University of Technology (FoMCUT). The name - international entrepreneurial intentions (IEI) is used for this kind of EI. Various aspects of IEI and additional determinants are discussed in the context of demographic characteristics of the sample. The study aims at the analysis of the symptoms of early internationalization of new ventures created in the future by the students of the Faculty. The conducted research leads to the conclusions concerning the level of IEI of the students of the faculty, which is strictly connected with the science and practice of management and entrepreneurship.

Key words: new venture, nascent entrepreneur, internationalization, students

Introduction

The focus of entrepreneurship scholars' attention emerging recently is the domain of international entrepreneurship (IE). According to B.M. Oviatt and P.P. McDougall (2005), IE "is the discovery, enactment, evaluation, and exploitation of opportunities - across national borders - to create future goods and services" (p.540). The research on IE can be divided into two streams: the one focusing on international new ventures (INVs) or 'born globals', and the other one focusing on the IE activities of the established companies (Covin, Miller, 2014, pp. 11-44). The paper is devoted to the first stream, describing the future entrepreneurs' intentions aiming at internationalization of their future new ventures.

Several previous studies have investigated the aspects related to the firm's start-up process, its stages, moments and subsequent performance. The relevance of understanding this process lays in the predominant role of entrepreneurs in the capitalist system development, given their skills to innovate and create employment and economic growth (Baltar, Coulon, 2014, pp. 69-81). As J.S. McMullen and D.A. Shepherd (2006, pp. 132-152) underline, entrepreneurship requires action. Whether conceptualized as the creation of new products or processes (Schumpeter, 1934), the entry into new markets (Lumpkin, Dess, 1996, pp. 135-172), or the creation of new ventures (Gartner, 1985, 696-706), entrepreneurship typically involves a phenomenon in which personal initiative influences the system-wide activity and outcomes (Kilby, 1971; Stevenson, Jarillo, 1990, pp. 17-27). In this context the personal initiative of an entrepreneur is the basis for any kind of entrepreneurial actions, including the ones leading to the activity on foreign markets and the rapidity of the internationalization process.

A number of small enterprises enter the international marketplace at a much younger age than others. Simultaneously, they pursue strategies that involve international activities at an earlier stage of their lifecycle. Those ventures also tend to grow faster in comparison to the ones operating mainly on domestic markets. This condition implicates the need for consideration and research on the determinants of early internationalization at as early stage as possible. However, much of the research concerns further stages of life cycle of early internationalized enterprises as the ex post analysis. Nonetheless, as entrepreneurial intentions and their predictors are often analyzed as the background of new venture creation, they also may be examined in the context of both early and incremental internationalization of the future enterprise. The assumption applied in this study is that the main actor of the internationalization

process and also the new venture creation process is the entrepreneur, performing the activities leading to a new entry both on the domestic, international, and even global market. Accordingly, the entrepreneur or the future entrepreneur (e.g. a person with strong entrepreneurial intentions but not in business yet) and the manager of a small business may be considered as the strategic actor affecting international performance of the enterprise. This leads to the conclusion that studying international entrepreneurial intentions and the symptoms of the prospective business activity on foreign markets may be advisable and may create the background for the prediction of the possibility of future internationalization of the new ventures to be created by future entrepreneurs.

Entrepreneurial intentions (EI) that direct attention, experience and activities towards business concepts, create the form and direction of organizations at their inception stage. Future organizational outcome such as survival, development and growth are based on these intentions. The ideas of entrepreneurs and their intentions formulate the initial strategic template of new organizations and are the underpinnings of new venture development of a relevant and crucial value.

While the number of studies dealing with early and rapid internationalization of small and medium-sized enterprises has grown substantially over the past twenty years, most of them focus on businesses originated in highly developed countries, such as the US, Scandinavian countries, Switzerland, Canada, UK, Spain, Australia or New Zealand. Studies covering the emerging economies have started to appear only recently and, in great part, they relate to the BRICs. Studies concerning early internationalization of SMEs from transition economies and particularly from Central and Eastern European (CEE) countries are still relatively rare (Nowiński, Rialp, 2013, pp. 191-231), which leads to the conclusion that studying international entrepreneurial intentions (including early internationalization) may constitute the contribution of a great significance both to IE and entrepreneurship domains.

In the light of the above, the aim of the study is to examine undergraduates' entrepreneurial intentions concerning international activity on the example of students of Faculty of Management of Czestochowa University of Technology (FoMCUT). The name - international entrepreneurial intentions (IEI) is used for this kind of EI.

New Venture Internationalization as the Research Direction

The distinctiveness of IE within the broader domain of entrepreneurship theory and research was first acknowledged in the late eighties of the 21st century (McDougall, 1989, pp. 387-399). The seminal article of Oviatt and McDougall of 1994 (pp.45-64) is often credited (E.g.: Keupp, Gassmann, 2009, pp. 40-65) with spurring research interest in this subject (Covin, Miller, 2014, pp. 11-44). The phenomena of the greatest interest to be explored are the factors enabling entrepreneurs not only to internationalize their operations but also to build entrepreneurial organizations capable of maintaining sustainable competitive advantage (Al-Aali, Teece, 2014, pp. 95-116).

While the number of studies dealing with early and rapid internationalization of small and medium-sized firms has grown substantially over the past twenty years (Szyliowicz, Galvin, 2010: pp. 317-332; Jones et al., 2011, pp. 632-659; De Clercq et al., 2012, pp. 143-165; Cesinger et al., 2012, pp. 171-190; Sipa, Smolarek, 2004, pp. 221-233), most of them focus on enterprises of highly developed countries, such as the United States, Scandinavia, Switzerland, Canada, UK, Spain, Australia or New Zealand (Rennie, 1993, pp. 45-52; Jones, 1999, pp. 15-41; McAuley, 1999, pp. 67-82; Andersson, Wictor, 2003, pp. 249-276; McDougall et al., 2003, pp. 59-82; Rialp et al., 2005, pp. 133-171; Coviello, 2006, pp. 713-731; Gassmann, Keup, 2007, pp. 350–366; Crick, 2009, pp. 453-476). Studies referring to the emerging economies do exist but mostly they relate to the BRICs (Zhou, 2007, pp. 281-293; Zhang et al., 2009, pp. 292-322; Majumdar et al., 2010, pp. 109-136; Naudé, Rossouw, 2010, pp. 87-111; Wood et al., 2011, pp. 252-282). As W. Nowiński and A. Rialp (2013) state, studies concerning early internationalization of SMEs from transition economies and particularly from Central and Eastern European (CEE) countries are still relatively few (pp. 191-231).

As S. Andersson and H. Floren (2011, pp. 233-258) pinpoint, Coviello and McAuley (1999, pp. 223-256) identified three different strands of research on the internationalization of small firms. The first focuses on foreign direct investment (FDI) and has its basis in Hymer's (1960) seminal work from 1960 and its later elaboration by Dunning (1988, pp. 1-31) who developed the eclectic paradigm that explains FDI in terms of ownership advantages, location advantages, and internalization. This stream of research is mainly focused on the problem why firms invest in foreign markets but small firms, due to the liability of smallness, often do not have the resources to engage in foreign direct investment, but instead use export and middlemen. The second strand of research includes the establishment chain models of internationalization. Probably the best-known model in this area is the so-called Uppsala

Internationalization Model (Johanson, Vahlne, 1977, pp. 23–32). It drew on both the behavioral theory of the firm (Cyert, March, 1963) and the theory of the growth of the firm (Penrose, 1959; Kuraś et al., 2014). This model is focused on the process of enterprise internationalization and explains the commitment on international markets by means of increased organizational empirical learning. This stream of research discusses how small firms grow internationally in a step-by-step way starting with direct export, followed by middlemen, sales subsidiaries, and production subsidiaries. The third strand of research is the development of this model which included network perspective (Axelsson, Johansson, 1992, pp. 218–234).

Traditional stage models such as the Uppsala Internationalization Model (Johanson, Vahlne, 1977, pp. 23-32) and Innovation-related Export Models (Bilkey, Tesar, 1977, pp. 93-98; Cavusgil, 1980, pp. 273-281; Reid, 1981, pp. 101-112; Czinkota, 1982) assume that most companies would follow a gradual internationalization path of increasing involvement in international operations. These models explained gradual internationalization through lack of knowledge concerning foreign markets/operations and perceived uncertainty of such operations (Andersen, 1993, pp. 209-231; Nowiński, Rialp, 2013, pp. 191-231).

An important strand of research in the area of internationalization of a new venture is focused on studying the rapidity of the venture internationalization process connected with the characteristics of the entrepreneur. As A. Rialp et al. (2005, pp. 133-171) underline, some small and medium enterprises (SMEs) become international soon after their foundation, while many other SMEs still appear to follow a slow, gradual, and evolutionary path of development abroad, some newly established and highly entrepreneurial ventures are becoming international almost at founding. Very likely, the revolutionary technological, social, and economic changes currently taking place in many markets and industries worldwide, together with more sophisticated and skilful managers and entrepreneurs, propel these firms into international markets from the outset (Oviatt et. al., 1995, pp. 30–43; Oviatt et al., 1997, pp. 85–99; McDougall et al., 2000, pp. 902–908).

According to some authors (e.g. Knight et al., 1996, pp. 11–26; Madsen, et al., 1997, pp. 561–583), born globals are becoming more and more widespread, and the growing relevance of such early internationalizing enterprises is critically challenging traditional internationalization theory. There has been identified an increasing number of SMEs choosing to be extensively present on international markets immediately – or very soon after – their birth. Such enterprises have been labeled in a different way (Rialp et al., 2005, pp. 133-171): Born-Globals , International New Ventures, High Technology Start-ups, Global Start-ups, Instant Exporters, Instant Internationals, Born-Internationals Micromultinationals and Early Internationalizing Firms.

Even though labeled very differently, the definitions have a common denominator: born globals (BG) or international new ventures (INV) are “small, (usually) technology oriented companies that operate on international markets from the earliest days of their establishment” (Knight, Cavusgil 1996, pp. 11-26). They have been described across different countries and industries. As B. Hagen and A. Zucchiella (2011, pp. 484-504) notice, two main studies by Rialp at al. (2005, pp. 147-166) and by Keupp and Gassmann (2009, pp. 600-633) are comprehensive sources of the state-of-the-art. Such enterprises of specific nature challenge conventional internationalization theories and the long-held belief that the strategic options of small firms are constrained by resource poverty by directly entering international markets at or near their founding (Oviatt, McDougall, 1994, pp. 45 – 64). Fast and broad internationalization of these businesses without any apparent path-dependency breaks the slow and incremental pattern described in the traditional process models of internationalization and consequently leads to much critique of their validity (Hagen, Zucchella, 2011, pp. 484-504).

Special attention in the existing research is paid to entrepreneur related factors and entrepreneurial capabilities. This is based on the fact that decision making in born globals often exclusively depends on just one person or only a few people - the entrepreneurs having unique and crucial role in organizations (Bloodgood et al., 1996, pp. 61-76; Westhead et al., 2001, pp. 333-358). In the above mentioned context it is vital to recall Jones and Coviello’s (2005, pp. 284-303) “models of internationalization as a time-based process of entrepreneurial behavior”. They identified time and behavior as primary dimensions for explaining and understanding internationalization. This leads to the conclusion that the behavior of the entrepreneur or even intentions of the entrepreneur that are the precursor of behavior should be the subject of the analysis that may enhance the knowledge on early internationalization of enterprises.

New venture success depends on how the entrepreneur or the whole founding team collectively seek and select information (Liesch, Knight, 1999, pp. 383-394), estimate environmental opportunities and consequently decide upon business position, processes and actions that result in or contribute to

internationalization (Hagen, Zucchella, 2011, pp. 484-504) but it also depends on earlier attitudes and intentions towards certain aspects of the management process which, in turn, lead to higher probability of early internationalization of a new venture.

The Entrepreneur's Role in the Center of the Business Activity

Several studies have investigated aspects related to the enterprise start up process, its stages, moments and subsequent performance (Reynolds, 1991, pp. 47-67; Reynolds et al., 2005, pp. 205-231). The relevance of understanding this process lays in the predominant role that the entrepreneur fulfills in the capitalist system development, given its skills to innovate and create employment and economic growth (Baltar, Coulon, 2014, pp. 69-81). This is also underlined by S. Sudoł (2002, p. 27), who states that the entrepreneur is the key figure in the enterprise. The entrepreneur is the main causative factor in the enterprise and the driving force of the economic progress. According to R. Lessem (1990, p. 19), the characteristics of the entrepreneur determine a good way of running the enterprise. They affect the future success of the organization.

The entrepreneur plays the most important role in organizing and managing the enterprise. This is the entrepreneur that decides on whether the entrepreneurial idea will be fulfilled and whether it will bring about the intended benefits in the future. The company and the entrepreneur are the unity and these two elements cannot be referred to separately (Lemańska-Majdzik, 2009, p. 32, 37).

Entrepreneurship is a complex phenomenon in which entrepreneurs play a number of different roles. The role of an innovator is the key role. The notion of entrepreneur as an innovator has been attributed to Joseph Alois Schumpeter, who put the entrepreneur at the core of economic development. No economic development can exist without entrepreneurs and no development can exist without entrepreneurs' ability to start a new venture. To a large extent the survival of enterprises depends on the innovative abilities of entrepreneurs. Both economic and social systems require entrepreneurs who can find new combinations of production factors, leading to new products and services that will satisfy the constantly changing needs of buyers. Under the guidance of entrepreneurs, the process of "creative destruction" is born, during which existing technologies, production processes, and organizational principles, as well as old products and services, cease to exist and are substituted with new products and services (Rebernik, Širec, 2011, pp. 15-41).

In the light of the above statements, it is possible to conclude that at the stage of the intention, the entrepreneur and, more precisely, their characteristics are of the key importance for the rules of functioning of the new venture. The capabilities and the way of thinking and the approach towards entrepreneurial ideas of such a person determines the performance of a new firm. One of the tracks of the nascent entrepreneur's characteristics is their approach to the operation on foreign markets and the speed of internationalization of a newly born firm. This leads to the conclusion that while analyzing entrepreneurial intentions, it is important to study attributes that lead to different paths and patterns of internationalization of future business ventures.

Research Method and Sample

This study builds on the expected patterns associated with INV/born-global and traditional, behavioral models of export-based internationalization by Rialp et al. (2005, pp. 133-171). This model is the synthesis of the most important differences between born-global enterprises and the ones following the step-by-step internationalization process based on exports. It points out three key dimensions: the founder's (entrepreneur's) characteristics, organizational capabilities and strategic focus. Every single key dimension is built by several attributes that may reach different parameters that determine whether the nature of the enterprise is closer to rapid internationalization or to the incremental process. This concept is used in the present study so as to identify international entrepreneurial intentions in the three dimensions mentioned above. The respondents' characteristics as potential founders' characteristics is examined along with organizational capabilities and strategic focus that may be delivered to the hypothetical new venture by them.

Semantic differential (SD) method is employed in order to assess the characteristics of the respondents and their attitudes towards certain organizational features leading to the achievement of certain organizational capabilities and strategic focus.

SD measures people's reactions to stimulus words and concepts in terms of ratings on bipolar scales defined with contrasting adjectives at each end. This scale enables measuring the directionality of

the reaction and also intensity (Heise, 1970, pp. 235-253). The study utilizes statements instead of adjectives as the attitudes are impossible to be described by one word only.

The sample amounted to randomly selected 107 students of FoMCUT, which accounted to 2.2% of the total population of students of the Faculty. In the research there participated 63 women and 44 men aged 20 to 39 (mean age – 23.83, whereas median - 23). The respondents were the students of both full-time studies (95 people) and part-time studies (12 people). The characteristics of the sample is presented in Table 1.

Table 1: Research Sample Demographics

N=107					
Frequency					
Female	63	Full-time studies	95	Bach./Eng.	34
Male	44	Part-time studies	12	Post bachelor master's study	73
%					
Female	58.9%	Full-time studies	88.8%	Bach./Eng.	31.8%
Male	41.1%	Part-time studies	11.2%	Post bachelor master's study	68.2%

The survey took place in March 2014. The research tool constructed by the authors was the questionnaire. The respondents were asked to describe the most suitable categories referred to maintaining their own businesses. The categories were chosen out from the concept of Rialp et al. Nine out of ten proposed in the original work were utilized as not all of the original ones were applicable for the conditions of the analysis of perceptions and intentions. In case of intentions "market knowledge and market commitment" were removed as intentions do not cover real time (in an ongoing enterprise) market knowledge and it would be misleading to include this item in the study of intentions. In the assessment of the authors of the present paper, the perception of the level of market knowledge and its accumulation should be evaluated during real business operation on domestic and foreign markets instead of its analysis at the stage of entrepreneurial intent. In the research process there were utilized Likert scales, which enabled the respondents to disclose their attitudes.

Research Results

The results of the first part of the study are presented in the framework of work of Rialp et al. adapted accordingly to the objectives of the present study. The selected intentions towards different patterns of internationalization are presented in table 2.

Table 2: Intentions towards patterns associated with internationalization of new ventures

Key dimension	Attribute	Gradualist approach	Born-global/INV theory
Founder's (and/or founding team's) characteristics	Managerial vision	International markets to be developed gradually after a significant domestic market base	Global from inception
	Prior international experience	Irrelevant or low degree of previous experience in international issues	High degree of previous international experience on behalf of founding entrepreneurs and/or managers
	Managerial commitment	General commitment with objectives and tasks but not directly related to internationalization	High and dedicated commitment with early internationalization efforts and challenges
	Networking	Loose network of personal and business partners; only foreign distributors seem to be relevant to	Stronger use of both personal and business networks at the local and international level

		the firm's gradual path and pace of internationalization	
Organizational capabilities	Intangible assets	Availability and role of intangible assets are less important for successful gradual internationalization	Unique intangible assets (based usually on knowledge management processes) are critical for early internationalization purposes
	Value creation sources	Less innovative and leading edge nature of products resulting in a more limited value creation capability	High value creation through product differentiation, leading-edge technology products, technological innovativeness, and quality leadership
Strategic focus	Extent and scope of international strategy	A more reactive and less niche-focused international strategy	A niche-focused, highly proactive international strategy developed in geographically spread lead markets around the world from inception
	Selection, orientation and relationships with foreign customers	In the hands of intermediaries at the earliest stages of internationalization	Narrowly-defined customer groups with strong customer orientation and close or direct customer/client relationships
	Strategic flexibility	Limited flexibility to adapt to rapidly changing external conditions and circumstances	Extreme flexibility to adapt to rapidly changing external conditions and circumstances

Source: based on Rialp, A., Rialp, J., Urbano, D., & Vaillant, Y. (2005). The Born-Global Phenomenon: A Comparative Case Study Research. Journal Of International Entrepreneurship, 3(2), 133-171

The respondents were asked to describe (to mark graphically) their attitude to the listed descriptions of attributes of the gradualist approach and the born-global approach on a seven point scale (1-closest to the gradualist approach listed on the left, 4-neutral and 7-closest to the born-global concept listed on the right). The respondents knew only the descriptions of the attributes but were not aware of the purpose of the questions.

The results of the research concerning the intentions towards patterns associated with internationalization of new ventures are shown in Figure 1 and table 3.

	Attribute	Gradualist approach			Neutral	Born-global/INV theory		
		1	2	3	4	5	6	7
A	Managerial vision			2.8				
B	Prior international experience		2.0					
C	Managerial commitment				3.3			
D	Networking						5.6	
E	Intangible assets					4.4		
F	Value creation sources						5.4	
G	Extent and scope of international strategy					4.4		
H	Selection, orientation and relationships with foreign customers						5.1	
I	Strategic flexibility						5.5	

Figure 1: The respondents' patterns associated with internationalization of new ventures (N=107)

Table 3: Selected descriptive statistics of intentions towards patterns associated with internationalization of new ventures (N=107)

	A	B	C	D	E	F	G	H	I
Mean	2.80	1.97	3.31	5.58	4.36	5.40	4.41	5.06	5.46
Std. Err.	0.14	0.16	0.12	0.13	0.12	0.13	0.14	0.13	0.12
Median	3	1	3	6	4	6	4	5	6
Std. Dev.	1.41	1.63	1.24	1.30	1.28	1.34	1.45	1.39	1.28
Variance	1.99	2.65	1.54	1.68	1.65	1.79	2.11	1.92	1.65
Min	1	1	1	1	2	1	1	2	1
Max	6	7	6	7	7	7	7	7	7

For each of the nine attributes there has been calculated the average. The average values have been inscribed in the corresponding places which, in turn, allowed for the formulation of the graphic interpretation of the respondents' profile. Three out of nine attributes reached the score below 4, which shows their strong tendency to maintain in the range characteristic of the gradualist approach. They include: managerial vision, prior international experience and managerial commitment. The remaining six attributes under research (networking, intangible assets, value creation sources, extent and scope of international strategy, selection, orientation and relationships with foreign customers and strategic flexibility) achieved the score above the neutral score (4), which shows the orientation of these attributes towards early internationalization intention. The average score for the whole set of attributes, for all the respondents, amounts to 4.3. This shows a slight tendency towards early internationalization or even creation of born-global ventures.

While aiming at completing the obtained results in the area of attributes based on the concept by Rialp et al., the respondents were directly asked about the general approach towards internationalization of enterprises. The results are shown in table 4.

Table 4: Nascent entrepreneurs' attitudes towards the speed of internationalization (N=107)

	n	%
Immediately after starting a business activity, the internationalization of the enterprise ought to be aimed at.	4	4
Internationalization should be the fundamental idea as early as in the process of planning of a new project.	20	19
Internationalization ought to take place gradually, beginning with initiating export through undisturbed entering foreign markets.	65	61
The most important are domestic markets and internationalization is a problem of the second importance.	18	17
Total	100	100

The conclusion is evident. As much as 61% of the respondents state that internationalization should take place gradually, beginning with initiating export through undisturbed entering foreign markets. Only 4% of those questioned express the opinion that immediately after setting up a business, internationalization ought to be aimed at.

To recognize the attitude towards potential benefits resulting from internationalization, the respondents were asked to reveal their attitudes towards statements depicting potential benefits resulting from internationalization in a general sense. The responses were given at the five-point Likert scale (1-I strongly disagree, 2-I'd rather not agree, 3-I neither agree nor disagree, 4-I'd rather agree, 5-I strongly agree). The results obtained in this area are presented in Table 4. The "Yes" responses shown in the table constitute the cumulation of the answers "I'd rather agree" and "I strongly agree" whereas the " No" answers are the cumulation of the responses "I strongly disagree: and "I'd rather not agree". The results are shown in Table 5.

Table 5: Nascent entrepreneurs' attitudes towards the benefits of internationalization (N=107)

	Yes		Difficult to say		No	
	Frequency	%	Frequency	%	Frequency	%
I think that by means of the enterprise internationalization it is possible to achieve sustainable competitive advantage.	81	76	22	21	4	4
I think that due to openness to foreign markets and international cooperation, the enterprise may gain access to rare and valuable resources.	89	83	17	16	1	1
I think that due to openness to foreign markets and international cooperation, the enterprise may gain exceptional capabilities.	90	84	16	15	1	1

Generally, it is necessary to state that internationalization is regarded as a positive phenomenon since about 80% of the responses referring to all the three questions are affirmative answers. Internationalization is generally regarded as a potential source of sustainable competitive advantage and the way of gaining rare and valuable resources, as well as gaining exceptional capabilities.

Conclusions

As entrepreneurial activity in different countries differs due to differences in the country institutional profiles (Busenitz et al., 2000, pp. 994-1003), this paper contributes to the understanding of the background conditions of the internationalization of new ventures in the context of entrepreneurial intentions of Polish students' focused on entering foreign markets.

Various aspects of IEI and additional determinants are discussed in the context of demographic characteristics of the sample. The conducted research leads to the conclusions concerning the level of IEI of the students of the faculty, which is strictly connected with the science and practice of management and entrepreneurship. The sample of students was chosen intentionally as the authors recognized the stage of education of future entrepreneurs as the earliest possible moment to assess the intentions, inclinations and foundations for early internationalization of new ventures.

The analysis of the results allows for the conclusion that at the stage of education (studies) it would be reasonable to carry out the activities directed towards international actions of potential new companies. As well as there should be conducted classes in the field of entrepreneurship, it would be advisable to activate future entrepreneurs in the area of early internationalization. The respondents are definitely aware of the benefits resulting from internationalization, however, the analysis of the individual attributes of early internationalization reveals some scarcity in attitudes and intentions which, in the future, may be reflected in the conducted business activity. Among the features which may affect the attitudes towards internationalization, it is possible to notice earlier exposition to "internationality", manifesting itself in the form of international contacts (not necessarily of a business nature), earlier activities for the benefit of the organization of an international scope and knowledge of foreign languages, which naturally eliminates communication barriers while widespreading the scope of the activity.

The students' intentions and attitudes towards internationalization of enterprises will definitely affect their future actions and decisions. The presence of the concept of internationalization at the stage of formulating plans of future activity or its lack will also have a critical impact on the fate of future enterprises set up by the respondents. At this point, it is necessary to state that the key role of nascent entrepreneurs and the person of a nascent entrepreneur is in the center of the project while affecting its competitiveness, used resources and possessed capabilities.

The entrepreneur, as early as from the stage of the intention is a carrier of future effects in the form of innovativeness, "creative destruction" or materialization of characteristics typically connected with entrepreneurial orientation. The characteristics of the entrepreneur are also the elements determining the horizons of entrepreneurial thinking, both in a sense of the entity and the place of running a business activity. The scope of thinking and perceiving the boundaries of the market and the boundaries of the organization does depend on the approach of the entrepreneur.

The descriptive study is the basis for the future research on the predictors of IEI as the foundation of new international business ventures. It outlines the background for examining

entrepreneurial traits and contexts which are important both for the development of every economy and the creation of directions for the practice of management of international small and medium enterprises. The results of the research presented in the present paper obviously cannot be the subject to generalization. They may only be referred to the group of respondents under research. The applied method may, however, be used for a larger representative sample, like in case of other countries, by means of which it would be possible to conduct cross country comparative analyzes.

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Investigation of some macro and micro elements in plants of the genus ferula using inductively coupled plasma optical emission spectroscopy

Sermin Yelkenci, Huseyin Altundag, Mehmet Sagiroglu, Abdul Razaque Memon

Sakarya University, Fen-Edebiyat Fakültesi Kimya Bölümü, Serdivan-SAKARYA/TURKEY
Email:altundag@sakarya.edu.tr

Abstract: The Apiaceae is a family of aromatic plants that constitutes about 3.700 species spread across 434 genera. Some of these species such as plants belonging to the genus Ferula are known to be used in South Asia, Middle East and North Africa as a traditional medicine for treating various disease conditions. The genus Ferula (Apiaceae) contains 180-185 species [1], with the highest diversity in central and southwest Asia. There are about 130 species and roughly 100 of which are endemic to Anatolian plateau [1]. In Turkey, the first revision of Ferula was done by PeÅŸmen [2], who characterized 18 species and nine of them were endemic to this region. Four new species have since been added to the flora of Turkey [3-5], and one of them was re-characterized by Sagiroglu and Duman [6]. The aim of this study is to analyze the metal composition of these important plant species and to determine the levels of these metals in different parts of plants used for natural herbal medicine.
In this study, 20 varieties of plants belonging to 20 species of the genus Ferula L. (Apiaceae) collected from various regions of Turkey were first solubilized by microwave solubilization dissolution technique, then levels of Al, B, Ba, Cr, Cu, Fe, Mn, Ni, Pb, Sb, Se, Sr and Zn were determined by ICP-OES method. The accuracy of the method used in the study was checked by analyzing reference materials with Tomato Leaves (SRM 1573a) and Tea Leaves (INCT-TL-1) certificates. The concentrations of elements were found in the following ranges: Al; 9.2-717.7, B; 29.6-143.0, Ba; 1.0-34.3, Cr; 0.54-3.1, Cu; 6.9-29.3, Fe; 40.3-638.2, Mn; 12.5-55.0, Ni; 0.40-11.4, Pb; 0.50-4.4, Sb; 2.6-7.8, Se; 1.0-10.0, Sr; 2.2-146.0 and Zn; 19.6-120.6 Âµg g-1 for fruit-bearing parts of the plants and Al; 7.8-498.7, B; 6.1-100.9, Ba; 1.0-78.8, Cr; 0.1-0.94, Cu; 1.2-11.2, Fe; 16.9-446.3, Mn; 4.5-24.2, Ni; 0.1-0.89, Pb; 0.07-0.89, Sb; 0.007-6.2, Se; 0.009-4.9, Sr; 5.5-169.2, Zn; 1.7-34.7 Âµg g-1 for flower-bearing parts of the plants.
Because of the importance of these plants for medicinal use we were interested to find out that whether these plants have any toxic concentration of heavy metal in their fruit bearing or flower bearing parts. Our results indicate that the elemental range in plant parts were normal and these plant parts can be safely used for medicinal purpose.

Keywords: Ferula; Trace element; Microwave; ICP-OES

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IPEA Conceptual model: Drawing a parallel between CRISP-DM

Process model and SIMON's decision making model

Cornelius J Bezuidenhout[a], Marianne Loock[b], Petra le Roux[c]

University of South Africa, South Africa
bezuicj@unisa.ac.za [a], loockm@unisa.ac.za [b], lrouxp@unisa.ac.za [c]

Abstract: This paper discusses the IPEA conceptual model constructed by drawing parallels between Simon's decision making model and the CRISP-DM process model. The approach of the study uses pragmatically eclecticism and compares the individual phases of the two models, and a logical conclusion is drawn based on the findings. The various models of decision-making are highlighted as well as the importance of the decision-making process in business as well as the need for accurate information in this process. Furthermore the significance of knowledge management is highlighted and the role that management information systems plays in the decision-making process.

Key words: Decision making, management information systems, knowledge management, data mining, CRISP-DM

Introduction

In a competitive socio-economic environment with expensive and limited resources, the making of accurate decisions is the central force in the business management process. In order to take decisions, management requires actionable, timeously and accurate information from management information systems (MIS) by capable information analysts. The importance of MIS was highlighted more than 30 years ago when Ward (1968, p21) stated that "any business, whatever the nature of the products or service it offers, can be considered as an information machine, and as management spends much of its time making decisions with inadequate information, the idea of having access to complete management information sounds a few stages removed from paradise".

However, the importance of MIS is not only relevant to corporate organisations and businesses, but is also particularly relevant to South African public higher education institutions. Decision makers within these public higher education institutions rely on information provided from the Higher Education Management Information System (HEMIS). The data obtained from HEMIS is used for statistical analysis, strategic planning, funding calculations, enrolment planning, benchmarking, quality assurance and institutional decision–making within South African public higher education institutions.

Background

MIS inform decision-making at various levels in an organisation or institution. The accuracy of this MIS is crucial for the making of informed decisions. Furthermore, cognitive knowledge internalisation is essential for effective management information as it enables the information analyst to access a knowledge databank with appropriate interrogated information and knowledge of the organisation from tacit knowledge about the organisation or institution. This tacit knowledge provides historical context for the data analyst to apply this business understanding within the data mining process model.

Turban, Sharda and Delen (2011) define data mining as a process that uses mathematical, statistical and artificial intelligence techniques to identify useful information and subsequently knowledge or patterns from large sets of data. The Cross Industry Standard Process for Data Mining (CRISP-DM) process model is used as preferred process model as it is recognised as the de facto standard for developing data mining (Marbán, Mariscal, & Segovia, 2009). Reinforcing CRISP-DM as the leading methodology for using in data mining, Gregory Piatetsky-Shapiro, president of KDNuggets.com asked the question: "What main methodology are you using for data mining?" The CRISP-DM process model was voted the preferred methodology for data mining in all polls during 2002, 2004 and 2007, averaging 45% of the votes and outscoring the closest competitor by 20%.

The field of qualitative research is scattered with research on various decision making approaches.

- The rational model of Simon (1977) assumes a rational and completely informed decision maker and comprises of a number of steps:
    - Intelligence: finding occasions for making a decision;
    - Design: inventing, developing and analysing possible courses of action;
    - Choice: selecting a particular course of action from those available; and
    - Review: assessing past choices.

- The model of bounded rationality, is described as the "satisfaction" process-orientated based on Simon's work (Simon, 1979).

- The instrumentalist view describes a step-by-step approach of incremental actions and the process is open to adjustment (Lindblom, 1959).

- The organisational procedures view seeks to understand as the output of standard operating procedures invoked by organisational sub-units (March, 1988).

- The political view sees decision-making as a personalised bargaining process, driven by the agendas of participants rather than rational processes (Pfeffer, 1981).

- The garbage can model describes decision-making in an "organised anarchy" based on the work of Cohen, March and Olsen (1972).

- The individual differences perspective focuses on the problem-solving behaviour of the individual manager, as influenced by the manager's decision making style (Keen & Scott Morton, 1978).

- Naturalistic decision-making is primarily concerned with investigating and understanding decision making in its natural context Klein's Recognition-Primed Decision (RPD) model (Klein, 1998).

- The multiple perspectives approach propose the multiple perspectives approach to decision-making as an attempt to "sweep in" all possible perspectives on a problem. It is based on Singerian inquiry as proposed by Churchman's (1971) concept.

Therefore, a parallel is argued between CRISP-DM process model on data mining and Simon's model on decision-making (Simon, 1977), in that the process of data mining is in itself a continuous decision-making process which contributes to creation of new tacit knowledge from existing tacit knowledge.

Literature Review

In order to draw a parallel between CRISP-DM process model and Simon's model on decision-making, a literature review was structured as follows:

A pragmatically eclecticism approach was used in this study to compare the practical, matter-of-fact situations in order to identify possible anomalies or parallels between the various theories and models. Pragmatic eclecticism, also sometimes referred to as pragmatism, foreground issues of utility above those of method and propagating the use of the most appropriate tools to investigate a phenomenon (Onwuegbuzie & Johnson, 2004, 2006; Onwuegbuzie & Leech, 2005; Tashakkori & Teddlie, 1998). Pragmatists willingly combine multiple diverse measures to address the research question appropriately, an approach that often combines qualitative and quantitative methods. This paradigm aims to employ the complementary strengths of various methods and approaches to supplement the weaknesses of other methods. (Onwuegbuzie & Johnson, 2004, 2006; Onwuegbuzie & Leech, 2005; Tashakkori & Teddlie, 1998).

An extensive literary search was done on both the constructs of decision making models and data mining models. The findings were studied and scrutinised for possible similarities and possible parallels that could be drawn between the various models.

Knowledge Management

The development of the field of knowledge management has been contributed to the ever-growing awareness of the importance of more effective identification and capturing of institutional knowledge and the channelling of organisational wisdom. Coetzee (2013, p21) highlights this importance by adding another application for knowledge internalisation and argues that this harvesting, capturing, and channelling of information lies at the heart of all project success. Coetzee (2013, p21) refers to the work of Van Graan (2013) that highlights the critical and strategically importance of capturing and sharing the right knowledge in today's business environment. Van Graan (2013) describes this environment as characterised by ever increasing complex operational challenges, more data, information and technology, and a haemorrhaging of experienced practitioners across the sector.

Only 20% of an organisation's knowledge is kept explicit in the form of documents and manuals, whereas 80% is in the form of undocumented, untapped, unshared know-how (Van Graan, 2013). In order for an organisation to be effective, it has to find ways to leverage this tacit knowledge and convert this to easily accessible explicit knowledge that can be utilised to guide future projects (Van Graan, 2013).

The lack of harvesting and channelling of tacit knowledge as discussed by Coetzee (2013, p19) is further reinforced by the publication of the whitepaper by The LeaderFuel Centre in 2009. This paper generally acknowledges that organisations should have a systematic and careful method for managing their body of knowledge, but the fact is that most do not. Centre to the 2009 LeaderFuel report, is the fact that only 25% of businesses have a formal or informal plan for knowledge transfer. This translates to the concern that 75% of businesses have no plan, method, or system in place to capture and use their own earned, expensive institutional knowledge.

In an on-going attempt to create knowledge management strategies and the successful implementation of these strategies, various scholars have embarked on researching the field of knowledge management. One such scholar, Jashapara (2011), define knowledge management as: "the effective learning processes associated with exploration, exploitation, and the sharing of human knowledge (tacit and explicit) that use appropriate technology and cultural environments to enhance an organisation's intellectual capital and performance". He also highlights the fact that "the assumption that knowledge in its tacit or explicit manifestation can be managed" lies at the base of the development of a knowledge management strategy.

Decision-Making

Strategic management plays a vital role in the vision and mission of the higher education institution. The future and direction of the institution is steered by management utilising information in the decision-making process. The decision-making process as per Simon's model (Simon, 1978) consists of various steps.

- Intelligence phase - the first step of the Simon model infers the gathering of all available information and options before deciding what to decide.
- Design phase - during this phase alternatives are developed.
- Choice phase - this phase is concerned with selecting a particular course of action from those available.
- Implementation - this phase involves the implementation of the choice.
- Review - the review of the assessing past choices is done.

Management Information System (MIS)

The critical link between management being able to make informed decisions and the raw data within public higher education institutions in South Africa, is the utilisation of a well-developed MIS.

MIS can be described as a system that is responsible for the delivering of information that is needed for the effective management of organisations. According to O'Brien (1999, p76), the term MIS is universally used to denote an assortment of information management methods assisting the human decision-making process. McLaughlin and Howard (2004, p8) argue that the successful use of information for decision support depends on a MIS that assures the quality and availability of relevant data that can be restructured for use by the decision makers.

The supply of management information should be seen as having a moderating effect on decision-making as various other factors may influence the making of correct decisions based on the supplied information.

The Data mining process

Based on Ward's (1968) statement, it is clear that the decision-making process relies on the accurate and timely supply of information to management to enable the decision-making process. In the process of preparation of this management information, a team of information analysts works on the mining of data to find various patterns or trends within the data. These trends are presented to management and might have a significant impact on the institutions future and competitiveness.

Turban et al. (2011, p196) explains an important aspect of data mining by highlighting that in the finding of unexpected results or as he termed it "striking it rich", the information analyst have to think creatively throughout the process of data mining which includes the interpretation of the findings. This puts the burden on the shoulders of the information analyst to make sense of the data set as well as interpreting and presenting the findings in such a way that it will be fit for understanding on decision-making levels. It is at this stage where the information analyst has to have a comprehensive understanding of the business and the data that they are working with.

As noted earlier, the CRISP-DM process model is the preferred methodology for data-mining. According to Chapman et al. (2000) who represents individual members of the CRISP Consortium, the process model was conceived in 1996 and is based on six phases namely business understanding, data understanding, data preparation, modelling, evaluation, and deployment.

- Business understanding - an understanding of what business wants to accomplish from a business perspective and also the understanding of business itself.

- Data understanding - a clear understanding of the data that is required, as to decide which data to access and utilise to reach the objective.
- Data preparation - decide on the data to be used for analysis.
- Modeling - selecting the actual modeling technique to be used.
- Evaluation - the actual evaluation of the model.
- Deployment - a strategy is developed for deployment.

In the step by step decision-making processes of data mining the context of business, data and user expectations is of utmost importance as this determines the directive which will be followed to obtain the required end result. The repetitive occurrence of decision-making within the process of data mining makes it an interesting process and breeding ground for the continual creation of new knowledge.

Simons' decision making model was developed by Herbert A. Simon (Simon, 1978). The model consisted of three steps, intelligence, design, and choice. In the intelligence phase, the problem is identified, and information is collected concerning the problem. The design phase develops several possible solutions for the problem. Finally, the choice phase chooses the solution. As an extension of his model Simon added two further steps in the form of implementation of the decision and lastly the review of the decision taken and the whole process followed.

This study will draw a parallel between the decision-making process of Simon (1978) and the CRISP-DM process model, as similarities are drawn between these two models. A high level parallel between the intelligence, design and choice phases in Simon are postulated to derive at the proposition that data-mining within the CRISP-DM process model is a continual decision-making process.

Based on the literature review of both these models as well as a literature review of a combination of these models, no such comparison has been done until this study of this IPEA conceptual model

The following IPEA conceptual model is based on the logical relationships emphasised by researchers such as Turban et al. (2011), Chapman et al. (2000), Simon (1978).

This IPEA conceptual model presents the parallel between Simon's model of decision-making and the CRISP-DM process model. It illustrates a continuous decision making process during data mining. The model was constructed as a visual translation of the existing theories and to illustrate the parallel between CRISP-DM process model and Simon.

This study utilised Simon (1978) model of decision-making as well as the CRISP-DM process model to draw a parallel between the various levels of these models. The validity and applicability of these two models is assumed as encompassed in the various academic articles as referenced and discussed.

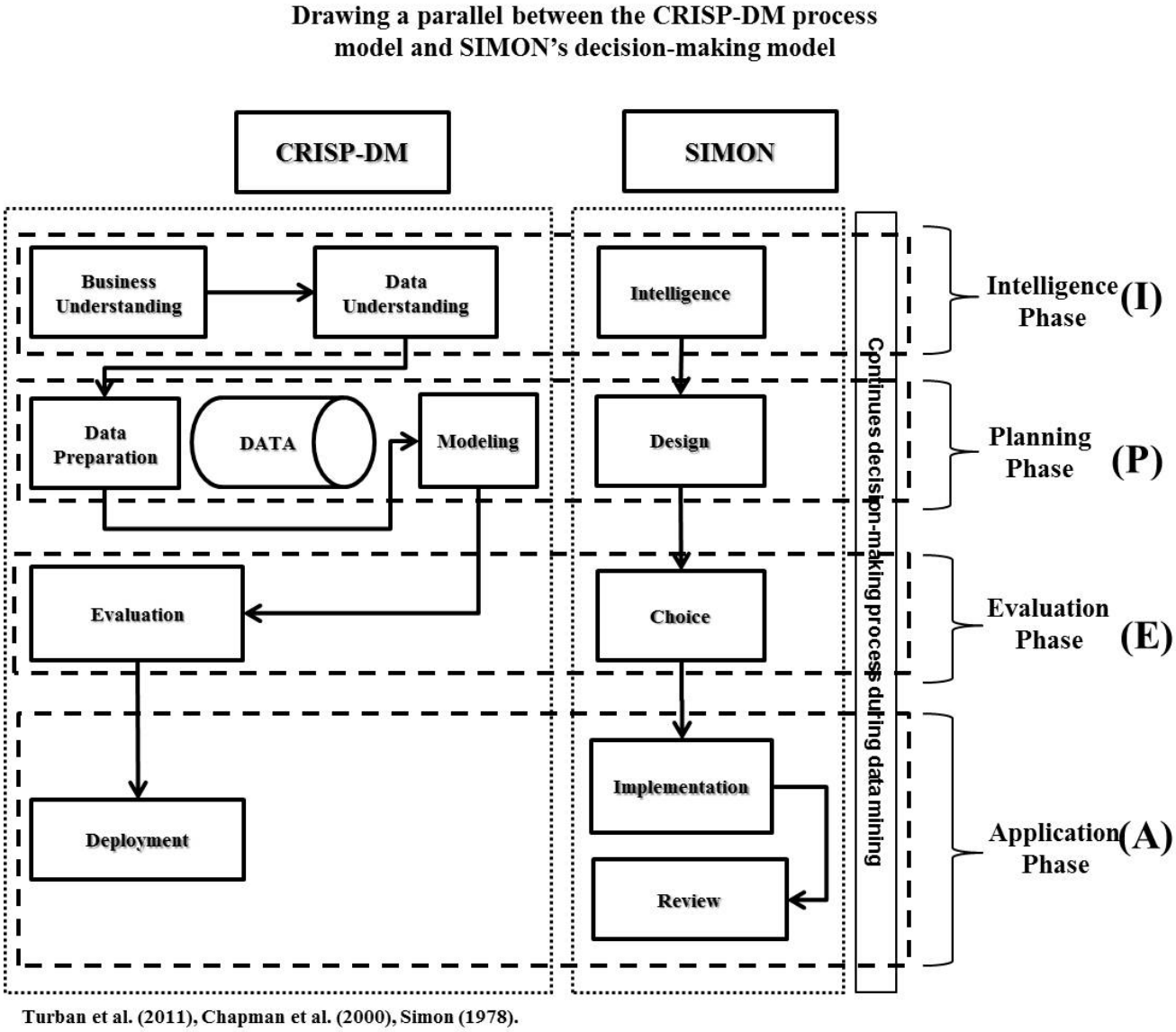

Figure20 IPEA Conceptual model

In Simon's (1978) decision-making model a first phase of intelligence is proposed before the next phase of the design of the decision to be made.

This infers the gathering of all available information and options before deciding what to decide. Within the CRISP-DM process model, the first two steps are directed towards the understanding of both the business as well as the data before the data preparation phase can start. The proposition is made that a direct relation does exist between the intelligence phase of the decision-making process and the first two understanding phases in the CRISP-DM process model. These collective intelligence phases imply that a conscious understanding and intellectual engagement in information and knowledge should be done before a decision can be made to inform the next step of a process. For the purpose of constructing the IPEA model, the first parallel is referred to as the Intelligence Phase (I)

The need for reliable information and knowledge is essential. Although the processes within the field of knowledge management intends to capture important information and knowledge, the problem does exist

that the focus in knowledge management is currently on the habits to create and upsurge the volume of knowledge availability, but this supply-side point of view is not addressing the institutions demand for knowledge (Gray & Meister 2004, p821). A further problem is that most institutions do not have some form of formal or informal knowledge management strategy in place to capture knowledge and this has a serious effect on the loss of valuable institutional knowledge. Not only are valuable information lost, but the existing knowledge on how to interpret the institutional memory is also lost.

On the second level of Simon's decision-making model, a design phase is proposed. During this phase alternatives are developed. In the CRISP-DM process model, the following steps are proposed: the election, cleaning, construction, integration, and formatting of the data. After these processes the modelling of the data is done and a model is presented to evaluate in the next phase.

Both these models revolve around the design of the process of data and modelling, planning what to use and possible course of action. For the purpose of constructing the IPEA model, the second parallel is referred to as the Planning Phase (P)

The third level of Simon's decision-making model refers to a choice phase during which alternatives are evaluated and the best one is selected. An evaluation phase is also proposed in the CRISP-DM process model. During this phase an evaluation of the result is done. It can be argued that evaluation and choice are related. In CRISP-DM process model the evaluation is done of the planning phase and an outcome is produced, the evaluation implies that results are present and a choice has to be made whether this result is going to be used for deployment. In Simons phase the choice is made between various available options. For the purpose of constructing the IPEA model, the third parallel is referred to as the Evaluation Phase (E)

The fourth and part of the extended level of Simon's decision-making model refers to the combined implementation phase as well as the review phase during which the choice is implemented and a review of the implementation is done. In the CRISP-DM process model in this phase deployment is proposed. During this phase an evaluation of the results is done and steps such as the planning of the deployment and the review of the process is done.

In phase 4 both models makes use of the application of the results of the first three phases by either deploying the information or implementing and reviewing the choice. For the purpose of constructing the IPEA model, the fourth parallel is referred to as the Application Phase (A)

The interdependence between the phases in both models should not be discarded and plays an important role in each of the models.

The similarities between Simon's model and the CRISP-DM process model at all four levels are prominent as both the models concern themselves on each level to a similar process but in their own respective way.

Based on the above comparison, a clear parallel can be postulated between the two models discussed.

Conclusion

The discussion above substantiates the similarities between each of the four levels of Simon's model of decision-making (1978) and CRISP-DM (1996) data mining process. It can therefore be concluded that a

parallel exists between the four phases in the Simon's model and the CRISP-DM process models, creating a new IPEA conceptual model with the subsequent Intelligence phase (I), Planning phase (P), Evaluation phase (E) and the Application phase (A).

As a result of drawing the above parallel, it can be argued that the process of data mining is in and of itself a decision-making process, as first indicated by the principles of Simon's decision-making model.

Future research

This postulated IPEA conceptual model will inform further investigation into the notion of continues knowledge creation in the activities of an information analyst.

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Is IBL (Inquiry based learning) helping Zayed University students acquire scientific skills in a general science course?

Iman Boukhobza

Zayed University, University College, Dubai, UAE

Iman Boukhobza@zu.ac.ae

Abstract The purpose of this work is to investigate if higher education students can develop scientific skills throughout the learning process supported by the approach of inquiry based learning (IBL). This method has been known to be a process where students have the chance to formulate questions, investigate to look for answers and earn new meanings and knowledge. This study suggests that IBL has considerable potential to create a non-traditional community for educational purposes. With the use of the IBL approach, Zayed University students have shown a good improvement within the area of scientific skills, and most important of all, students have shown a high level performance and course satisfaction.

Keywords: Scientific skills, Inquiry based learning approach (IBL), General education course.

Introduction

In the last two decades, higher education has known great changes, the main thrust in teaching is more on professional programs rather than knowledge based programs, and therefore a lot of concerns toward teaching effectiveness have been raised within many educational institutions around the world.(Biggs & Tang, 2011) In this regards, many approaches have been developed to improve the quality of higher education, to convert learning from teacher centered to student centered and to adopt interactive methods.(Justice, Rice, Roy, Hudspith, & Jenkins, 2009) These approaches have used several methods such as problem solving, problem based learning, project based learning and inquiry based learning.(Smith, Sheppard, Johnson, & Johnson, 2005) All these approaches suggested that opportunities for gaining a good understanding in higher education could be achieved via courses that use interactive methods.(Egenrieder, 2007) In fact, these comprehensive strategies allow students to work in groups and conduct investigations of real world topics. Students usually work over extended period of times to solve challenging questions or problems. Therefore students would be involved in the process by: designing and conducting investigations, gathering information, collecting data, asking questions, drawing conclusions based on their results and reporting their findings toward the end of their work.(Brickman, Gormally, Armstrong, & Hallar, 2009)

Inquiry-based learning (IBL) is a pedagogical approach, developed in 1960 as a trial to enhance new instructional methods against traditional forms of instruction that were primarily based on memorization.(Bruner, 1961) The main idea behind IBL is that students can generate information themselves and make sense out of it. Students are engaged with the content or the material, and come up with questions and investigate. The meaning constructed from an experience or experiment can be concluded individually or within groups.(Bächtold, 2013; ROTH & Jornet, 2014) The process of using the IBL approach involves many steps such as: developing questions, making observations, searching for related information, designing experiments and collecting data, analyzing and interpreting data, and finally concluding and outlining possible explanations and developing recommendations for future studies.(Haury, 1993) For science education, a lot of criticism was made about the fact that science

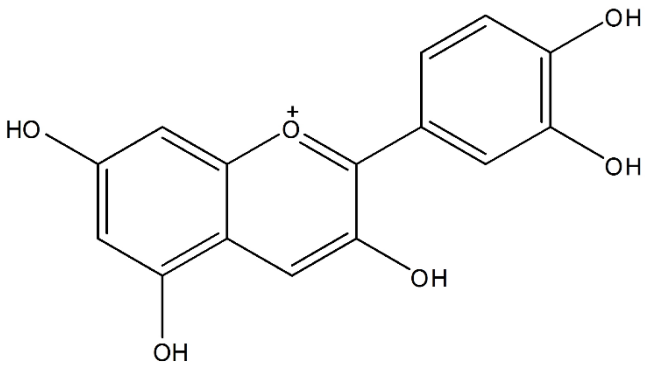
courses were taught in a way that does not encourage thinking. John Dewey, a well-known scholar in the field of education, was the first to propose at the beginning of the 20th century that science should be presented to students as a process and way of thinking rather than a subject with facts to be memorized.(Loucks-Horsley & Olson, 2000) Furthermore, science courses lend by nature to investigation and collection of data, therefore the IBL approach was firstly adopted within the sciences' community.(Bianchini & Colburn, 2000; Crawford, 2007; Wood, 2003)

The main goal of this study was to investigate the important effect of IBL in promoting sciences' learning within undergraduate students' population at Zayed University. Students performance in the second required science course (The introduction to the environemtal sciences) has been compared with that of students who did not take the first IBL science course. Three methods were used to evaluate the ouput of the study: class observation, grade's comparison and students' survey. And the reseeach results revealed that achievement in a general education science course of undergraduate students significally improved with the acquiring of sciences skills via inquiry based learning approach.

Study method

The sample of the study conducted at Zayed University, Dubai campus, UAE, consisted of a total of 77 (four sections) female students from the general education level (COL 165 course: The nature of science discovery). The inquiry based learning approach was used for a non- major introductory science course taken by all undergraduate students to fulfill the science general education requirement. The course was normally scheduled to meet two times a week for a period of 80 minutes each time. Course sections had in average 19 students. And, over consecutive semesters (Fall, spring and summer) of the academic year 2013-2014, data were collected. The students of the general education science course needed first to work on different scientific classroom activities that helped them acquire different scientific skills. They have started learning how to formulate scientific questions, how to make good qualitative and quantitative observations. Then the focus was to learn throughout designed activities how to come up with possible explanation by trying to find answers (Conjectures). Students then have been guided to come up with a testable hypothesis and to design experiments that will allow them to provide evidence for their chosen hypothesis. In this specific phase of the IBL course, students needed to be introduced to different types of variables (dependent variables, independent variables, fixed variables and controlled group). After few activities, where students had the chance to practice the above skills within a chemistry, physics or biology frame, they were able to start conducting scientific experiments. Students were ready to collect data, analyze and interpret it and conclude. Around the middle of the semester, students were ready to start working on a scientific project. Students were given the chance to choose a topic on their own, and start their scientific investigation. This assessment component has helped students put what they learned in action (Knowledge in action) and investigate something that interest them (Ownership of knowledge).

Example of scientific activities: The IBL approach is mainly based on designed activities where students learn through inquiries and investigating theses inquiries. For instance, one example of class activities conducted in the COL 165 course at Zayed University within the chemistry frame of the course, consisted on investigating the color change of a cyanidin solution. The main objective of the activity was to help students formulate scientific questions, make qualitative and quantitative observations and come up with conjectures. Students were given first cyanidin solution and they needed to add it to other different solutions. Students needed to come up with a question that implies the relationship between the cyanidin solution and the color change. After that, students needed to investigate more the chemical concept of the color change by trying specific solutions (Acid and alkali). At this moment, students started to come up with observations that address the link between the color change and the acidity of the solution. Most of the observations highlighted the fact that when cyanidin is added to acidic solutions, the color change is different compared to when the same cyanidin was added to alkali solutions. Yet within the same acidity, the color change was the same. At this phase of the activity, students needed to come up with conjectures and therefore needed to use their prior knowledge or start a search on the subject. At the end of the activity and based on the inquiry based learning approach, students had learned independently about indicators, natural indicator and artificial indicators, solution acidity, color change and pH. At this specific activity, students did not investigate further the color change concept, their main focus was not yet to provide evidence, it was rather to investigate based on formulating questions, making observations and coming up with conjectures. Later on during the semester, students needed to work on various investigations by using other skills that include hypothesis, experiment design, data collection and others.



Structure de cyanidin: 2-(3,4-Dihydroxy-phenyl)-3,5,7-trihydroxy-chromenylium

Study evaluation: Throughout the semester, general education students were observed inside the class and their involvement in various course activities (COL 165) was closely followed up. In addition, and toward the end of the fall semester, students were asked for their feedback concerning the course. Furthermore, and during the following semesters (spring and summer), grades of students who have taken the first science course (COL 165) then the second science course (COL 260) were investigated and a comparison between the performance in the second science course was conducted between this population of students and another population of students who took the second science course without taken the first science course. The figure below shows different component of the study's methodology.

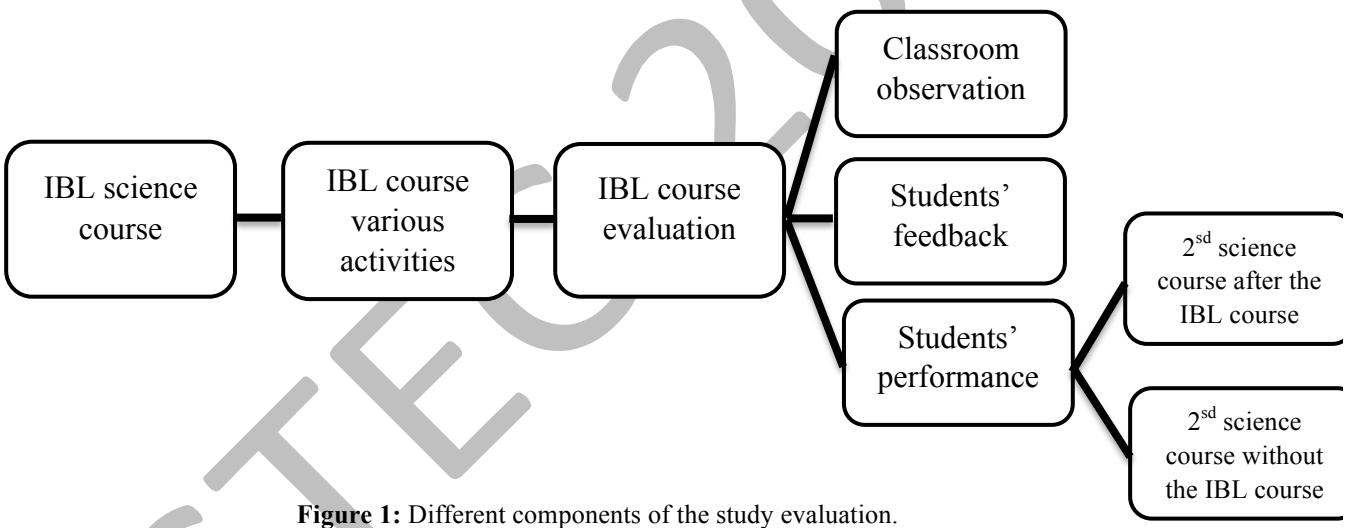


Figure 1: Different components of the study evaluation.

Results and discussion

In higher education, it has been proven that the success of using the approach of IBL within the instructing process is based on the practice nature of knowledge and learning, on the nature of the different activities, and finally on the knowledge integration. All of that has proved to overcome challenges of the learning process for university students. Using IBL, students normally use the scholarly and research practices to engage in a discipline or interdisciplinary activities or problems in a learning environment rich of challenge and support.(Li & Zhao, 2015) In a traditional general education science course, undergraduate students usually are presented with the contents of three different disciplines (chemistry, physics and biology). Different scientific concepts are discussed, and each part of the course is followed by a test. In the redesigned form of the course developed in Zayed University using the IBL approach, students need to work continuously to acquire scientific skills throughout various activities inside and outside the class. The assessment is not test driven, rather it is mostly based on scientific activities performed inside the class and an individual project. Achieving success in each part of the IBL course provided students with self-confidence and brought motivation and enthusiasm for the course.

In this work, the main objective behind using the inquiry based learning in a science subject, is to prove that designing course activities that are relevant and interesting can practically provide students with good opportunities to become independent learners. The students' population involved in this study is non-science major that implies that students had various levels at sciences and quantitative background. Teaching this heterogeneous group of students is known to be a very challenging task. However, if the IBL approach is used, every one of these students will be given a chance to contribute, and to develop skills depending on her abilities and understanding. Furthermore, and in addition to students acquiring many scientific skills, students can in parallel develop the skill of working with a clear objective (Knowledge in action) as well as the skill of working within groups. The first part of the study evaluation conducted in Zayed University in the Dubai campus, was based on classroom observation. Students' involvement in various activities inside the class has shown a positive improvement throughout the semester. Students have seemed to like different practical activities where they needed to work on their own and take responsibility of their own learning. Figure 2, shows that a good percent (64%) in the COL 165 course have loved working in different activities inside the classroom. Only 9% of the COL 165 students seemed not to agree about the usefulness of these various class activities. This finding is expected, as many students resist the change and like to learn in the same way previous generations had learned.

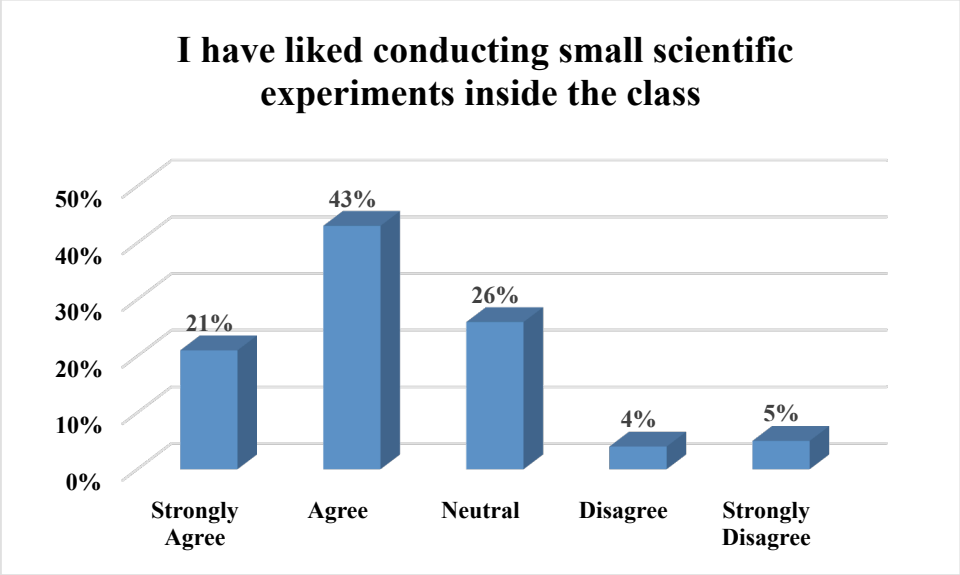


Figure2: Data reflecting students' involvement inside the class.

The second part of the study concentrated on evaluating the impact of the scientific skills that students have acquired in the COL 165 course on their performance in the second science course they need to take (COL 260) during the following semesters (Spring or summer). These students' performance was compared to that of students who did not take COL 165 but took directly COL 260. The table below presents grades comparison.

Table 1: Grades data for two categories of students. The first category forms students who have taken directly COL 260. The second category forms students who have taken COL 165 first then COL 260.

	Without COL165	With COL165
A	2%	28%

B	**25%**	**43%**
C	**55%**	**15%**
D	**16%**	**13%**
F	**2%**	**2%**

The table shows that students who have taken COL 165 course first then COL 260, as part of their sciences' requirement of the general education courses in the university, had performed better compared to students who took directly COL 260. The number of students who got A in the second science course has positively changed from 2% to 28%. The percent of students who got B in COL 260 has jumped from 25% for students who took directly the course as opposed to 43% for students who took first COL 165 then COL 260. For students who got C the number have dropped from 55% to 16%, and finally the number of students with D has dropped from 16% to 13%. This data that was collected from students who took COL 165 first during fall 2013 then COL 260 during spring- summer 2014 (64 students). The COL 260 data of students who did not take COL 165 was based on previous entries of students' grades during fall 2012, before the new science course was offered for general education students in Zayed University. The performance comparison shows clearly that students who took COL 165 first had performed better.

The last part of the study was based on student's feedback. At the end of the 2013 fall semester, an online survey was conducted for four sections of COL 165 of an average of 77 students. Figure 3 presents an example of students' answers.

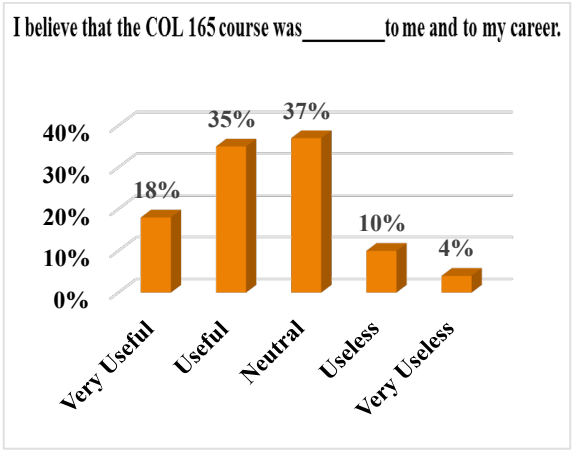
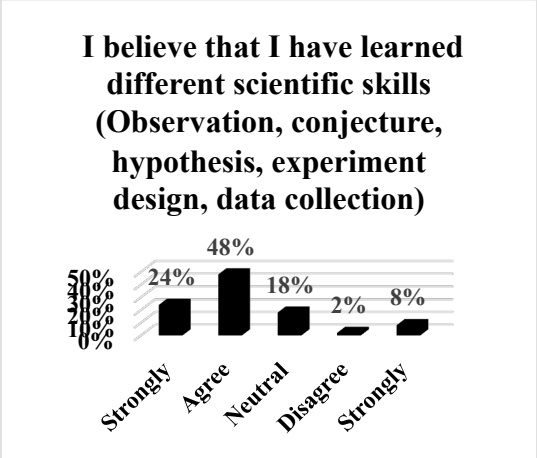


Figure 3: Students' feedback as per the COL 165 course. The online survey was conducted toward the end of the semester (Fall 2013)

The data shows that students were mostly positive about the IBL science course. Around 87% of students either strongly agree or agree about the fact that the course allow them to acquir scientific skills. A percent of around 70% believed that they have learned sciences in the IBL course better than in a traditional science course. Finally around 53% of students thought that the IBL science course was useful and would help them in their careers, while 37% of these students were neutral about that. As explained previousely, that will always be a population of students who would resist the change and would prefere to learn in a traditional teacher centered environment.

In addition to asking students for their feedback in my own sections (77 students in four different section of the COL 165 course). Students' feedback from other sections of the same course was used and a population of 50 students was asked for their feedback toward the end of spring 2014. Interesingly, similar patterns were obseved. Infact, across different sections of the COL 165 course, around 72% of students believed that IBL allowed them to acquire scientific skills. Students of different sections (54%) said that they have learned in the IBL medium more than a traditional environment. A percent of 46% thought that the IBL course was useful to them as well as to their carreers. Below is an example of students' feedback obtained from other COL 165 sections during spring 2014.



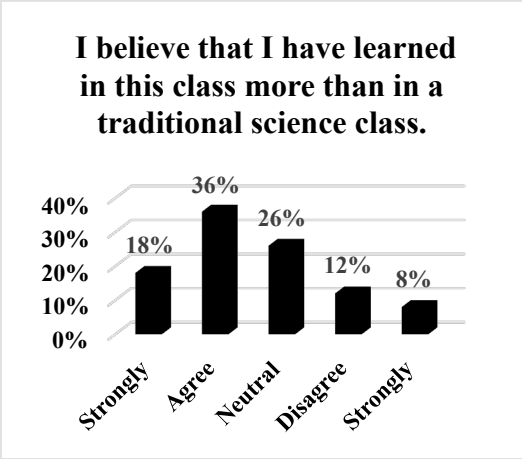


Figure 4: Students' feedback as per the COL 165 course. The online survey was conducted toward the end of the semester (Spring 2014)

Conclusions

This study has shown that inquiry based learning is an effective pedagogical approach in which students engage in intellectually challenging work that allow them to gain knowledge and skills. At Zayed University, IBL has enabled students of the first general education science course to work on real scientific cases, to quantify their funding and to comprehend the process of using the scientific method to investigate or solve a problem. The IBL course was designed to provide students with enjoyable and effective activities. Students have put their knowledge in action, they have practice how to make quantitative and qualitative observations, how to come up with good and relevant conjectures, how to make a testable hypothesis, how to design experiments to provide evidence for their hypothesis, how to collect data, analyze and interpret it and finally how to conclude. Students had afterwards the chance to practice these skills on an individual project of their own. The study evaluation has shown that the IBL approach was overall a positive experience for the general education students, classroom observation, students' performance and students' feedback has proved that university courses can be a good area for students to acquire scientific skills as well as knowledge in an interactive and student centered model. The approach should be used though carefully as skills can overtake the knowledge area of the course, therefore, classroom activities and different components of the course should be designed in a way that balances skills and knowledge. Finally, Zayed University can create an autonomous life-long learning environment by: Identifying learning objectives, employing non-traditional learning approaches such as IBL, using appropriate resources, training its faculties and spreading the awareness of the importance of the learning opportunities that exist inside classrooms.

Acknowledgements

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Iteration Free Fractal Image Compression For Color Images Using Vector Quantization, Genetic Algorithm And Simulated Annealing

A R Nadira Banu Kamal

Professor, Dept of Computer Science, TBAK College for Women, Kilakarai, Tamil Nadu, India
nadirakamal@gmail.com

Abstract: This research paper on iteration free fractal image compression for color images using the techniques Vector Quantization, Genetic Algorithm and Simulated Annealing is proposed, for lossy compression, to improve the decoded image quality, compression ratio and reduction in coding time. Fractal coding consists of the representation of image blocks through the contractive transformation coefficients, using the self-similarity concept present in the larger domain blocks. Fractal coding achieves high compression ratio but it consumes more time to compress and decompress an image. Different techniques are available to reduce the time consumption and improve the decoded image reliability. But most of them lead to a bad image quality, or a lower compression ratio. Usage of synthetic codebook for encoding using Fractal does not require iteration at decoding and the coding error is determined immediately at the encoder. The techniques Vector Quantization, Genetic Algorithm and Simulated Annealing are used to determine the best domain block that matches the range blocks. The proposed algorithm has the better performance in terms of image quality, bit rate and coding time for Color images. Only the encoding consumes more time but the decoding is very fast.

Key words: Fractal code, Iteration free, Vector quantization, Genetic algorithm, Simulated annealing

Introduction

With the recent rapid growth of multimedia applications and digital transmission, image compression techniques have become a very important subject. A digital image obtained by sampling and quantizing a continuous tone picture requires an enormous storage. For instance, a 24 bit color image with 512x512 pixels will occupy 768 Kbytes storage on a disk and a picture twice of this size will not fit in a single floppy disk. To transmit such an image over a 28.8 Kbps modem would take almost 4 minutes (Vivek Arya et al., 2013). Thus image compression addresses the problem of reducing the amount of data required to represent a digital image, so that it can be stored and transmitted more efficiently. Fractal compression is one of the methods and this method is used in this research work to achieve improved image quality, compression ratio and reduction in coding time. The proposed method has the advantages such as low time consumption for decoding and less memory requirements for storage, which is most needed in today's communication.

Fractal coding consists of the representation of image blocks through the contractive transformation coefficients, using the self-similarity concept present in the larger domain blocks. Fractal coding achieves high compression ratio but the time required to compress and decompress an image is time consuming. There are many modified versions proposed to improve the fractal coding techniques (Ghazel et al., 2005, Mohsen et al., 2003). Most of the studies focus on

- refining the block transformation (Chong and Minghong, 2001)
- reducing of the complexity of the encoding process (Chen et al., 2002)
- speeding up the process (Hau-Jie and Wang, 2005, Riccardo et al., 2006)

An iteration-free fractal image coding for color images using the techniques Vector Quantization (VQ), Genetic Algorithm (GA) and Simulated Annealing (SA) is proposed for lossy compression in this research work to improve decoded image quality, compression ratio and to reduce the coding time. The major problems with a VQ encoder are the codebook search complexity and the memory required to store the codebook. Both the codebook search complexity and storage requirements increase exponentially with the vector dimension (Jeng et al., 2003). Therefore the size of the VQ blocks is usually kept very small

which in turn results in a high statistical correlation between adjacent blocks. In this research work the size of the vector is limited to 64 ie., 8x8 blocks. The searching process of the reproduction vector for an input vector using full search requires intensive computations. Many algorithms are proposed to speed up the searching process. The algorithm given by Jim and Yi (2004) uses the vector's features (mean value, edge strength, and texture strength) to delete impossible codewords that cannot be rejected by the DHSS algorithm using three projections. Two additional inequalities, one for terminating the searching process and another to reject impossible codewords, were presented to reduce the distortion computations. This algorithm is better than the DHSS algorithm and Pan's method (Pan et al., 2003) in terms of computing time and the number of distortion calculations hence this algorithm was included in the present research work for eliminating the domain blocks while searching for the optimal solution in the proposed method using the technique VQ. As genetic algorithms and Simulated Annealing are global search and optimization method, it can be applied to the proposed method to find the optimal domain block for each range block in iteration-free fractal color image coding. The problems faced in GA are encoding the solution, fixing the size of the population, choosing the crossover and its probability, mutation and its probability and selection procedure. Similarly the problems faced in SA are generating a candidate solution, problem-specific cooling schedule, objective function and Metropolis-step in which the algorithm decides if a solution is accepted or rejected. The selection of these parameters greatly affects the solution. The proposed method using the VQ technique aims to design an efficient domain pool for the fractal coding schemes and it also introduces the optimization techniques like GA and SA to improve the quality of the decoded image and for speeding the encoding time in generating the fractal codes. This research work of introducing VQ, GA and SA reduces the computational complexity, improves the image quality and reduces the coding time.

Algorithm of the proposed method

Usage of synthetic codebook for encoding using Fractal does not require iteration at decoding and the coding error is determined immediately at the encoder (Chang and Chung, 2000). Hence there is a reduction in decoding time. In the proposed method a synthetic codebook is created as the domain pool using the mean image, whose pixel values are the block means of all the range blocks. This code book is used as the domain pool for genetic algorithm and simulated annealing techniques. As these techniques have become an efficient tool for search and optimization, they can be used to find the better domain block from the domain pool that matches the range block of the image in fractal coding.

Parameters for VQ

In the iteration-free fractal image coding using vector quantization the domain pool was classified and pruned for each range block for each RGB component before the comparison for the identification of the better domain block from the codebook for the range block in order to reduce the computational time (Jim and Yi, 2004). The proposed methodology using the VQ technique reduces the coding process time and intensive computation tasks by pruning the domain block for each range block. The redundancies in the domain pool are first reduced by the Linde Buzo Gray (LBG) Algorithm. Further redundancy in the domain block for each range block was achieved using the vector features such as mean value, edge strength, and texture strength (Nadira and Priyanga, 2014a). A pruning condition for terminating the searching process to find the best domain block from the domain pool has been used in this proposed research work.

Parameters of GA

Crossover is made in hope that new chromosomes will contain good parts of old chromosomes and therefore the new chromosomes will be better. However, it is good to let some part of old populations survive to next generation. The crossover probability is chosen as 0.85 in the proposed method. Mutation generally prevents the GA from falling into local extremes. Mutation should not occur very often, because GA will in fact then change to random search. The mutation probability is chosen to be 0.06 in the proposed method (Nadira and Priyanga, 2014). Research shows that after some limit (which depends mainly on encoding and the problem) it is not useful to use very large populations because it does not solve the problem faster than moderate sized populations. In the proposed method the size of the population is chosen to be 40. There are many methods in selecting the best chromosomes. Examples are Roulette wheel selection, Boltzmann selection, Tournament selection, Rank selection, Steady state selection and some others. Roulette wheel selection is used in the proposed method.

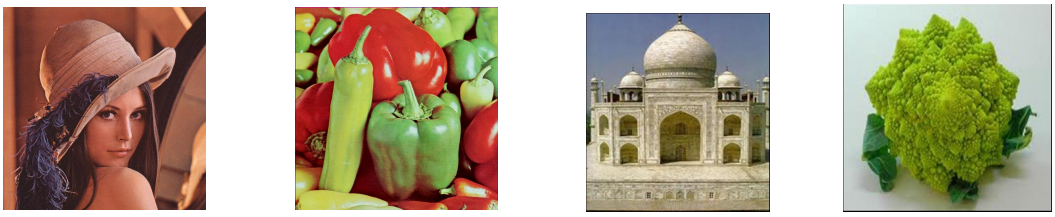
Parameters of SA

At each step, the SA heuristic considers some neighbors of the current state **s**, and probabilistically decides between moving the system to state **s'** or staying back in state **s**. The probabilities are chosen so that the system ultimately tends to move to states of lower energy. Boltzmann's Probability is used in the proposed method. In the present problem the neighbor of a state is any domain block from the domain pool. The probability of making the transition to the new state **s'** is a function P(δE, T) of the energy difference δE = E(s') - E(s) between the two states, and of a global time-varying parameter T called the control parameter (Nadira , 2012). In the proposed method T is made to vary from 1 to 0. Initially, T is set to a high value (or infinity), and it is decreased at each step according to some annealing schedule. Various cooling schedules are suggested in literature. In the proposed method $T_i = T_0 - i\frac{T_0 - T_{N2}}{N2}$ is used as it leads to better solution (Nadira and Thamaraiselvi, 2006a).

The sender sends the color image for compression. In the preprocessing stage, the input MxNx3 image under coding is divided into non-overlapping square blocks of BxBx3 pixels called the range blocks. Then the mean and variance of each range blocks are determined. After the mean of all the range blocks are obtained, a mean image of size M/B x N/B x 3 with each pixel corresponding to the block mean is generated. The mean image must be larger than the size of the range block i.e. M/B x N/B x 3 > B x B x 3. The maximum size of B is limited to 8 in order to produce a good quality of the decoded image. The higher the resolution of the input image (MxNx3) more blocks can be generated for the domain pool which helps to find a good mapping between the domain and range blocks. The initial domain pool with blocks of the same size as the range is generated using the mean image. In the encoder if the variance of the range block is smaller than the threshold value E, the range block is coded by the mean, or else the range block will be coded by the contractive affine transformation (Chang, 2001). The aim of the proposed scheme is to find the domain block for each image range block and the transformation parameters that minimize the distortion between the image block and the transformed domain block in a minimized time. This process of finding the best domain block makes use of the techniques like VQ, GA and SA. In the decoder, the mean information of each range block is extracted from the fractal codes. Using this information the mean image is constructed. This mean image is partitioned into blocks of the same size as the input image. This forms the domain pool for GA and SA search methods but for VQ the domain pool is constructed from the mean image blocks (same size as that of the input) using LBG algorithm. The decompressed image is constructed block by block by applying the transformation parameters to the selected domain block from the domain pool as per the code.

Implementation

For implementation of the proposed algorithms, four 512 x 512 benchmark color images of Lena, Pepper, Tajmahal and Cauliflower [shown in Figure 1 (a) to (d)] with twenty four bit color resolution were used. In the simulation, the images were partitioned into range blocks with the block size, 8x8 or 4x4 or 2x2. The maximum block size is set to 8x8 because for a range block size greater than 8x8 the determination of the proper domain block was difficult and the quality of the image reconstructed was poor. The threshold value for the variance of range blocks was chosen by trial and error basis to be of size 20 for block size 8x8, 10 for 4x4 and 5 for 2x2 that results in good compression ratio and PSNR. The number of blocks in the mean image is the size of the domain pool. These algorithms were implemented using the software Matlab 7.12 on the Intel (R) Core[TM] 2 E7500 systems with 2.93 GHz and 1.96 GB of RAM.



(a) Lena (b) Pepper (c) Tajmahal (d) Cauliflower

Figure 1: Original (512 X 512x3, 24 Bit/Pixel) Images.

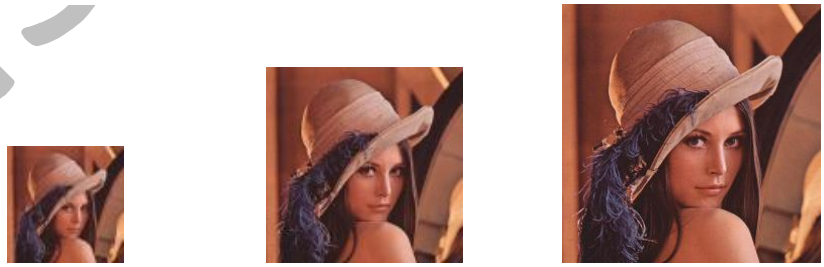
The range block with a size 8x8, 4x4 and 2x2 was considered for simulation. The length of the attached header to the proposed iteration-free fractal code for each range block was one bit because it only denoted whether or not the range block was coded by the mean. For an image partitioned by 4x4 range blocks, every block mean was calculated and a 128x128 mean image was obtained. Figure 2 (b) shows the mean image of Lena got by this partition and it is very similar to its original image except its size. Therefore the domain pools of different sizes namely 16, 32 and 64 using the LBG-based method from the mean image was constructed for VQ. For GA and SA the range block with a size 8x8, 4x4 & 2x2 was considered for simulation. Here the total number of range blocks for the block size 4x4 for each color component was n = 16384 and total number of domain blocks (m) to search were (128 / 4) x (128 / 4) = 32 x 32. Thus, the cardinality (N1) of the search spaces for this case was 8 x 4 x 1024.The string length n was taken to be 15 (3 + 2 + 10). In GA out of these 2^{15} binary strings, forty strings (S = 40) were selected randomly to construct an initial population. A high crossover probability, say p_c = 0.85, was taken for the crossover operation. For mutation operation, p_m was 0.06. Roulette-wheel selection procedure was used. The fitness value of a string between the given range block and the obtained range block for each RGB color component is taken to be the MSE given in Eq. 1.

$$MSE(R,\hat{R}) = \frac{1}{B^2}\sum_{0,i,j\le B}\left(r_{i,j} - \hat{r}_{i,j}\right)^2 \qquad (1)$$

The probability of selection of a string in the population to the mating pool was inversely proportional to its fitness value because the present optimization problem is a minimization problem. The total number of generations (iterations) considered in the GA was T = 60. Hence, the search space reduction ratio was approximately 14. For the block size 8x8, the total number of range blocks for each RGB component was n = 4096 and total number of domain blocks to search was (64 / 8) x (64 / 8) = 8 x 8. Thus, the cardinality (N1) of the search spaces for this case was 8 x 4 x 64. The string length n was taken to be 11 (3 + 2 + 6). For the block size 2x2, the total number of range blocks was n = 65536 and total number of domain blocks to search was (256 / 2) x (256 / 2) = 128 x 128. Thus, the cardinality (N1) of the search spaces for this case was 8 x 4 x 16384.The string length n was taken to be 19 (3 + 2 + 14). The domain pool was found and the coding performance using the above parameters was simulated. Using SA for the block of size 8x8, 4x4 and 2x2 the solution configuration length was taken to be 11, 15 and 19 respectively. Knuth random numbers were globally generated for the rearrangement of the solution so that most possible solutions were considered. The seed value was chosen to be as 0.5. In the simplest form of the problem, the objective function was taken as the Mean Square Error (MSE). Some random rearrangement of the solution was first generated, and used them to determine the range of values the objective function encountered from move to move. Choosing a starting value for the parameter T_0 which was considerably large say 1, and process was conducted downward each amounting to a decrease in T. Each new value of T was kept constant for, say, N (N=40) reconfigurations and store the configuration which produces minimum value for the objective function. If the terminating condition was not reached, the parameter for T was reduced and the next trial was started with the configuration that produced minimum value for the objective function. The equation for the parameter T was chosen as

$$T_i = T_o - i\frac{T_o - T_N}{N} \qquad (2)$$

where T_o = 1 and T_N = 0 and i is the iteration number. The coding performance with the contractive affine transformation under the different sizes for the domain pool on the parameters like coding time, image quality and bit rate was determined.



(a) 64x64 (b) 128x128 (c) 256x256

Figure 2: Mean Images Of Lena.

Results and Discussions

The range blocks were classified before coding [Yung et al., 2003]. Range blocks were grouped into two sets according to the variability of the pixel values in these blocks. If the variability of a block was low, i.e., if the variance of the pixel values in the block was below a fixed value, called the threshold, the block is called smooth type range block. Otherwise, it is called a rough type range block.

Table 1: Classification of blocks and bit rate using different types of encoding on the chosen images using the proposed techniques.

Image	Range Block size	No of Range Blocks for GA/SA		Bit Rate		Compression ratio		PSNR		
				GA / SA	VQ	GA / SA	VQ			
		Smooth	Rough					GA	SA	VQ
Lena	2 * 2	43927	21611	7.56	7.47	3.17	3.20	41.60	35.41	31.55
	4 * 4	8394	7992	1.95	2.04	12.26	12	33.12	31.68	27.84
	8 * 8	1559	2539	0.48	0.54	49.82	44.50	28.76	28.36	25.16
Pepper	2 * 2	51409	14129	7.02	7.16	3.41	3.35	39.84	36.24	30.78
	4 * 4	9851	6535	1.87	1.99	12.81	12.06	33.52	32.20	26.92
	8 * 8	1638	2460	0.47	0.53	50.16	45.19	27.84	27.84	23.91
Cauliflower	2 * 2	49433	16105	7.16	7.04	3.34	3.40	37.63	37.44	27.03
	4 * 4	8640	7746	1.94	1.87	12.34	12.77	29.49	28.31	23.45
	8 * 8	1682	2416	0.47	0.49	50.36	48.87	24.23	24.88	21.97
Tajmahal	2 * 2	44672	20866	7.51	7.35	3.19	3.26	42.83	39.90	22.50
	4 * 4	6624	9762	2.05	1.98	11.65	12.07	33.86	32.32	25.49
	8 * 8	1018	3080	0.50	0.57	47.58	44.44	26.64	26.52	30.42

The purpose of choosing this block classification was for two reasons. One is to get higher compression ratio, and the other is to reduce the coding time. The threshold value that separates the range blocks into two types was chosen as stated earlier. After classification, VQ-based, GA-based and SA-based coding was adopted for the rough type range blocks only. All the pixel values in a smooth type range block were replaced by the mean of its pixel values. [Table 1] gives the classification of blocks and bit rate using different types of encoding using the proposed techniques on the images chosen for simulation. From the results tabulated in [Table 1], it is observed that for the images which have the number of smooth blocks significantly high has a high compression ratio.

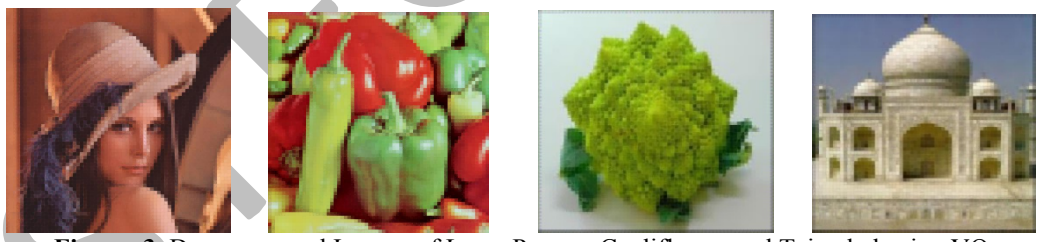
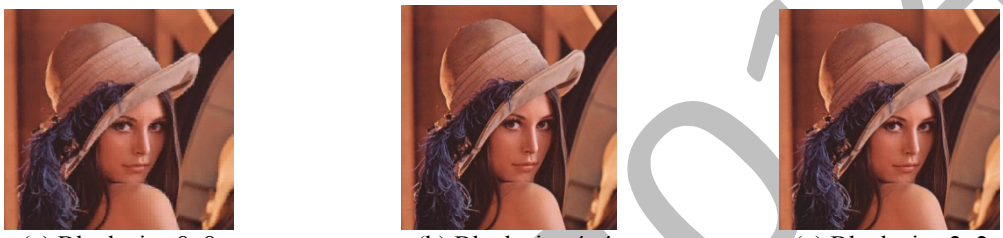


Figure. 3. Decompressed Images of Lena, Pepper, Cauliflower and Tajmahal using VQ for block size 8x8 using 16 level

Figure 4: Decompressed Images of Lena, Pepper, Cauliflower and Tajmahal using VQ for block size 4x4 using 32 level

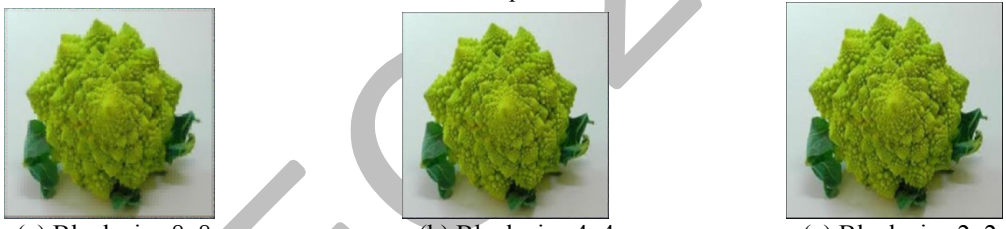
The decompressed image of Lena, Pepper, Cauliflower and Tajmahal for the block partition of sizes 8 x8 using 16 level, 4x4 using 32 level and 2x2 using 64 level for the technique VQ is shown in Figure 3,4and 5 respectively.

Figure 5: Decompressed Images of Lena, Pepper, Cauliflower and Tajmahal using VQ for block size 2x2 using 64 level



(a) Block size 8x8 (b) Block size 4x4 (c) Block size 2x2

Figure 6 : Decompressed Image Of Lena For Block Size 8x8, 4x4 And 2x2 Using The Proposed GA Technique.

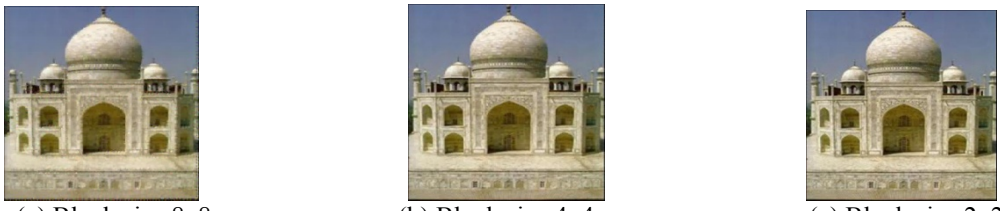


(a) Block size 8x8 (b) Block size 4x4 (c) Block size 2x2

Figure 7: Decompressed Image Of Cauliflower For Block Size 8x8, 4x4 And 2x2 Using The Proposed GA Technique.

(a) Block size 8x8 (b) Block size 4x4 (c) Block size 2x2

Figure 8: Decompressed Image Of Pepper For Block Size 8x8, 4x4 And 2x2 Using The Proposed GA Technique.



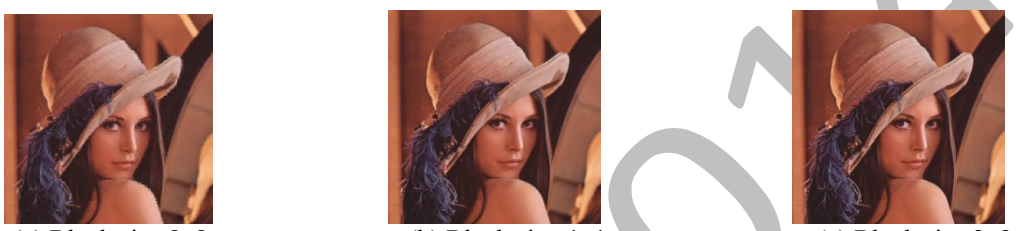
(a) Block size 8x8 (b) Block size 4x4 (c) Block size 2x2

Figure 9: Decompressed Image Of Tajmahal For Block Size 8x8, 4x4 And 2x2 Using The Proposed GA Technique.

The decompressed image of Lena, Cauliflower, Pepper and Tajmahal for the block partition of sizes 8 x8, 4x4 and 2x2 using the technique GA is shown in Figure 6,7,8 and 9 respectively. The decompressed image of Cauliflower, Lena, Pepper and Tajmahal for the block partition of sizes 8 x8, 4x4 and 2x2 using the technique SA is shown in Figure 10,11,12 and 13 respectively.

(a) Block size 8x8 (b) Block size 4x4 (c) Block size 2x2

Figure 10: Decompressed Cauliflower Image for Block Size 8x8, 4x4 And 2x2 Using the Proposed SA Technique



(a) Block size 8x8 (b) Block size 4x4 (c) Block size 2x2

Figure 11: Decompressed Lena Image for Block Size 8x8, 4x4 And 2x2 Using the Proposed SA Technique

(a) Block size 8x8 (b) Block size 4x4 (c) Block size 2x2

Figure 12: Decompressed Pepper Image for Block Size 8x8, 4x4 And 2x2 Using the Proposed SA Technique

(a) Block size 8x8 (b) Block size 4x4 (c) Block size 2x2

Figure 13: Decompressed Tajmahal Image for Block Size 8x8, 4x4 And 2x2 Using the Proposed SA Technique

The Encoding time of the proposed techniques using GA, SA and VQ values are reported in the [Table 2]. These results of encoding time using block sizes 8x8, 4x4, 2x2 are plotted in the graph and shown in Figure 14 and the and their PSNR values are plotted in the graph shown in figure 15.

Table 2: Results of the Proposed Iteration-Free Fractal Method Using the Techniques VQ, GA and SA

Image	Range Block	Using GA	Using SA	Using VQ

	Size	RMS	Coding Time (secs)	RMS	Coding Time (secs)	Codebook size 16		Codebook size 32		Codebook size 64	
						RMS	Coding Time (secs)	RMS	Coding Time (secs)	RMS	Coding Time (secs)
Lena	8x8	9.29	31250	9.64	17784	14.06	5941.4	14.30	6374.3	14.29	7009.6
	4x4	5.62	63871	6.64	51921	10.33	23272	10.14	70142	10.19	31386
	2x2	2.12	110330	4.32	106660	6.74	79228	6.69	104390	6.57	153450
Pepper	8x8	10.84	36276	10.33	17076	16.24	5855	16.38	6756.4	16.57	6881
	4x4	5.37	52157	6.25	22802	11.50	21268	11.23	24023	11.35	28241
	2x2	2.59	77985	3.92	70342	7.37	55990	7.30	160930	7.23	109640
Cauliflower	8x8	15.39	34054	14.52	17743	20.31	4562.8	20.29	4789.2	20.34	5265.7
	4x4	8.54	50683	9.78	20484	17.12	16334	16.92	18459	16.77	22585
	2x2	3.34	84643	3.42	64120	11.34	49001	11.31	66905	11.25	96249
Tajmahal	8x8	11.86	31250	12.02	28842	19.11	8817.3	19.49	5616.4	19.52	6408.1
	4x4	5.16	64737	6.16	17794	13.53	14163	13.39	24725	13.39	31149
	2x2	1.84	110470	2.57	60320	7.68	38014	7.52	95678	7.39	138210

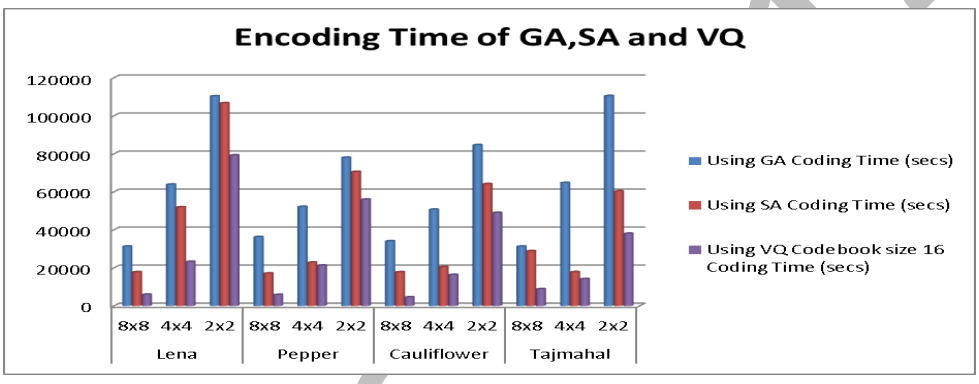


Figure 14: Encoding Time of GA, SA and VQ

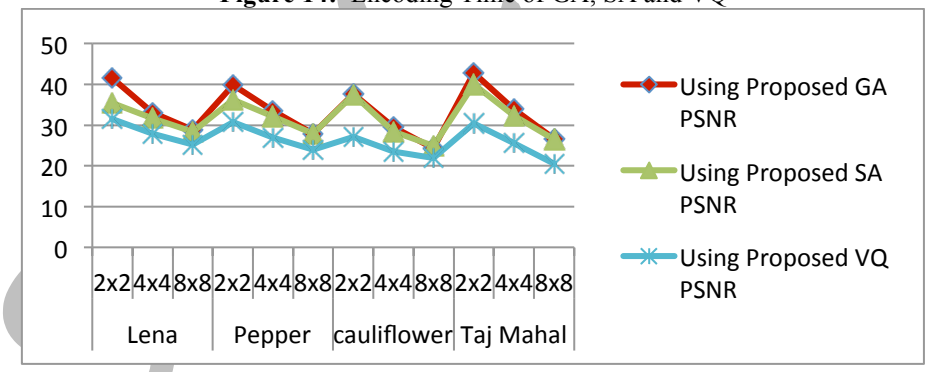


Figure 15: PSNR Of Lena, Pepper, Cauliflower and Tajmahal for Block Size 8x8, 4x4 and 2x2 Using the Technique GA, SA And VQ.

From the results obtained, it is obviously clear that GA technique for iteration-free fractal coding is preferred for better image quality whereas VQ is preferred for reduced coding time and SA is preferable for optimal image quality and time. The proposed methods using VQ, GA and SA are found to provide computational efficiency, thereby drastically reducing the cost of coding. [Table 3] gives the result of similar methods found in the literature and the proposed methods for the bench mark image of Lena and Pepper (512 x 512, 24 bit color image). In the proposed method using SA, GA and VQ the PSNR is highly effective when compared to the existing fractal methods given in references (Somasundaram, 2011) and (Nileshsingh and Kakde, 2007)

Table 3: PSNR of some methods for 512x512 color images

Image	Range	SA	GA	VQ	RGB & Gray Scale Component On MPQ-BTC In Image Compression (Somasundaram, 2011)	Color Image Compression with Modified Fractal Coding on Spiral Architecture (Nileshsingh and Kakde, 2007)
Lena	4 x 4	31.68	33.12	27.84	24.1209	29.05
Pepper	4 x 4	32.20	33.52	26.92	24.1531	-

Conclusion

In this Work, a fast-encoding algorithm for fractal image coding is proposed and implemented using Genetic Algorithm, Simulated Annealing and Vector Quantization for still color images. First the range blocks were classified as either smooth or rough depending on the variance of the block. This classification was very useful when the image had lot of smooth blocks. So depending on the image and the partition, a high compression ratio was achieved. Only the encoding consumes more time but the decoding is very fast. GA technique for iteration-free fractal coding is preferred for better image quality whereas VQ is preferred for reduced coding time and SA is preferable for optimal image quality and time. The proposed methods using VQ, GA and SA are found to provide computational efficiency, thereby drastically reducing the cost of coding. The execution time can further be reduced by implementing the proposed method in parallel for encoding. Color images are commonly used in most of the application now-a-days. Applications where images can be stored in a compressed form, which require faster retrieval, like medical images and photographs for identification can use the proposed method.

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İşletmelerde Bilgi Teknolojisi Ağları

Information Technology Networks in Business

Yrd. Doç. Dr. Hakan ÇETİN

Akdeniz Üniversitesi İktisadi ve İdari Bilimler Fakültesi Ekonometri Bölümü
hakanc@akdeniz.edu.tr

Öğr. Gör. İbrahim GUNDAK

Akdeniz Üniversitesi Ayşe Sak Uygulamalı Bilimler Yüksek Okulu Uluslararası Ticaret ve Lojistik Bölümü
ibrahimg@akdeniz.edu.tr

Özet : Günümüz iş dünyası için ağ teknolojilerinin gelişmesi işletmelerin kendi bünyelerindeki gelişmeleri ve değişimleri çok hızlı bir şekilde çalışanlarına ve paydaşlarına aktarma fırsatı sağlamıştır. İşletmelerde birimler arası bilgi alış verişinin güvenli, hızlı ve etkin bir şekilde sağlanabilmesi için intranet sistemleri, kurumların farklı bölgelerdeki birimleri, tedarikçileri ve dağıtım kanalları ile ilgili bilgi ve iletişim ihtiyaçları için ise ekstranet sistemleri geliştirilmiştir. Literatür taraması yönteminin kullanıldığı bu çalışmada güvenli ve hızlı iletişim ihtiyacını karşılayan intranet ve ekstranet kavramları ele alınmış, bu kavramların avantajları, kullanım alanları ve bilgi paylaşım şekilleri incelenmiştir.

Anahtar Kelimeler: İntranet, Ekstranet, İnternet, Şirket Ağı, İş dünyası, Güvenlik

Abstract : In today's business world, the development of network technologies provided enterprises with an opportunity to transfer developments and changes in their structure very quickly to their employees and stakeholders. In the organizations, intranet systems have been developed to enable the exchange of information safely, quickly and effectively and extranet systems have been developed for information and communication needs concerning the departments of the institutions in different regions, suppliers and distribution channels. In this study, where the literature review method was used, intranet and extranet concepts that meet the needs of secure and fast communication have been considered, and the advantages, usage and knowledge sharing ways of these concepts have been examined.

Keywords: Intranet, Extranet, Internet, Enterprise Network, Business world, Security

Giriş

Alvin Toffler 1980 yılında yayınlamış olduğu "üçüncü dalga" adlı kitabında insanlık tarihini tarım toplumu, sanayi toplumu ve bilgi toplumu olmak üzere üç evrede açıklamıştır (Toffler, 1980). Üçüncü dalga olarak nitelendirilen bilgi toplumunun oluşumunu sağlayan ve insanlık tarihini etkileyen en önemli buluşlardan biri olan internet, kişileri, ülkeleri ve kıtaları birbirine bağlayan dev bir ağdır. 1980'lerden sonra kişisel bilgisayarların yaygınlaşmasıyla internet iletişim ağının genişlemesi, bilgiye ulaşımı hızlandırmış, istenilen mekânlardan ve istenilen bir zaman diliminde bilgi alışverişinin yapılabilmesini

sağlamıştır (Özçağlayan, 1998).

Bilginin öneminin daha çok arttığı bugünlerde işletmeler kurum içi önem arz eden konuları ve bilgileri doğal olarak dış dünya ile paylaşmak istememektedirler. Bu noktada işletmeler bilgi güvenliğini sağlayarak çalışanlarının iletişimini hızlandırmak ve kalitesini artırmak için dış çevreye kapalı bir sisteme ihtiyaç duymuşlardır (Tunçhan, 2009). Bu doğrultuda bilişim teknolojileri ve ağ uzmanlarının çalışmaları işletmelerin ve çeşitli organizasyonların ihtiyaçlarını karşılayacak intranet ağ sisteminin doğmasını sağlamıştır. İşletmelerin büyümesi ve farklı bölgelere yayılması ile birlikte uzak noktadaki ortaklar, tedarikçiler ve bölümler ile iletişimi etkin ve hızlı bir şekilde devam ettirme isteği oluşmuş, bununda karşılığı olarak ekstranet sistemi geliştirmiştir.

İntranet ve ekstranet sistemleri aslında internetin kurumlar içinde kullanılan farklı türleridir. İnternette kullanılan protokoller her ikisi içinde geçerlidir. Bu çalışma internet, intranet ve ekstranet kavramlarını açıklamakta ve bunların işletmeler için avantajlarını, dezavantajlarını ele almaktadır. Ayrıca bu sistemlerin işletme çalışanları için getirdiği yenilikleri ve fırsatları da ortaya koymaktadır.

İnternet

CERN'de 1989 yılında Tim Berners-Lee tarafından yapılan çalışmalar sonucunda ortaya çıkan HTML işaretleme dili ile birlikte dünya çapında ağ (WWW) olarak adlandıran gelecekte dünyayı çepeçevre saracak bilgi paylaşım sistemi kurulmuştur (http://tr.wikipedia:2014).

İnternet iletişim ağı olarak tanımlanan bu iletişim ağı üzerinden her kullanıcının yetki verildiği durumlarda kolaylıkla ulaşabileceği bilgiler sunulmaktadır. TCP/IP protokolü bugün varolan internetin omurgasını oluşturmakta ve desteklenen pek çok servis sunmaktadır (Tokgöz, 2000). TCP/IP protokolü ile internet erişimi olan bir kullanıcı, kendisine yetki verilmesi halinde, İnternete bağlı diğer herhangi bir kullanıcıyla iletişime geçebilmekte ve paylaşımda bulunabilmektedir.

Ayrıca İnternet araçları sayesinde de bilgiye ulaşım daha da kolaylaşmış ve ulaşılabilecek bilgiler ve sunulan servisler, miktar ve çeşit olarak artış göstermiştir. Internet Word Stats tarafından yayımlanan Haziran 2014 yılı dünya internet kullanıcı sayıları ile artış oranları Tablo 1 'de gösterilmiştir (www.internetworldstats.com:2014).

Tablo 1: Dünyada İnternet kullanıcı istatistikleri

Dünya Bölgeleri	Nüfus (2014 Yılı)	İnternet Kullanıcısı (2000 yılı)	İnternet Kullanıcısı (2014 yılı)	Nüfusun Kullanım Oranı	Büyüme 2000-2014	Kullanım Yüzdesi
Afrika	1,125,721,038	4,514,400	297,885,898	26.5 %	6,498.6 %	9.8 %
Asya	3,996,408,007	114,304,000	1,386,188,112	34.7 %	1,112.7 %	45.7 %
Avrupa	825,824,883	105,096,093	582,441,059	70.5 %	454.2 %	19.2 %
Orta doğu	231,588,580	3,284,800	111,809,510	48.3 %	3,303.8 %	3.7 %
Kuzey Amerika	353,860,227	108,096,800	310,322,257	87.7 %	187.1 %	10.2 %
Güney Amerika	612,279,181	18,068,919	320,312,562	52.3 %	1,672.7 %	10.5 %
Avustralya	36,724,649	7,620,480	26,789,942	72.9 %	251.6 %	0.9 %
Dünya Toplamı	7,182,406,565	360,985,492	3,035,749,340	42.3 %	741.0 %	100.0 %

Tablo 1 'e göre dünya nüfusunun %42,3'ü interneti kullanmakta ve 12 yıldaki kullanıcı sayısındaki artış %741,0 oranındadır. İnternet live stats verilerine göre dünyada 2014 yılı haziran ayı itibari ile internet kullanıcı sayısı 3,035,749,340 kişiye ulaşmıştır (Europan Project, 2014).

İnternetin bu denli hızlı gelişmesi işletmelerin koşullarını etkilemiştir. İşletmelerin bu teknolojiyi kullanmaları ile birlikte çalışanlar arasındaki bilgi alış verişinin kötü amaçlı kişiler tarafından çalınabilme riski ve güvenlik problemleri ortaya çıkmıştır. Güvenlik problemlerinin çözümlenmesi için birçok çalışma yapılmış ve halen yapılmaktadır (Ayvazoğlu, 2013). Bu çalışmalardan biriside ticari firmaların kendi içlerinde ve ortakları ile iletişimi hızlı ve güvenilir yapabilmeleri için geliştirilen intranet ve ekstranet teknolojileridir.

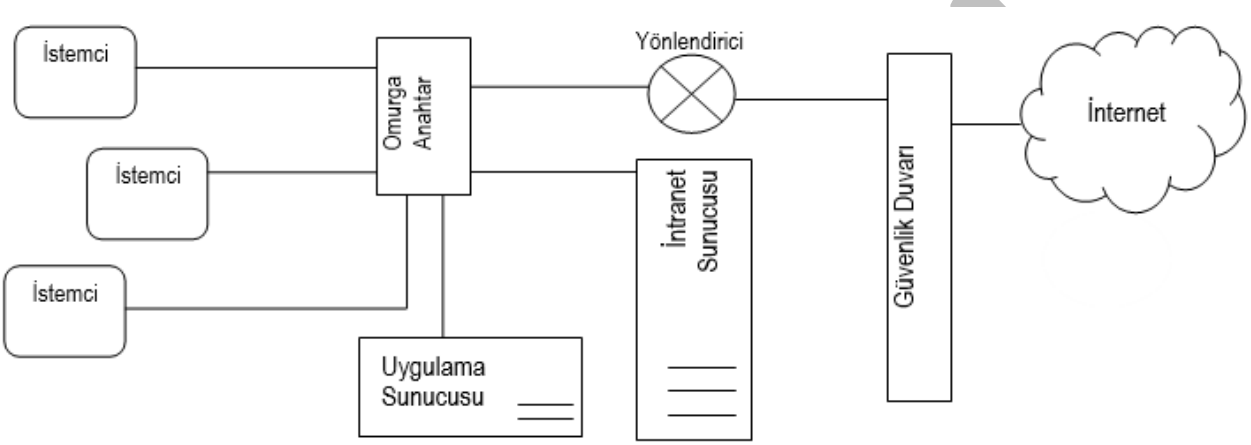
İntranet Ağı

İntranet ilk olarak, Lockheeed, Hughes ve SAS Institute gibi şirketlerde kullanılmaya başlanmış

olup başlangıçta “iç web”, “İnternet kolonisi”, “kurumsal web” veya “özel web” gibi isimler verilmiştir. 1995 yılında ise “intranet” terminolojisi ortaya atılmıştır (Canbazoğlu:2001).

İntranet, işletmelerin bütün haberleşme cihazlarının çeşitli bilgileri paylaşabildiği, internet uyumlu uygulamaları çalıştıran bilgi sistemleri ağıdır. İntranet, şirket içi bilgi akışının diğer bir deyişle enformasyon alışveriş sisteminin kalbi olarak düşünülmektedir (Hannon: 1998). Başka bir ifade ile İntranet, belirli bir işletmenin internet teknolojisi, ağ hizmetleri, TCP/IP ve HTTP iletişim protokolleri ve HTML yayımcılığı üzerinde kurulu bir kurum içi ağdır. İnternet küresel boyutta bir iletişim kanalı iken, intranet belirli amaçlar doğrultusunda kısıtlanmış bir bilgi ve iletişim ağıdır.

İşletmeler, kuracakları intranet sisteminin kaça mal olacağı ile ilgili fayda maliyet analizi yapmalı, intranetin kapasitesinin yüzde kaçından yararlanılacağı öngörülmelidir. İşletme ve bağlı şirketler farklı şehirlerde ve ülkelerde etkinlik gösteriyorlar ise, intranet büyük kolaylıklar sağlayacak, iletişim için gerekli olan süreyi büyük oranda azaltacaktır (Yönetim Bilgi Sistemi: 2014).



Şekil 1: Sunucu ve istemcileri içeren bir şirketin İntranet yapısı

İntranet sistemi insanları, ticari süreçleri, ortak bilgiyi, tedarikçileri, ortakları ve müşterileri bir araya getirir. Güvenlik duvarları sayesinde sistem dışarıdaki kişilerden korunur. İntranet sistemi işletme içinde yer alan kişilerin birbirleri ile işbirliği yapmasına, iletişim kurmasına imkân tanıyan ortak bir alan sağlamaktadır (Kartan, 2007:38).

İntranet, internette yer alan herkese açık bir web sitesi ile aynı genel kuralları kullanmakta fakat yalnızca çalışanlar ve kuruluşun yetkili aracıları erişebilmektedir. İntranet sistemi dış dünyadan bir güvenlik duvarı ile korunmaktadır. Kullanıcılar herkese açık bir Web sitesinde olduğu gibi bir Web tarayıcının aracılığıyla sisteme bağlantıyı gerçekleştirmektedirler.

İntranet teknolojisinin temel özelliklerini sıralayacak olursak;

- Yalnızca bir kuruluşa aittir.
- Özel bir ağdır. İnternette olduğu gibi tüm dünyaya açılan bir girişi yoktur.
- Kullanıcı sınırlandırması vardır.
- Merkezde servis sağlayıcısı bulunmaktadır.
- Kullanıcılar İntranet üzerinden fikir alışverişini güvenli bir şekilde gerçekleştirebilirler.
- Çok daha optimize bir şekilde bilgi arama işlemi gerçekleştirilebilir.
- İntranet üzerinden şirkette çalışan kullanıcıların, telekonferanslar yoluyla haberleşmesi güvenli bir ortam içerisinde sağlanmış olur.
- Şirket içinde gündelik bilgilere daha hızlı ulaşmak ve düşük maliyetle bu paylaşımı gerçekleştirmeyi amaçlamaktadır.
- İnternete giriş izni vardır, ancak internetin intranete giriş izni yoktur (Ayvazoğlu, 2013).

İntranet, bulunduğu ağ içerisindeki kişilere firma tanıtımı, satış bilgileri ve teknikleri, güvenlik, eğitimler, toplantılar, özel haber ve duyurular gibi birtakım bilgiler sunar. Bu bilgilerin intranet üzerinden paylaşılmış olması çalışanlara özellikle büyük ve çok konumlu organizasyonlar için kolaylık sağlar.

İntranet işletmelerde genellikle dört amaç için kullanılmaktadır (http://en.wikipedia.org:2014).

1. İletişim ve işbirliği için;

- Elektronik posta, faks ve çağrı alma ve gönderme
- Tartışma odaları ve sohbet odaları
- Sesli ve görüntülü konferans
- Sanal toplantı takımları oluşturarak ortak proje geliştirme
- Şirket olaylarını canlı olarak tartışma

2. Web yayınları için;
   - Çoklu ortam dokümanlarını geliştirmek ve yayınlamak (şirket haberleri, ürün katalogları, teknik talimatlar, Eğitim materyalleri vb.)
3. İş operasyonları ve yönetim için;
   - Sipariş işleme
   - Envanter kontrolü
   - Ürün kurulumu ve kontrol
   - Bilgi yönetim sistemleri
   - Veritabanı erişimi
4. Kurum içi ağ yönetimi için;
   - Merkezi sunucuları, istemcileri, güvenlik, dizinler ve trafik dahil tüm ağ fonksiyonları yönetmek
   - İç ve dış iş araçları / çeşitli uygulamalar için kullanıcılara erişim vermek
   - Farklı teknolojilere adaptasyon
   - Kullanıcıların araştırma yeteneklerini ve stratejilerini geliştirmek (rastgele örnek anketler, kullanılabilirlik testi, odak grupları, vb.)

İntranet, işletme içinde çalışanlarına Belge dağıtımı, Firma aktiviteleri, Varlık yönetimi, Ağ yönetimi, Stok ve satış bilgilerine erişim, İnsan kaynakları, Eğitim ve Oryantasyon, Çalışma grupları, Ortak iş programlarının kullanılması, Üretim yönetimi, Müşteri ilişkileri, Proje tanıtımları, İşletmenin organizasyon yapısı, görev tanımları, Yeni belgeleme sistemleri, Firma finans bilgileri, Sanal Alış-Veriş, Servis ve Destek gibi imkânları sunabilmektedir.

İntranetin İşletmeler İçin Avantaj ve Dezavantajları

İntranet ağının işletmeler için avantajlı yönlerini ifade edecek olursak;

- Hızlı bilgi akışı: İşletme içinde yer alan kişi ve bölümler arasında ses, grafik ve video gibi araçlarla bilgi akışının ve iletişimin hızlı bir şekilde olmasını sağlar.
- Mevcut donanımların kullanımı: İntranet yeni donanım veya yeni bir program gerektirmez bu yüzden bir işletmenin İntranete geçerken büyük yatırımlar yapması gerekmez.
- Maliyet avantajı: Bir işletme farklı birimlerin birleşiminden oluşan bir ağ üzerine kurulu bir e-posta ve bilgi sistemlerine sahipse intranet o işletmeye bilgilerin aktarılması ve kullanılmasında maliyet avantajı sağlar (Yönetim Bilgi Sistemi, 2014).
- Kâğıt kullanımının azaltılması: Bölümler arası doküman alış verişinde intranet sisteminin kullanılması ile kâğıt kullanımı en asgari düzeye düşürülmektedir.
- Bilgi Güvenliği: Kapalı bir sisteme sahip olan intranet dışarıdan gelebilecek tehlikelere karşı daha güvenlidir ve güvenlik standartları daha yüksektir.
- Veri ambarı ve Arşivleme: Doküman arşivleme yapılarak veri ambarı oluşturulur ve herkesin kullanımına sunulabilir. Veri ambarı sayesinde şirket elemanlarının bilgiye erişimlerinin daha hızlı ve yöneticilerin kararlarını daha hızlı almalarına olanak sağlar (Oymacı, 1998).
- Daha az toplantılar dolayısıyla daha az yer değişimi: İşletmede görev yapan üst kademeden alt kademeye kadar kişilerin intranetin sağlamış olduğu imkânlardan yararlanarak yerlerinden kalkmadan toplantılarını, görüşmelerini ve eğitimlerini gerçekleştirebilirler. Böylece şehirlerarası yüz yüze görüşülmesi gereken meseleler bile hiçbir masraf yapılmadan halledilebilir.
- Aram Kolaylığı: İntranet işletmeye ait özel bir ağ olduğu için bilgi tarama kolaylığı ve hızı sağlar.
- Grup halinde çalışma kolaylığı: Aynı projede çalışanların intranette ortak bir alana doküman yerleştirmesi ve bu ortak alandan istenildiği zaman dokümanlara erişebilmesi grup çalışmasını kolaylaştırır.

İntranetin işletmeler için potansiyel dezavantaj olabilecek yönlerini ise şu şekilde ifade edebiliriz;

- Teknolojinin sürekli olarak geliştiği günümüzde yeni teknolojiler ve yazılımlarla uyumsuzluk sorunları olabilir.

- Güvenlik tedbirleri yetersiz olabilir.
- Kullanıcı desteği zayıf olabilir.
- Performans yönetimi yetersiz düzeyde olabilir.
- İçerik koruma zaman alıcı olabilir.
- Bazı çalışanların masalarında bilgisayar olmayabilir.
- İntraneti geliştirmek işletmenin ihtiyaçlarına uyumlu olmayabilir.

Literatürde İntranet Çalışmaları

İş dünyasında intranet kullanımı ile ilgili yapılmış bazı çalışmaları incelemek amacıyla yaygın bilimsel veritabanlarında "business" ve "intranet" anahtar sözcükleri ile taramalar yapılmıştır. Bulunan makalelerden bazıları Tablo 2'de özetlenmiştir.

Tablo 2: İntranet ve İş Dünyası ile ilgili yapılmış çalışmalar

Yazarları ve Yılı	Çalışmanın Konusu
Zhang, Y. (2004)	Bir telekomünikasyon işletmesinde 680 çalışan ile yapılan çalışma iş hayatında internet ve şirket ağı kullanım düzeyini belirlemeyi amaçlamaktadır.
Neill, W. D. ve Richard, J. E. (2012)	Çalışanların İntranet portallarını kabullenme ve kullanma düzeyleri ve tutumları modellenmiştir.
Denton, K. ve Richardson, P. (2006)	Çalışma stratejik amaçların uygulanmasında intranetlerin rolünü araştırmaktadır.
Hussain, Z., Barber, K. ve Hussain, N. (2009)	Proje yönetimi ve kalite standartlarının uygulamasında kolaylaştırıcı olarak bir intranet tabanlı sistem geliştirilmesi amaçlanmıştır.
Flowers, S., Newton, B. ve Paine, C. (1998)	Fakülte intraneti oluşturulması bir vaka çalışması olarak ele alınmıştır.
Singh. M. (2009)	Bu çalışmada işletmeden-çalışana B2E (business to employee) modelinin farklı bir uygulaması büyük bir şirkete uygulanarak vaka çalışması şeklinde ele alınmış.

Ekstranet Ağı

İnternet teknolojisi ve alt yapısının kullanılarak iş dünyasında zamana ve mekâna hükmetmenin en son halkası ve gelinen son nokta ekstranettir (Baltacı, 2013). Ekstranet, bir işletmenin iş ortaklarını, müşterilerini ya da işbirliği yaptığı diğer kuruluşları birbirine bağlayan iş ya da eğitim amaçlı kullanılan bir bilgisayar ağıdır. Başka bir ifade ile işbirliği yapılan işletmelerin kullanımına açık veya diğer şirketlerle işbirliğine olanak tanıyan bir uzatılmış intranet olarak da tanımlanabilir (Sevim ve Öncel, 2002).

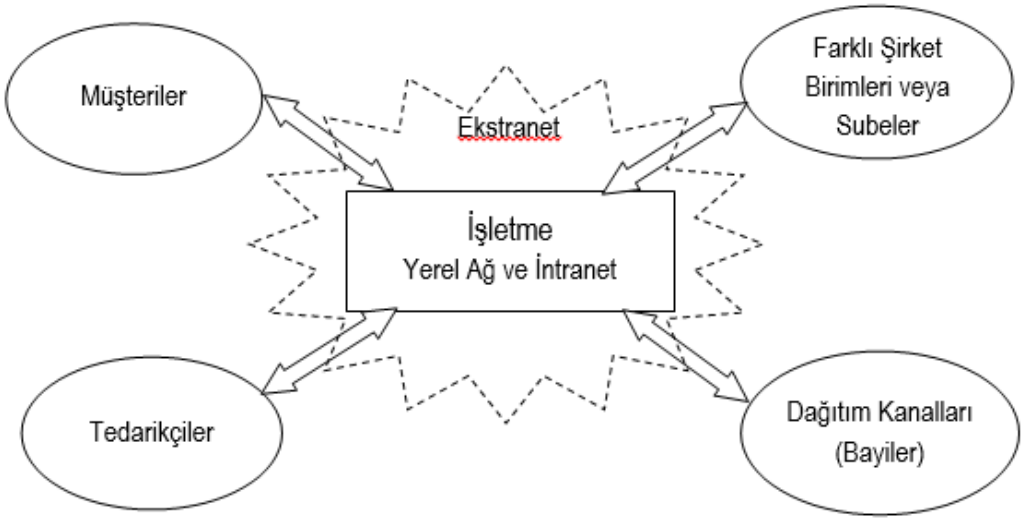
İntranetin teknik alt yapısını ve mantığını kullanan ekstranet, önceden yetkilendirilmiş ve giriş izni verilmiş kişilerin, müşterilerin, bayilerin, alıcıların ve satıcıların girebildiği, gerekli bilgilere ulaşabildiği katılımcı bir sistemdir (Baltacı, 2013). İlk bakışta karmaşık gibi gözüken sistemin, firmanın iş konusuna ve isteklerine göre tasarlanacağı akıldan çıkarılmamalıdır. Dolayısıyla sistemden ne istendiği, neyi nasıl sunulmasının gerektiği, bilgilere kimlerin ulaşabileceği gibi seçeneklerin tamamen firma tarafından belirleneceği sistemde karmaşıklık ve anlaşılmazlığın olması da mümkün değildir. Ekstranette yine zaman ve mekân sınırı olmadan iş akışını hızlandıran, basitleştiren ve en önemlisi iş verimini artıran bir unsur olarak inanılmaz bir hızla dünyada yaygınlaşmaktadır (Baltacı, 2013).

Ekstranetler ilk olarak 1990'ların sonlarında ve 2000'lerin başlarında kullanılmaya başlanmıştır. O tarihlerde işletmeler sadece özel çalışma gruplarını kapsayacak şekilde yetkilendirilmişlere web üzerinden bağlanabilme imkânı sağladılar. Örneğin 2003 yılında İngiltere inşaat işbirliği teknoloji sağlayıcılarını bir araya getiren bir proje başlattı. Projede sektörde önde gelen satıcıların çeşitli teknolojilere teşvik edilmesi ve farklı veri sistemleri arasında veri işbirliğini sağlanması amaçlandı. Proje sonuncunda kurulan ekstranet sistemi ile belirlenen amaçlara ulaşım sağlandı (http://en.wikipedia.org, 2014).

Ekstranet sayesinde şirket ortaklarına ve çalışanlarına yine intranette olduğu gibi, güvenlik, müşteri şikâyet bildirileri ve geri dönüş formu, stok bilgileri, müşteriye özel haberler ve duyurular gibi

bilgiler sunulabilir. Organizasyon intranetlerinin dış ortama açık hale gelmesiyle oluşturulan ekstranetler de güvenlik tedbirleri daha üst seviyelere çekilmelidir. Güvenlik için elektronik duvarların yanı sıra çoğu kez şifreler, kriptografi, elektronik imza gibi güvenlik açısından daha ileri teknolojiler uygulanmaktadır (Yönetim Bilgi Sistemi, 2014). Özellikle ekstranetler de sanal veri odaları imkânı sunarak hukuk, askeriye ve maliye gibi kritik sektörlerde faaliyet gösteren işletme ve kurumların güvenlik yönetimine katkı sağlamaktadır.

Bir intranetin aksine, bir ekstranet yetkili site dışı kullanıcılar için erişilebilir durumdadır; Sadece geçerli bir kullanıcı adı ve parolası olanlar ekstraneti kullanabilmektedirler. Ekstraneti kullananlar arasından bazı kullanıcılara belirli noktaların erişimi kısıtlandırılabilir. Örneğin, satış temsilcilerinizin satış yaptığı bir alıcı, yalnızca kendi şirketlerinin hesap bilgilerine erişilebilir; alanda çalışan bir satış temsilcisi kendi hesabının tamamı için erişime sahip olabilir ve e-posta denetimi için evden bağlanan bir sekreter muhtemelen hiçbir finansal bilgi için erişime sahip olmayacaktır.



Şekil 2: Ekstranet yapısı

Ekstranetin işletmeler için sağladığı avantajlar

Ekstranet ağları işletmeler için stratejik ve operasyonel düzeyde birçok fayda sağlamaktadır. Bunlar aşağıdaki şekilde sıralanabilir:

- İşletme çalışanları, tedarikçi firmaları ve stratejik ortakları arasındaki bilgi paylaşımını kolaylaştırır.
- İşletmenin müşterilerle daha iyi ilişkiler kurmasına ve yeni hizmetler sunmasına olanak sağlar.
- Eğitim programlarının işletme içinde uygulanmasını ve iş ortakları ile ortaklaşa proje geliştirme imkânını sağlar (Ayvazoğlu, 2013).
- Bilgiye erişimin sınırlandırmasını sağlar.
- İşlem maliyetleri düşürerek zaman ve kaynak tasarrufu sağlar.
- İşletmenin rekabet gücünü arttırır.
- Her yerden erişim imkânı sağlar.
- Operasyonel maliyetleri en aza indirir.
- Zaman ve kaynak tasarrufu sağlar.
- İşletmelerin tedarikçileri ve ortakları arasındaki ilişkileri geliştirir.
- Genel olarak işten işe (business-to-business relationships) ilişkileri geliştirir.

Literatürde Ekstranet Çalışmaları

Şirketlerin ekstranet kullanımları ile ilgili daha önce yapılmış çalışmalar incelenmiş olup bazıları Tablo 3'te örnek olarak sunulmuştur.

Tablo 3: Ekstranet ve İş Dünyası ile ilgili yapılmış çalışmalar

Yazarları ve Yılı	Çalışmanın Konusu
Spralls, S. A., Hunt, S. D. ve Wilcox, J. B. (2011)	Çalışma ekstranet yeteneklerinin organizasyonel yeterlilikleri ne ölçüde etkilediğini belirlemeyi amaçlamaktadır.
Buhalis, D. (2004)	Havayolu şirketlerinde bilişim teknolojilerin ve ekstranetin işletmeden-işletmeye B2B ilişkileri desteklemesi yoluyla stratejik ve taktik kullanımı aktarılmıştır.
Dubas, K. M. ve Brennan, I. (2002)	Bu çalışma webcasting ve ekstranet sistemlerinin pazarlama süreçlerine etkilerini incelemektedir.
Vlosky, R. P., Fontenot, R. ve Blalock, L. (2000)	Ekstranetlerin bir işletmenin iş uygulamalarına ve B2B yoluyla personeli, müşterileri, tedarikçileri ve stratejik partnerleri ile ilişkilerini nasıl geliştireceği incelenmiştir.
Angeles, R. (2001)	Çalışma bir ekstranet uygulaması için rehberlik edebilecek bir kavramsal çerçeve çıkarmayı hedeflemektedir.
Laukkanen, S., Sarpola, S. ve Kemppainen, K. (2007)	Bu çalışma ekstranet portallarının sistemden-sisteme S2S yapısını kullanarak müşteriler ve tedarikçiler için sunduğu çözümleri incelemektedir.

Sonuç

İnterneti kullanarak istediğimiz bilgiye anında ulaşabilme imkânına sahip olduğumuz bugünlerde bilgiye ulaşma hızı noktasında sıkıntı yaşanmamaktadır. Fakat ulaşılan bilginin güvenirliği ve ulaştırılan bilginin güvenliği akıldan çıkarılmamalıdır. Intranet ve Ekstranet sistemleri bize bu güvenliği ve güvenirliği sağlamaktadır.

Küçük, orta ve büyük ölçekli işletmelerde teknoloji kullanımı farklı seviyelerdedir. Küçük işletmelerde bir kaç bilgisayar ve basit programlar gibi temel seviyede bilgi teknolojileri kullanılırken büyük işletmelerde, yüzlerce veya binlerce bilgisayardan oluşan ve bunları birbirine bağlayan Intranet ve Ekstranet gibi daha karmaşık sistemler kullanılmaktadır. Intranet ve ekstranet sayesinde işletmeler, bilgi ve kültür paylaşım hızını artırmakta, riske karşı olan direnci kuvvetlendirmekte ve ölçek ekonomisi ile pazar payı kapma konusunda daha güçlü konuma gelmektedirler (Europan Project, 2014).

İntranet ve Ekstranet kavramları farklı teknolojiler gibi gözükseler de aslında internet altyapısını kullanan özelleştirilmiş ağ sistemleridir. Bir işletmenin faaliyet gösterdiği sektör ve büyüklüğe göre İnternet, intranet ve ekstranet sistemlerinden birini veya birden fazlasını kullanabilmelidir. Çünkü bu sistemler rekabet ortamında işletmenin hızını arttıracak, bilgi akışını hızlandıracak ve hayatını devam ettirebilmesine katkı sağlayacaktır.

İnternet, intranet ve ekstranet sistemleri birtakım özellikler bakımından benzerlikler göstermekte ve farklılaşmaktadırlar. Bu sistemlerin aralarındaki benzerlikler ve farklılıklar özetle Tablo 4'de gösterilmiştir.

Tablo 4: İnternet, intranet ve ekstranet sistemlerinin özellikleri

	Erişim	Kullanıcılar	Bilgi Türü
İnternet	Açık	Tüm kullanıcılar	Genel
İntranet	Özel	İşletme kullanıcıları	İşletmeye Özel
Ekstranet	Anlaşma	İşletme kullanıcıları, iş ortakları ve tedarikçiler	Seçilmiş Bilgi

Sonuç olarak bir değerlendirme yapıldığında işletmelerin intranet ve ekstranet sistemlerini kullanmaları işletmelerin bilgi ve birikimlerinin paylaşılması noktasında önemlidir ve gereksinimler doğru tespit edilerek doğru teknolojiler ile yapılandırılmış bu sistemler mutlaka kullanılmalıdır.

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İŞLETMELERDE ÖNYARGI VE AYRIMCILIĞIN ÇALIŞMA HAYATI ÜZERİNDEKİ ETKİLERİ

Dr.Gökhan Ofluoğlu

Bülent Ecevit Üniversitesi, İktisadi ve İdari Bilimler Fakültesi, Çalışma Ekonomisi ve Endüstri İlişkileri Bölümü,Zonguldak, Türkiye
gofluoglu@yahoo.com

Merve Zeynep Kimsesiz

Bülent Ecevit Üniversitesi, İktisadi ve İdari Bilimler Fakültesi, Çalışma Ekonomisi ve Endüstri İlişkileri Bölümü,Zonguldak, Türkiye
mervezeynepkimsesiz@gmail.com

ÖZET: Önyargılar, gündelik hayatımızda ve ilişkilerimizde olduğu gibi sosyo-politik dinamiklerde de sık sık karşımıza çıkan ve çeşitli ayrımcılıklara neden olabilen tutumlardır. Başka bir tanımıyla; bir insan grubuna karşı temelsiz bir inanç ya da fikir olarak tanımlanabilecek bir kalıpyargı ve buna eşlik eden güçlü duygulanımlardır. Önyargının bilişsel bir parçası olan kalıpyargı, insan gruplarına dair genelgeçer, şablonvari inançları içerir. Bir kalıpyargıya güçlü bir duygulanım da eşlik ederse, bir tutum olarak önyargı oluşmuş olur. Tutumlar sonucu meydana gelen önyargı, bir tek ya da bir grup bireyin öncelikle grup üyeliği kapsamında değerlendirilmesi ile oluşur. Ön yargılar, duygusal temellere ve bunun sonucu olarak da peşin hükme dayalıdır. Sosyologlar ve antropologlar, önyargı ve dışlama nedenleri olarak sosyokültürel faktörlere vurgu yapmaktadırlar. Bu sosyokültürel faktörler arasında: - Şehirleşme, makinalaşma ve karmaşanın artma fenomeni - Belli grupların yukarı doğru yükselme hareketliliği -Yetenek ve eğitime fazlaca vurgu, iş (meslek) yetersizliği ve "öteki" ile rekabet -Zaten sınırlı olan kullanılabilir alan üzerinde nüfus artışı ve yeterli konut olmayışı - Birçok insanın geçim standardındaki yetersizliğin başkalarına (diğer insanlara, organizasyonlara, kitle iletişim araçlarına...) bel bağlamaya neden olması ve davranışların uydumcu tiple sonuçlanması ve de - Ahlakî değişmelerle birlikte ailenin rolü ve fonksiyonunun değişmesi ve bir de medya sayılabilir Önyargıların ve kalıp düşüncelerin davranış olarak sonucu ayrımcılıktır. Ayrımcılık, herhangi bir kişinin önyargılı olduğu bir kişi ya da gruba karşı olumsuz davranmasıdır. Allport'a göre ayrımcı davranışlar şöyle sıralanabilir: Karşı Olmayı İfade Etme: Önyargı sahibi insanlar kendisi gibi önyargılı olan insanlarla konuşur ve düşmanca duygularını ifade ederler. Uzak Durma: Eğer önyargı daha yoğun ise, birey hoşlanmadığı ya da önyargılı olduğu kişi ve gruplarla birarada olmaktan kaçınır. Ayrımcılık: Kişi önyargılı olduğu grupların iş, konut, eğitim ve sağlık gibi hizmetlerden yararlanmasına ve politik haklarını kullanmasına karşıdır. Fiziksel Saldırı: Önyargılı olunan gruba karşı şiddet yada şiddet sayılabilecek bazı saldırılar yapılır. Yok Etme: Linç etme olayları buna örnek olarak verilebilir. Kalıp düşünce ve önyargılar, kategorik düşüncenin ve şemaların sonucu olarak ortaya çıktığı için tamamen ortadan kalkması mümkün değildir. Bu nedenle mantık, önyargıları azaltmada başarısız olur. Ancak etkisini en aza indirmek toplumsal gerginliği azaltılması insanların etkin bir iletişim sürecine girmesini, birbirlerini tanımasını ve toplumsal hoşgörüyü sağlayabilir. Çalışma hayatında gruplaşmalar, bireyler hakkındaki peşin önyargı ve ayrımcı davranışlar, çalışma hayatının verimliliğini önemli ölçüde düşürmekte ve çalışanlarda kişinin işinde iken kendinde olmaması, kendinde iken işinde olmaması durumu olan yabancılaşma duygusunu uyandırmakta ve çalışma hayatını erken

terketme durumlarına neden olabilmektedir. Bilgi toplumuna geçtiğimiz çağımızda güncel psiko-sosyal risklerin çalışma hayatında arttığı görülmektedir. Teknolojinin yoğunlaşması, çalışma sürelerinin artması, iş ve özel yaşam dengesinin bozulması, mesleki tükenmişlik gibi sorunların yanısıra pozitif ayrımcılık ve önyargılar çalışma hayatının verimliliğine ve kalitesine olumsuz tesir etmektedir. Çalışanların beklentilerine uygun bir çalışma hayatında görev alması anlamına gelen yaşam kalitesi düzeyinin yükseltilmesi, insan onuru, şeref ve haysiyetine yakışır, dengeli bir çevrede yaşama ve çalışma olanaklarına sahip kılınmaları için çalışma hayatının önyargılardan ve ayrımcılıktan uzak tutulması gerekmektedir.

Anahtar Kelimeler: Ön yargı, ayrımcılık, çalışma psikolojisi, yönetim

Giriş

Ayrımcılık kavramının kalıpyargılar ve önyargı kavramlarıyla birebir ilişkide olduğunu görmekteyiz. Çünkü ayrımcılık; önyargı ve kalıpyargıların davranışsal bir sonucudur. Kalıpyargı değişmesi neredeyse imkansız, kalıplaşmış ve kemikleşmiş yargı türüdür. Bu kavram burnunun dikine gitmeye ve at gözlüğüyle bakmaya sebeptir. Yaşantımız boyunca karşılaştığımız pek çok insana ait imgelerle ya da diğer bir ifadeyle; kalıpyargılar ile dolaşıyoruz. Bu kalıpyargılar; bir sosyal grubun üyeleri hakkında yaygın bir biçimde paylaşılan genellemelerdir (Hogg ve Vaughan, 1995).

Kalıpyargıları biraz daha detaylandıracak olursak: (Hogg ve Vaughan, 1995):

- İnsanlar çok geniş insan gruplarını birkaç kaba özellikle nitelemeye hazırdırlar.
- Kalıpyargılar çok yavaş değişmektedir.
- Kalıpyargılarda meydana gelen değişiklikler, genellikle sosyal, politik ve ekonomik değişikliklere bir tepki sonucu ortaya çıkmaktadır.
- Kalıpyargılar çok küçük yaşta edinilmekte ve sıklıkla çocuk, grup hakkında hiçbir şey bilmeden önce, onun hakkındaki kalıpyargıları öğrenmektedir.
- Gruplar arasında sosyal gerilim ya da çatışmalar ortaya çıktığı zaman, kalıpyargılar daha fazla dile getirilmeye başlanmakta ve daha düşmanca bir nitelik kazanmaktadır. Bundan sonra kalıpyargıların değiştirmek daha zor olmaktadır.
- Kalıpyargılar yanlış ya da kesin olmayan (şüpheli) imgeler değildirler, onları belirli bir bağlamdaki gruplar arası ilişkileri anlamlandırmaya hizmet eden araçlar olarak görmek daha doğrudur.

Bir sosyal grup hakkındaki kalıpyargılar, bize o grup hakkında kestirme yoldan bir fikir, bir bilgi verir. Bu, çoğu zaman o grubun üyesi ile karşılaştığımızda onun davranışı hakkındaki beklentimizi ve ona karşı davranışımızı önceden ayarlamamızı sağlar (Kağıtçıbaşı, 1999). Bunlar sosyal kalıpyargılara sahip olmanın getirdiği avantajlardır. Ne var ki çevremizi anlamamızı ve ona hâkim olmamızı sağlayan aynı kalıpyargılar, önyargıları beslemeye de hizmet etmektedirler. Sosyal kalıpyargılar genellikle mantıksız ve haksız nitelemeler olarak görülmektedirler. Çünkü grubun her bir üyesi için geçerli olsun ya da olmasın, olumsuz özellikler, grubun tamamına aşırı bir şekilde genellenmektedir.

Önyargılar ve Toplumsal Hayattaki Etkileri

Önyargılar, gündelik hayatımızda ve ilişkilerimizde olduğu gibi sosyo-politik dinamiklerde de sık sık karşımıza çıkan ve çeşitli ayrımcılıklara neden olabilen tutumlardır (Peker, 2011). Başka bir tanımıyla; bir insan grubuna karşı temelsiz bir inanç ya da fikir olarak tanımlanabilecek bir kalıpyargı ve buna eşlik eden güçlü duygulanımlardır (Quillian, 2006). Önyargının bilişsel bir parçası olan kalıpyargı, insan gruplarına dair genel geçer, şablonvari inançları içerir. Bir kalıpyargıya güçlü bir duygulanım da eşlik ederse, bir tutum olarak önyargı oluşmuş olur. Tutumlar sonucu meydana gelen önyargı, bir tek ya da bir grup bireyin öncelikle grup üyeliği kapsamında değerlendirilmesi ile oluşur(Taylor, Peplau&Sears, 2007). Önyargılar duygusal temellere ve bunun sonucu olarak da peşin hükme dayalıdır. Yeni tanışılan insanlar, bireysel özellikler temelinde değil de grup üyelikleri, gruba uyumları temel alınarak değerlendirilir (Taylor, Peplau&Sears, 2007).

İster bireysel isterse de toplumsal olarak hakkında fikir sahibi olmadığımız, bize yabancı olan, bizi ürküten ve bizlere rahatsızlık veren şeylerle karşılaştığımızda, o şeyi kendimizden uzaklaştırma, damgalama, yabancılaştırma ve onun hakkında olumsuz düşünme eğiliminde bulunuruz. Alışık olmadığımız, ortak paydada buluşmadığımız, bize farklı gelen şeyler hakkında olumsuz tutumlar

sergileriz. Tutumlarımız yaşantımızdan ve kültürden gelen deneyimlerimizden etkilendiği gibi felsefe ve inançlardan da etkilenmektedir. Tutumlarla ilişkili kavramlardan olan önyargılar da bu süreç içinde oluşmaya başlar (Aker ve ark., 2002). Günlük yaşama bakıldığında, yukarıda örneklerini verdiğimiz gruplar ve kişilerden mutlaka bir veya bir kaçı hakkında ön yargılarımız olduğunu söyleyebiliriz.

Önyargıda muhakeme etmeden, üzerinde akıl yürütmeden bir konum alış söz konusudur. Önyargı akıl öncesidir, rasyonel bir teste tabi tutmadan yaptığımız bir tercihtir ve rasyonel terimlerdeki motiflere yoramayacağımız sezgiler ve içgüdüler ile belirlenir(Lindbom, 1997).

Her tür usavurumsal işlemden önce gelen önyargılar üç değişik biçimde kendini gösterir:

- Gelişigüzel bir gelişmenin ve büyümenin sonucu olarak ortaya çıkabilir (bu akılcılık normuyla başlayabilir).
- Bazen tecrit, dışlama ve hakların inkârına götürebilir (bu da adalet normundan hareket eder).
- Ve sonuçta önyargı küçük görmeye, reddetmeye götürür; bu da insan hissiyatının bir biçimidir (aktaran:Gürses, 2005).

Önyargı nedeni sayılabilen ferdî motifler hakkındaki anlayışların çoğu, direkt veya dolaylı olarak Freudyen teorilerden etkilenmiştir. Freud'un önyargı ile ilgili iki temel görüşü vardır: Dışgrup(outgroup) düşmanlığın kaçınılmazlığı ve önyargının grubu bir arada tutma işlevi. Örneğin bir keresinde O şöyle yazmıştı: "Önyargının, bir kısım insanların saldırganlık göstermelerini istiab etmesi kadar, önemli sayıda insanı da sevgide birbirine bağlaması her zaman mümkündür". Tabii ki bu görüş, Sosyal Darwinizm'in görüşlerine oldukça uygun düşmektedir (Gürses, 2005).

İnsana ait ürünü her durumu insan psikolojisine ve insan kişiliğine bağlayan psikanalitik yaklaşıma göre önyargı psikodinamik bir süreçtir. Psikanalistlere göre önyargılar ve kalıpyargı (stereotype)lar insanın doğal bir eğilimiyle ilişkilidir. Bu yaklaşım sahipleri, ilk çocukluk yıllarında yaşanan engellenmelerin duygusal gerilimler yarattığını ve ileriki yıllarda içinde bulunulan durum tarafından haklılaştırılmayan birtakım saldırganlık ve düşmanca duygular duyulduğunda, bunların yansıtma mekanizması (projection) vasıtasıyla başkalarına yüklendiği şeklinde bir model geliştirmişlerdir(Bilgin, 1994; Bilgin, 1996). Aslında kişinin önyargılı tutumu, kendinin de farkında olmadığı bir gereksinmeyi karşılamaktadır. Bu gereksinme, yıpranmış olan egosunu tamir etmek ve yükseltmektir (Kağıtçıbaşı, 1991).

Freud'un kişilik teorisinin çok yoğun tesirinde kalmış olan Otoriteryen Kişilik yazarları Adorno ve arkadaşlarına göre de önyargı bilinçaltı ihtiyaçların, çatışmaların ve savunma mekanizmalarının bir ifadesidir(aktaran: Gürses, 2005). Onlar, önyargı ve stereotipleri kişiliğin bir boyutu olarak değerlendirmişlerdir. Bu perspektif, ana-babanın çocuklar üzerindeki etkilerinden yola çıkmaktadır. Bu görüşe göre önyargı, olumsuz erken çocukluk çağı tecrübeleri ve engellenme sonucu beliren saldırganlık duygusunun yön değiştirerek dışgruplara yöneltilmesidir. Onlara göre, önyargılı kişiler, diğer insanlarla onların kişisel niteliklerinden ziyade, onların sosyal rollerini ve etnik grubunu betimleyen hazır klişelerle bakarlar. Farklı insanlar, milliyetler ve etnik gruplar hakkında katı ve kapalı kanaatleri vardır. Diğer gruplardan katı bir şekilde söz ederler. Çocuklukta ana-babalarına hissettikleri çift yönlü duygularını ifade edememeleri nedeniyle zihinlerinde bir klikleşme oluşur; bu duygular iyi ve kötü diye ikiye ayrılır. Olumlu yanlar ana babaya bağlı kalır, olumsuz ve düşmanca duygular ise başka hedeflere, örneğin azınlıklara veya sosyal normlardan sapanlara yöneltilir. Sonuçta ana-baba figürleri tüm erdemlerin somut sembolü olurken, diğerleri kötülüklerin sembolü olmaktadır. Bu anlayış önyargılı ayırımı kişilik psikodinamiğine dayayarak açıklamaktadır. Kişinin güdülerinin doyumu engelleniyorsa ortaya çıkan sıkıntı saldırganlığa dönüşecek, bu saldırganlığın doğrudan ifadesi toplumca hoşgörülmediğinden, yön değiştirerek toplumun horgördüğü azınlık gruplarına ya da dışgruplara karşı ayırımcı önyargı şeklinde ifade edilecektir(Kağıtçıbaşı, 1991; Bilgin, 1994).

Yapılan değerlendirmelerden hareketle önyargı hakkındaki psikodinamik teorileri iki grubta toplamak mümkündür. Bunlardan birincisi, önyargıyı insanî durumlarda aramaktadır; çünkü, engellenme insan hayatında kaçınılmazdır. Engellenme ve mahrumiyet, kontrol edilemeyen ve muhtemel olarak etnik azınlıklara boşaltılan düşmanlık içtepilerine kılavuzluk eder. Engellenme sonucunda, saldırılabilir bir hedef bulunamadığında engellenmeden doğan sonuçlara karşılık asıl hedef yerine başka hedeflere, "şamar oğlanı" (veya günah keçisi-scapegoating) hedefine saldırılır. Zencileri linç etme, sinegogları yakma ve azınlık gruplarının temsilcilerine saldırma böyle davranışların örnekleri olmuştur (Gürses, 2005).

Psikodinamik teorilerden ikincisi, önyargının ancak zayıf bir karakter veya kusurlu bir kişilik yapılanmasına sahip bir insanda gelişeceği noktasına odaklanmıştır. Bu perspektif, önyargıyı normal bir durum olarak kabul etmez; önyargı nevrotik insanların güvensizliği ve şiddetli anksiyetenin bir sonucu olarak ortaya çıkmaktadır(Aktaran: Gürses, 2005).

Pettigrew, psikodinamik yaklaşımların her birini, bir haricileşme süreci olarak tanımlamaktadır. İnsanlar harici olayları kendi kişisel algılarına göre yorumlamaktadır. Örneğin titizlik takıntısı olan bir

kişi, insanları dağınık ve düzensiz olarak görebilir. Böyle bir durumda kişi kendi psikolojik "takıntıları"nı yansıtmaktadır. Bu teoriye göre, eğer önyargıyı değiştirmek istiyorsak, direkt olarak önyargılı kişinin üzerinde odaklanmak gerekmektedir. Fakat yine de bazı önyargılı insanların durumunu açıklamada, psikodinamik yorumlar uygun düşmeyebilir. Bu açıdan, psikodinamik yaklaşım, sosyal yapının her yerine sinmiş olan önyargı ve diskriminasyonu izah etmede tek başına yeterli değildir(aktaran: Gürses, 2005).

Önyargıyı yalnızca psikolojik acıdan ele alış, kişi düzeyinde durumu açıklasa bile, toplum düzeyinde bazı sorulara cevap verememektedir. Bu nedenle önyargıyı sadece psikolojik açıdan incelersek, psikolojik indirgeme yapmış oluruz. Oysa sosyal-psikolojik ele alış, gözleme dayanan sosyal olgu düzeyinden başlayıp kişilik düzeyinden geçerek gene sosyal düzeye geçmektedir (Kağıtçıbaşı, 1991;Şerif ve Şerif, 1996). Bu açıdan önyargıyı incelerken tarihsel, sosyo-kültürel nedenleri gözönünde bulundurmak gerekmektedir. Çünkü insan davranışları içinde oluştuğu bağlam (context)dan bağımsız incelenmezler. Az önce de ifade ettiğimiz gibi, önyargıyı uyaran koşullar hakkında bilgiye sahip olmaksızın tek tek bireyler düzeyinde analiz yapmak, sadece kişilik özelliklerinin bir betimlemesi olmaktan öteye gidemez (Şerif ve Şerif, 1996). Peki, öyleyse önyargıyı uyaran faktörler nelerdir? Deaux ve arkadaşları, önyargı nedenlerini şu başlıklar altında sıralamaktadırlar: Tarihsel, ekonomik, durumsal (fenomenal), kişiliksel ve sosyokültürel nedenler (Aktaran: Gürses, 2005)

Önyargı psiko-sosyal nedenlerin yanısıra, pratikte sağladığı sosyo-ekonomik avantajlar açısından da değerlendirilmiştir. Klineberg, önyargıların pratik bir amaca yönelik olabileceğini ve bazılarının bundan yarar sağladığını, çeşitli örnekler vererek ustalıkla ortaya koymuştur. Kölelik ve sömürgecilik dönemlerinde önyargıların ekonomik yararları açıktır; bu sayede beyazlar istedikleri her şeyi ele geçirmişlerdir. Nazi Almanyası'nda Yahudilerin işgal ettiği meykiler, seçimler öncesinde partizanlara vadedilmiş ve bu az çok yerine getirilmiştir. Fakat, yine de önyargılı kişiler genelde ekonomik motivasyonları gizleyerek daha soylu nedenler gösterirler (Bilgin, 1996). Herder ise, "önyargı zamanında iyidir" der. Çünkü insanı mutlu kılar. Halkları kendi merkezine getirir ve onları köklerine sağlam bir şekilde bağlar. Allport'a göre de önyargı özellikle de dış güdümlü dindarlar için pratikte yararlar sağlayan bir oluşumdur. Freud açısından da önyargı önemli sayıda insanı sevgide birleştirme kapasitesine sahiptir. Önyargı, bize verilmiş olan hayatı korumaya yönelik iş görür. Bireylerin ve sosyal hayatın savunma mekanizmalarından biridir. Bireyin, grubun ve cemaatin varlığını sürdürmesini sağlayarak bozulma ve dağılmaya karşı mukavemet eder (Bilgin, 1996; Bilgin, 1994; aktaran: Gürses, 2005; Lindbom, 1997).

Prothro'nun bir "Amerikan açmazı" olarak değerlendirdiği önyargılar, aileden, öğretmenlerden ve arkadaşlardan edinilmiş tutumlardır (aktaran: Gürses, 2005). Bu nedenle önyargıları sadece insanın doğal eğilimine bağlamak yerine öğrenme sürecinin bir parçası olarak da görmek gerekmektedir. Önyargılar, bizim deneyim yoluyla elde ettiğimiz tüm değer sistemlerine veya tutumlara uygulanan açıklayıcı ilkelere tabidir. Kaldı ki önyargının gerçeklik üzerinde yaptığı çarpıtmalar ilk çocukluk yıllarında görülmez, sonradan belirir. Eğer sosyal hiyerarşinin dayattığı engeller yoksa, fiziksel görünüş bakımından farklı insanlar arasında derin dostluklar kurulabilir (Bilgin, 1994; Bilgin, 1996).

Sosyal öğrenme yoluyla edinilen önyargılar çok küçük yaşlarda aile içinde öğrenilmeye başlar. Çocuk, sen kimsin diye sorulduğunda etnik veya dinî grup üyeliğine göre cevap verebilir. Bunun yanında bazı grup etiketlerini öğrenmiştir; bu grup etiketleri küçümseyici sıfatlar içeriyorsa, çocuk bu kelimelerin yalnızca öfkeli olunduğunda ya da kötü söz söylenirken kullanıldığını bilir. Çocuk biraz büyüyüp okula gitmeye başlayınca, içinde yetiştiği mahalle, kasaba onu etkilemeye devam eder. Çocuğun çevresinde söylenilen sözler, yapılan davranışlar, yargılamalar, dedikodular, uydurulan lakaplar çocukların zihinlerinde izlerini bırakırlar ve onların da ana-babaları veya komşuları gibi aynı önyargıları benimsemelerine yol açar. Böylece çocuk kesin özdeşleşmeler kurarak hayatta bazı "yerleri"nin olduğunun farkına varmaya başlar. Gelişen egosu, "ben neyim"in yanı sıra "ben ne değilim" den oluşur. Kendi tarafındakilere ve başkalarına "nasıl davranırım" üzerinde kavramlar geliştirir. Akran grupların etiketlerini kullanır. Liseye vardıklarında ise çocukların kalıpyargıları neredeyse erişkin topluluğunun kalıpyargılarının düzeyine yaklaşır. Bu esnada kalıpyargıların oluşmasında ana-babanın ve akranların rolü unutulur ve bunun eskiden de böyle olduğu düşünülür (Cüceloğlu, 1996; Şerif ve Şerif, 1996). Yetişkinlik çağında ise o, artık daha geniş bir sosyokültürel yapının neden olduğu önyargılara sahip biridir.

Sosyologlar ve antropologlar, önyargı ve dışlama nedenleri olarak sosyokültürel faktörlere vurgu yapmaktadırlar. Bu sosyokültürel faktörler arasında:

- Şehirleşme, makinalaşma ve karmaşanın artma fenomeni
- Belli grupların yukarı doğru yükselme hareketliliği
- Yetenek ve eğitime fazlaca vurgu, iş (meslek) yetersizliği ve "öteki" ile rekabet
- Zaten sınırlı olan kullanılabilir alan üzerinde nüfus artışı ve yeterli konut olmayışı

- Birçok insanın geçim standardındaki yetersizliğin başkalarına (diğer insanlara, organizasyonlara, kitle iletişim araçlarına...) bel bağlamaya neden olması ve davranışların uydumcu tiple sonuçlanması ve de
- Ahlakî değişmelerle birlikte ailenin rolü ve fonksiyonunun değişmesi ve bir de medya sayılabilir (aktaran: Gürses, 2005).

Thomas Pettigrew önyargıda kişiliğin ve kültürel olarak öğrenilmiş tutumların her ikisinin de rolünü test etmiş ve bunun kültür- den kaynaklandığı sonucuna varmıştır (aktaran: Gürses, 2005) . O, önyargıyı kişilik dışı süreçlerle açıklarken bu süreçleri şöyle tasnif etmiştir:

a. Sosyal uyum (conformity): Kişi önyargılı tutumunu, değer verdiği ve aynı tutuma sahip kişilerle iyi ilişkilerini sürdürmek için kullanabilir.

b.Nesne değerlendirmesi (objectapprassial)(Kağıtçıbaşı, 1973).

Buraya kadar ifade ettiklerimizden de anlaşılacağı üzere önyargıyı anlamada psikolojik ve sosyal faktörlerin ikisinin de önemli olduğu görülecektir. Açıkçası, önyargı gibi sosyal bir durumu yalnızca ferdi kişiliğin bir sonucu olarak anlamak mümkün değildir. Öncelikle, sosyal ve kültürel etkiler çok daha güçlüdür. Diğer taraftan da bu alışkanlıkları gerçekleştirenler fertlerdir (aktaran: Gürses, 2005). Bu açıdan önyargıyı incelerken, bir tarafta psikolojik diğer tarafta da sosyal indirgemecilikten kaçınmak için önyargı fenomenini durumsal, kişiliksel ve sosyokültürel faktörlerin karşılıklı ilişkisi açısından ele almak daha doğru görünmektedir. Böylece önyargının, psikodinamik, tarihsel, ekonomik, durumsal, sosyal öğrenme, kitle iletişim ve kültürün oluşturduğu faktörler yumağının ortak etkimesi sonucu oluştuğu görülmektedir. Goldstein'ın dediği gibi, önyargılar daha çok, belki de en önemli olarak durumsal, tarihsel ve kültürel düzeyde ortaya çıkmaktadır. Eğer bu argümanlar doğruysa, ne zaman ki büyük ölçüde sosyalpolitik-tarihsel-ekonomik bağlam (context) değişir, o zaman önyargı ve ayrımcılık (discrimination) da değişecektir(aktaran: Gürses, 2005).

Kalıp Düşünce ve Önyargıların Çalışma Hayatındaki Davranışlar Üzerindeki Etkileri

Kalıp düşünceler ve önyargılar bilişsel ve duygusal süreçler de olsalar algı, yargı ve davranışları etkilediği için çalışma hayatında da önemli sonuçlara neden olmaktadır. İnsanların kategorik düşünmelerinin sonucu olduğu için değişime karşı oldukça dirençlidirler. Herhangi bir kişiyle ilgili edinilen bilgi, o kişinin ait olduğu toplumsal gruba ilişkin kalıp düşüncelerle uyumlu veya uyumsuz olabilir Bu durumda genellikle kalıp düşünceyle uyumlu bilgi hatırlanıp uyumsuz olan hatırlanmayacaktır. Yapılan çeşitli araştırmalar, insanların bazı durumlarda kalıp düşünceye uygun bilgileri anımsamakla kalmayıp edinecekleri yeni bilgilerin de kalıp düşüncelerden kaynaklanan beklentileri doğrular biçimde olmasını seçtiklerini göstermiştir (Hortaçsu, 1998).

Kalıp düşüncelerin içerikleriyle çelişen bilgilere rağmen çalışma hayatında da varlıklarını sürdürmesi söz konusudur. Bir kişinin üyesi olduğu gruba ilişkin kalıp düşünceyle çelişen davranışları olduğu zaman, onun kalıp düşünceye uygun davranması beklenir. Eğer grup üyesinin davranışı, grup hakkında geliştirilen kalıp düşünceyle aşırı derece çelişiyorsa o zaman da gruptan başka birinin kalıp düşünceye uygun davranması beklenir (Hortaçsu, 1998). Kalıp düşünceler ve önyargılar genellemelere dayalı olduğu için grup üyeleri bireyselliklerini kaybederler. Bu durumda kişinin davranışlarını yorumlanmasında üyesi olduğu grup için kullanılan önyargı ve kalıp düşüncelerin etkisi olacaktır.

Önyargıların ve kalıp düşüncelerin davranış olarak sonucu ayrımcılıktır. Ayrımcılık, herhangi bir kişinin önyargılı olduğu bir kişi ya da gruba karşı olumsuz davranmasıdır. Allport'a göre ayrımcı davranışlar şöyle sıralanabilir:

Karşı Olmayı İfade Etme: Önyargı sahibi insanlar kendisi gibi önyargılı olan insanlarla konuşur ve düşmanca duygularını ifade ederler.

Uzak Durma: Eğer önyargı daha yoğun ise, birey hoşlanmadığı ya da önyargılı olduğu kişi ve gruplarla birarada olmaktan kaçınır.

Ayrımcılık: Kişi önyargılı olduğu grupların iş, konut, eğitim ve sağlık gibi hizmetlerden yararlanmasına ve politik haklarını kullanmasına karşıdır.

Fiziksel Saldırı: Önyargılı olunan gruba karşı şiddet yada şiddet sayılabilecek bazı saldırılar yapılır.

Yok Etme: Linç etme olayları buna örnek olarak verilebilir (aktaran: Coşgun, 2004).

Kalıp Düşüncelerin ve Önyargıların Etkilerinin Azaltılması

Kalıp düşünce ve önyargılar, kategorik düşüncenin ve şemaların sonucu olarak ortaya çıktığı için tamamen ortadan kalkması mümkün değildir. Bu nedenle mantık, önyargıları azaltmada başarısız olur. Ancak etkisini en aza indirmek toplumsal gerginliği azaltılması insanların etkin bir iletişim sürecine girmesini, birbirlerini tanımasını ve toplumsal hoşgörüyü sağlayabilir (Coşgun, 2004).

Kalıp düşüncelerin değişmesini sağlayacak üç model vardır. Bunlardan biri defter tutma modelidir. Bu modele göre kalıp düşünceyle çelişen bilgiler birikerek kalıp düşünceyi yavaş yavaş değiştirir. İkinci model, kalıp düşünceyle çelişen önemli ve çarpıcı bir örneğin kalıp düşünceyi değiştireceğinin ifade edildiği değişme modelidir. Alt kategori oluşturma modeli, kalıp düşüncelerin nasıl değişeceğini açıklayan üçüncü modeldir ve kalıp düşünceyle çelişen bilgilerin alt kategoriler oluşturacağını ve kalıp düşüncenin değişebileceğini ifade eder (Hortaçsu, 1998). Kalıp düşünceyle çelişen bir bilgi, bireyin düşünceleri hakkında şüpheye düşmesine neden olur. Böylece tutum ve düşünceleri hakkında şüpheye düşen birey yeni bilgileri değerlendirmeye alarak tutumlarını değiştirebilir (Oktay, 2000).

Kalıp düşüncelerin değişmesinde etkili olacak faktörlerden biri de gruplar arası temastır. Temas hipotezi, hasım grupların birbirleri hakkında gerçekçi olmayan bir şekilde olumsuz beklentiler oluşturdukları ve birbirleriyle temastan kaçındıkları; eğer birbirleriyle temas kurarlarsa aralarındaki ilişkinin iyileşeceği şeklindeki hipoteze dayanır. Ancak temasın olumlu etki yapması için bazı şartlar gerekmektedir. Allport bu koşulları şöyle ifade eder:

- Temas, etkileşimden ziyade işbirliği gerektiren birliktelikleri ve gündelik etkinlikleri içermelidir.
- Bütünleşme, resmi ve kurumsal destek çerçevesi içinde olmalıdır.
- Temasta bulunan kişiler – gruplar eşit statüde olmalıdır. Eşit olmayan statülerin stereotipleri doğrulaması ve önyargıları güçlendirmesi söz konusudur (aktaran: Coşgun, 2004). Ancak, Triandis gerçek yaşamda iki grup arasında sosyal eşitliğin pek mümkün olmadığını, bu durumda olumlu sonuçların ancak gruplar arsında benzerlik olduğu ve ortada paylaşılacak bir şeyin olmadığı durumlarda ortaya çıkacağını belirtir (Harlak, 2000).

Kalıp düşünceleri ve önyargıları değiştirmenin etkili yollarından biri de hakkında olumsuz düşünce ve duygular geliştirilen kişilerin bulunduğu ortamlarda belirli bir zaman geçirerek onları ve bulundukları ortamı tanımaktır. Gruplar arasındaki düşmanca duygular, bir çıkar çatışmasından çok kişi ve grupların birbirleri hakkındaki yanlış inançlara bağlıdır ve bu inançların nedeni birbirlerini yeterince tanımamalarıdır (Oktay, 2000). Bu nedenle, yanlış bilgilenmeye ve boş inançlara dayanan önyargılı tutumlar geliştirmiş bulunan kişi, grup ve ulusların açık bir diyalog ortamında karşılıklı konuşarak anlaşmazlıkları gidermeleri ve birbirlerini tanımaları olumlu düşüncelerin gelişmesini sağlayabilir. Allport, gruplar arası önyargının azalması için beş öneri sunar: Karşılıklı bağlılık; ortak bir amaç; grup üyelerinin eşit statüde olması;- kişilerarası enformel ilişkilerin varlığı; çeşitli dış grup üyeleriyle ilişkilerin olması (aktaran: Coşgun, 2000).

Ayrımcılık, Toplum ve Çalışma Hayatındaki Etkileri

Ayrımcılık bir devletin ya da toplumun bazı üyelerinin, ötekilere sağlanan belli hak ve/veya ayrıcalıklardan yoksun bırakılmasıdır (aktaran: Ataöv, 1996). Diğer bir ifade ile ayrımcılık: Bir insana ya da insan grubuna, belli bir özelliği nedeniyle eşitsiz/farklı muamele yapılması durumudur (National Research Council, 2004). Bu muamele sadece tek boyutta düşünülmemelidir. Çünkü ayrımcılık kavramı, ayrımcılığa uğratılanı dezavantajlı kılacak biçimde yani bir diğer değişle olumsuz biçimde olabildiği gibi; ayrımcılığa uğratılanı avantajlı kılacak şekilde de karşımıza çıkabilmektedir. Bu ayrımcılık, kişilerarası ilişkilerde ortaya çıkabileceği gibi, sıklıkla kurumsal/yapısal düzeyde de görülebilir. Bazı birey ya da gruplar "kategorik olarak ayrımcılığın" konusu olurlar; çünkü toplumsal olarak "ya ırk, din, cinsiyet ya da bir toplumun üyelerini birbirinden ayırmada kullanılan herhangi bir tanımlama yüzünden" belli bir sınıflama içine sokulurlar (aktaran: Ataöv, 1996). Bu sınıflama da temel alınan, bireyin o topluma o gruba ne düzeyde ait olduğudur. Çünkü, İç-grupla özdeşim düzeyi ne denli artarsa, dış-gruplara karşı geliştirilen önyargı ve ayrımcılıkların dozu da o denli artar (Brewer 1999). Başlıca ayrımcılık tipleri aşağıdaki gibi sınıflandırılabilir:

Doğrudan Ayrımcılık: Yasama, yürütme ve yargı organları ile gerçek kişiler ile kamu ve özel tüzel kişilerin; cinsiyet, ırk, renk, dil, din, inanç, ulusal köken, etnik köken, cinsel kimlik, felsefi ve siyasi görüş, sosyal statü, medeni hal, hemşericilik, hamilelik, sağlık durumu, engellilik, yaş ve benzeri temellere dayalı olarak, düzenlenen hak ve özgürlüklerden, karşılaştırılabilir durumdakilere kıyasla eşit şekilde yararlanmasını engelleyen veya zorlaştıran, her türlü farklı muameleyi ifade eder. Tanımı kısaca özetlersek, doğrudan ayrımcılık kavramı, bir bireye, (cinsiyet, ırk, engellilik hali vb) herhangi bir unsur merkezinde, diğer bireylerden farklı davranmayı içermektedir. Örneğin, kamu hizmeti verilen bir yerde, (örneğin bir hastanede ya da okulda) belirli bir ırka ya da cinsiyete hizmet verilmemesi, bir istihdam edilme faaliyetinde, engellilik ya da kadın olmanın (işi nevinden ya da sakıncalarından kaynaklanan bir gerekçe olmaksızın) işe alınmaması gibi uygulamalar birer doğrudan ayrımcılık örneğidir.

Dolaylı Ayrımcılık: Kamu tüzel kişileri ile özel gerçek ve tüzel kişilerden kaynaklanan ve görünüşte ayrımcı olmayan her türlü eylem, işlem ve uygulamalar sonucunda, bir gerçek veya tüzel kişinin veya topluluğun, düzenlenen hak ve özgürlüklerden yararlanması bakımından nesnel olarak haklılaştırılamayan dezavantajlı bir konuma sokulmasıdır. Bir eylem, işlem veya uygulamanın nesnel olarak haklılaştırılabilmesi için, meşru bir amaca sahip olması ve ölçülü olması gerekir. Dolaycı ayrımcı uygulamalarda çoğu halde ayrımcılık farklı davranmaktan değil, aynı davranmaktan kaynaklanan bir haldir. Örneğin bir okulda asansör varken, engelli öğrencilerin merdivenleri kullanarak üst kattaki sınıflara çıkmalarının istenmesi, (yani engellilik yüzünden başarılamayacak bir davranış ya da erişim şekline) zorlanması dolaylı ayrımcılık örneğini teşkil etmektedir. Burada engelli birey, engelli olmayan bireylerin fiziksel kapasitelerinin elverdiği bir hareket biçimine zorlanarak dezavantajlı hale getirilmektedir.

Taciz: Psikolojik ve cinsel türleri de dâhil olmak üzere, insan onurunun çiğnenmesi amacını taşıyan veya böyle bir sonucu doğuran, yıldırıcı, düşmanca, onur kırıcı, aşağılayıcı veya saldırganca bir ortam yaratan veya kişi tarafından bu şekilde addedilen ve istenilmeyen her türlü davranıştır. Örneğin kişinin engel haliyle ya da cinsel yönelimiyle dalga geçilmesi, aşağımla amaçlı olarak o farklılığının vurgulanması taciz olarak nitelendirilebilir.

Ayrık tutma: Bir eylem veya eylemsizliğin sonucu olarak bir kişinin veya kişilerin diğerlerinden ayrılması durumudur. Ayrık tutma halinde; ayrık tutmanın meşru bir amacı yoksa veya amaca ulaşmak için kullanılan araçlar oranlı ve gerekli değilse, eylem ayrımcılık teşkil eder. Örneğin engelli çocukların oyun parkında oyun oynama ihtiyaçlarının, engelli olmayan yaşıtlarıyla birlikte, aynı oyun parkında karşılanması yerine, sadece onlara özel, onları yaşıtlarından ayrı tutan bir ortamda "engelli oyun parkı" olarak tanımlanan bir parkta karşılanmaya çalışılması ayrık tutma halidir.

Mağdurlaştırma: Eşitlik ilkesine uyulmasını talep eden veya kanunlarda yasaklanan tutum ve davranışlara karşı şikâyette bulunan, şikâyette bulunması ihtimali bulunan veya bu şikâyet süreçlerine katılan veya katılması ihtimali bulunan kişiler ile bu kişileri temsil edenlerin, bu talep ve şikâyetler nedeniyle maruz kaldıkları her türlü olumsuz tutum ve davranışı ifade eder.

Ayrımcılık talimatı: Bir kişinin kendi nam veya hesabına eylem ve işlemlerde bulunmaya yetkili kıldığı kişilere veya bir kamu görevlisinin bir kamu görevinin icrasıyla ilgili olarak emri altındakilere verdiği ayrımcılık yapma talimatını ifade eder.

Makul düzenleme: Engellilerin kanunlarda düzenlenen hak ve özgürlüklerden tam ve diğer bireylerle eşit şekilde yararlanmasını sağlamak üzere belirli bir durumda ihtiyaç duyulan, ölçüsüz veya aşırı yük getirmeyen, gerekli ve uygun değişiklik ve düzenlemeleri ifade eder.

Kalıpyargı, önyargı ve ayrımcılığın, nasıl da kolayca üretilebileceği deneysel olarak da gösterilmiştir. Bu deneylerin en ilginçlerinden biri, meslekten sosyal psikolog olmayan bir öğretmen tarafından 1970 yılında ABD'de ilkokul 3. sınıf öğrencileri üzerine gerçekleştirilmiştir (aktaran: Paker, 2011). Aşağıda özetini verdiğimiz bu deney bize göz rengi gibi tamamen uydurma bir değişken üzerinden bile çok kısa sürede iç ve dış-grupların oluşturulabildiğini ve çok ciddi derecede önyargı ve ayrımcılığın üretilebildiğini göstermektedir.

Sonuç

Sonuç olarak birbirini 'insan' olarak tanımayan, birbiriyle insani hiçbir ortak paydayı paylaşmayan, birbirini sadece 'öteki' grubun üyesi olarak gören bir toplumsal yaşam biçiminde, çalışma hayatında önyargı ve ayrımcılığın yaygın olması şaşırtıcı değildir. Hatta bu koşullar toplumu gruplar arasında bir çatışmaya gebe kılmaktadır. Bu, her çatışma ortamı içinde olmazsa olmaz en temel 'katkı maddesi'dir.

Önyargıları ve ayrımcı davranışları, sadece kişilik özelliklerinden hareketle anlamaya çalışmak, ayrımcılıktan kaynaklanan şiddeti açıklamakta yetersizdir. Bazı toplumlarda ve tarihin belirli dönemlerinde çalışma hayatı da dahil olmak üzere toplumun neredeyse tümüne yayılan bir ayrımcılıktan söz etmek mümkündür. Eğer önyargı ve ayrımcılık bireysel farklılıklarla açıklanabilseydi, o zaman toplumun tümünde ya da büyük bir bölümünde eş zamanlı olarak görülüyor olmazdı. Sonsöz olarak ayrımcılığı bütünlüklü bir sosyal olgu olarak görmek gerektiği söylenebilir: Ayrımcılığın kişisel, sosyal, hukuksal yönlerini birbirini tamamlayan yapılar olarak değerlendirmek önemlidir. Ayrıca, bir ideoloji olarak ayrımcılığın bu yazıda değindiğimiz bütün yönlerinin, ancak belli bir hiyerarşik sosyal sistem içinde anlamlı bir bütün oluşturduğunun ve ayrımcı davranışlara dönüştüğünün farkına varmak gerekir.

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İşletmelerin Lojistik Faaliyetlerinde Dış Kaynak Kullanımı Ve Bir Uygulama

Mustafa Yılmaz İÇERLİ[1], Ali Aykut PEKER[2]

[1]Aksaray University, Turkey,

yilmazicerli@aksaray.edu.tr

[2]Aksaray University, Turkey,

aykutpeker@aksaray.edu.tr

Özet: Günümüzün küreselleşen dünyasında işletmeler artan talepler doğrultusunda ya müşteri taleplerini yeterince karşılayamamış ya da bu talepleri karşılamak istediklerinde de maliyetleri aşırı derecede artmıştır. Bu yüzden işletmeler hem maliyetlerini azaltmak hem de ana faaliyet konusu olan işlerine odaklanarak müşterilerine daha iyi hizmet verebilmek için dış kaynak kullanımına yönelmişlerdir. Diğer taraftan yoğun rekabet ortamında işletmeler rakiplerinin bir adım önüne geçebilmek için ürünlerinin yeterince kaliteli olmasının yanı sıra ürünlerin doğru zamanda, doğru yere etkili ve verimli şekilde ulaşmasını sağlaması gerekir. Bu nokta da lojistik kavramı karşımıza çıkmaktadır. İşletmeler için lojistik faaliyetler son derece önemli olmakla birlikte lojistik faaliyetleri kendi bünyelerinde gerçekleştirmek isterlerse de aşırı derece maliyete katlanmak zorunda kalırlar. İşletmeler hem bu maliyetlerden kaçınmak için hem de ana faaliyet konusu olan işlerine tam anlamıyla yoğunlaşabilmek için lojistik faaliyetlerde dış kaynak kullanımı yoluna gitmektedirler.

Anahtar Kelimeler: Lojistik, Dış Kaynak Kullanımı, Lojistik Faaliyetlerde Dış Kaynak Kullanımı (3PL)

Giriş

Küreselleşme sayesinde ortaya çıkan rekabet ortamında işletmeler için lojistik faaliyetlerin önemi gün geçtikçe artmaktadır. Yoğun rekabet ortamında ayakta kalmak ve müşteri memnuniyetini en üst seviyeye çıkartmak isteyen işletmeler lojistik faaliyetlere ayrıca odaklanmak zorundadırlar. Büyük-küçük her işletme için lojistik faaliyetlere odaklanmak ekstra bir maliyet yükü getirmektedir. İşletmeler ana faaliyet konusu dışında olan lojistik faaliyetlere belli bir miktarda kaynak ayırmak zorunda kalacaktır. Bu durum işletmeleri belli bir risk altına sokacaktır. Bu yüzden işletmeler çeşitli risklerden kaçınmak için kendileri için çok önemli olan lojistik faaliyetlerde, dış kaynak kullanımı yoluna yönelmiştir. Dış kaynak kullanan işletmeler hem kendi ana faaliyet konularına yönelme imkânı elde etmelerinin yanı sıra sabit maliyetlerini değişken maliyetlere çevirerek ekstra bir kaynak yaratmış olacaklardır hem de dış kaynak kullanacakları işletme kendi alanında uzman olması nedeniyle belki de müşterilerine kendilerinin sundukları hizmetlerden daha iyi hizmet sunabilecek pozisyona geleceklerdir.

Lojistik ve Lojistik Faaliyetlerde Dış Kaynak Kullanımı

Lojistik Yönetim Konseyi (CLM) tarafından yapılan iş dünyasında geçerli olan ve genel kabul gören bu tanıma göre lojistik; müşteri ihtiyaçlarının karşılanması için hammaddeden ürünün nihai tüketiciye ulaşıncaya kadar tedarik zinciri içerisinde malzemelerin, servis hizmetlerinin ve bilgi akışının etkili ve verimli şekilde her iki yöne doğru (müşteri-işletme ve işletme-müşteri) hareketinin planlanması, uygulanması ve kontrol edilmesidir (Cooper, Lambert, & Pagh, 1997). Lojistik faaliyetleri, doğru ürünün, doğru yer ve zamanda doğru müşteriye ulaştırılmasına olanak veren faaliyetlerin hepsini kapsayan bir kavramdır (Kotler & Armstrong, 2004:419). Literatürde genel kabul görmüş Yedi D'ler tanımına göre lojistik**,** doğru ürünlerin, doğru müşterilere, doğru durumda, doğru yerde, doğru zamanda, doğru miktarda, doğru fiyatla (mümkün olduğunca düşük fiyatla) ulaşması şeklinde tanımlanmıştır (Ozalp, Suvacı, & Tonus, 2010).

Başlangıçta, sadece taşıma ve depolama hizmetlerini kapsayan lojistik faaliyetler, lojistiğin kapsam ve alanının gelişmesiyle zamanla daha fazla alanı kapsayacak şekilde çeşitlenmiştir. Bu durum aynı zamanda işletmelerin performans analizlerinde, faaliyetlerin planlanması ve tasarımında lojistik faaliyetlerin dâhil edilmesini zorunlu kılmaktadır (Jane,2011). Lojistik faaliyetleri ve fonksiyonları gösteren Tablo-1 aşağıda belirtilmiştir.

Tablo 1. Lojsitik Faaliyetler ve Fonksiyonları

Lojistik Fonksiyonlar	**Aktiviteleri**
Taşıma	Taşıma, sevk etme, birleştirme, sevkiyat anlaşması, ev eşyası taşıması, yükleme kâğıdı, komisyonculuk
Depolama	Depolama, kabul etme, montaj, iade mallar
Envanter Yönetimi	Danışmanlık hizmeti, Yerel(Bölgesel) analizler, Tahmin(Öngörü), Plan düzenlemesi
Siparişin Hazırlanması	Çağrı merkezleri, Nakliye Yönetimi, Sipariş Yönetimi
Bilgi Sistemleri	Yapay zekâ, listeleme, uzmanlık hizmetleri, internet tabanlı iletişim, takip ve izleme
Değer katan aktiviteler	Müşteriye özel hizmet, Dizayn ve paketlemenin geri dönüşümü, işaret, etiket/faturalama, arama hizmetleri aktiviteleri

Tablo 1: Lojistik Fonksiyonlar ve Aktiviteleri
Kaynak: Aguezzoul, The Third Party Logistics Selection, 2007.

Günümüzde artan rekabet koşulları hızlı karar alma, hareket edebilme ve kıt kaynakların etkin yönetimi konusunda rakiplerine göre farklı stratejiler geliştirmelerine zorlamaktadır. Örneğin dış ticareti işletme bünyesinde yapmaktan ziyade hizmet satın alma katma değeri düşük ürünleri dış kaynak yoluyla ürettirme, nüfus edilemeyen ve girilemeyen pazarlarda dağıtım şirketleriyle anlaşılması. Bu temelde en önemli faktörlerden biri de üretilen mal ve hizmetlerin müşterilere zamanında, kusursuz ve düşük maliyetle teslimi büyük önem arz etmektedir. Bu yönüyle lojistiğin bir boyutu "dış kaynak kullanımı" sürecidir.

Dış kaynak kullanımı, uzun yıllardır işletme faaliyetlerinin gerçekleştirilmesinde kullanılan, ancak rekabetin öneminin artmasıyla ön plana çıkan bir kavramdır. Kullanıp kullanmama kararının verilmesinin zor olduğu, kullanılmadığı zaman çeşitli fırsatlardan yararlanmama riskine neden olan, kullanıldığı zaman ise başka işletmelerin bağımlılığın artması gibi sorunların ortaya çıkmasına neden olan bir olgudur (Acar ve Ateş, 2011: 22).

Dış Kaynak Kullanımı işletmelere rekabet avantajı sağlayan faaliyetleri tespit edip odaklanmasına, kendi uzmanlık alanıyla doğrudan bağlantısı olmayan faaliyetlerini ise bu konuda uzmanlaşmış işletmeler aracılığıyla yapılmasını sağlayan modern bir yönetim stratejisidir. Literatürde "outsourcing'' olarak yer almaktadır (Karahan, 2009: 187). Literatürde yapılan çalışmalara göre İşletmeleri Dış Kaynak Kullanımı'na yönelten nedenler aşağıdaki Tablo 2'de şöyle gösterilmiştir:

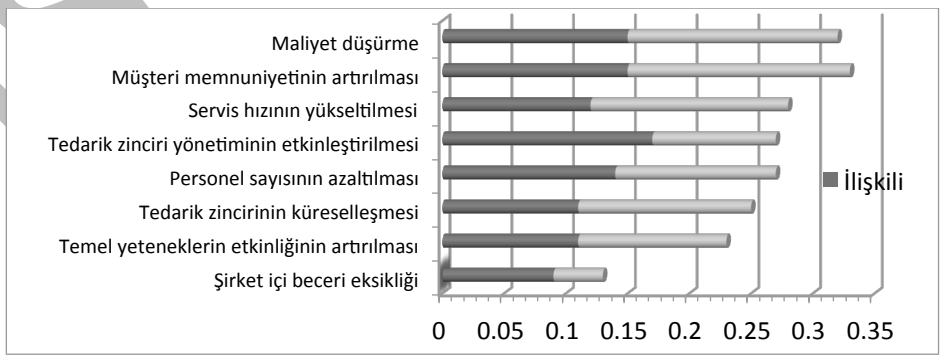
Yazar Ve Araştırmacılar	İşletmeleri Dış Kaynak Kullanımına Yönlendiren Nedenler
Lacity ve Hirscheim (1995) Mc Forlan ve Nolan (1995) Bartehemly ve Geyer (2000) Kakabadse ve Kakabadse (2002)	İşlem Maliyetlerini Düşürmek
Quinn ve Hillmer (1994) Sounders ve Diğ., (1997) Alexander ve Young (1996) Kakabadse ve Kakabadse (2002)	Temel Yetenekleri Geliştirmek
Mc Forlan ve Nolan (1995) Kakabadse ve Kakabadse (2002) Bartehemly ve Geyer (2000)	Kaynak Transferlerini Geliştirmek
Quinn ve Hillmer (1994) Kakabadse ve Kakabadse (2002)	Kaliteyi Arttırmak
Alexander ve Young (1996)	Sabit maliyetleri değişken maliyetlere dönüştürmek
Lacity ve Hirscheim (1995) Alexander ve Young (1996)	Küçülerek iş departmanları üzerinde etkinliği arttırma

Tablo 2. İşletmeleri Dış Kaynaklardan Yararlanmaya Yönlendiren Nedenler
Kaynak: Ofluoğlu ve Doğan, 2009: 147.

Lojistik servis merkezleri gerek ulusal gerekse uluslararası mal ve hizmetlerin taşınması ve depolanmasını sağlamaktadır. Burada işletmenin mallarını müşterilerine ulaşması için kurduğu merkezleri başka işletmelerin kullanımına açarak hem gelir artırıcı hem de maliyet azaltıcı bir işlem yapmış olmaktadır. Bu duruma lojistikte dış kaynak kullanımı ve/veya kullandırma denir (Roorda ve Diğ., 2010: 22). Üçüncü Parti Lojistik yeryüzünde gerek lojistik firmalarının gerekse ticaret işletmelerinin strateji ve faaliyet değerlerini sürekli geliştirmesini sağlar (faq-logistique, 2012).

Günümüz global ekonomisinde ticari şirketlerin kazançlarının ortalama % 11'ini, lojistik şirketlerinin ise %42'sini lojistik hizmetlerde dış kaynak kullanımına bağlı harcamalardan oluşmaktadır. Bu bağlamda şirketlerin dış kaynak kullanımında fayda maliyet analizlerinin önemi ortaya çıkmaktadır (Langley, 2010: 4).

Literatürdeki çalışmalar incelendiğinde işletmeleri lojistikte dış kaynak kullanıma yönlendiren sebeplerin en başında maliyetlerin azaltılması, hizmetlerin iyileştirilmesi, temel yetkinliğe odaklanmak ve esnekliği sağlama olarak görülmektedir. Bu durum aşağıda Tablo 3'de gösterilmektedir.



Tablo 3. 3PL seçiminde anahtar sürücüler
Kaynak: www.eyefortransport.com, 2012.

Sink ve Langley'in yapmış olduğu araştırmada lojistik faaliyetlerde dış kaynak kullanımının yararları önem sırasına göre; maliyetleri azaltmak, esnekliği artırmak, hizmet seviyelerini arttırmak, işçi

sayısını azaltmak, temel yeteneklere odaklanmak, sermaye harcamalarını azaltmak, faaliyetlerin daha uygun raporlanmasını sağlamak, bilişim teknolojilerinin kullanımını arttırmak şeklinde sıralanmıştır (Sınk & Langley, 1997)

Yukarıda sunulan görüşün yanında bazı çalışmalarda da işletmelerin dış kaynak araştırmaları, uygulamaları ve kullanımında bazı sorunlarla karşılaşacağı belirtilmektedir. Bunlar bazıları; Dağıtım işini dışarıya vermenin ve hizmetinden memnun kalınmayan bu hizmet sağlayıcılarını değiştirmenin oluşturacağı maliyetler, müşterilerle doğrudan temasın azalması, tedarikçi işletmelere karşı oluşan bağımlılık, servis sağlayıcılarının servis alanla ilgili hayati firma bilgilerine ulaşması ve bu bilgileri rakiplere verme ihtimali, düşük performans, yetersiz bilgi, çalışanlar tarafından kabul edilmeme, kaybedilen müşteri geri bildirimleri, servis sağlayıcılarının özel ürün ihtiyacına cevap verememesi olarak sıralanabilir (Çabuk ve Diğ., 2010: 256; Konuk, 2012: 3).

Yöntem ve Bulgular

Araştırma tanımlayıcı araştırma modeli ile gerçekleştirilmiştir. Araştırma evrenini Aksaray İli Organize Sanayi Bölgesi'nde faaliyet gösteren üretim işletmeleri oluşturmaktadır. Örnekler, Aksaray ilindeki belirlenen ana kütleden, kolayda örnekleme yöntemi kullanılarak seçilmiştir. Anketler yüz yüze görüşme yapılarak uygulanmıştır. 87 anket istatistiki analiz yapmak için yeterli görülmüştür. Analizler SPSS 20.0 istatistik paket programı kullanılarak gerçekleştirilmiştir.Anket çalışmasına katılan işletmelere ilişkin bazı tanımlayıcı bilgiler aşağıda yer almaktadır. Ankete katılan işletmeleri faaliyet gösterdikleri sektörlere göre tek bir grup altında toplamak mümkün değildir.

Tablo 4. İşletmelerin Faaliyet Gösterdiği Sektör ve Faaliyet Süreleri

Faaliyet Gösterdiği Sektör	Frekans	Yüzde (%)	Faaliyet Süreleri	Frekans	Yüzde (%)
Maden	7	8	1-5 Yıl	38	43,7
Süt ve süt ürünleri	2	2,3	6-10 Yıl	20	23
Makine imalat sanayi	27	31	11-20 Yıl	17	19,5
Ambalaj	6	6,9	21-50 Yıl	7	8
Tarım	6	6,9	51 Yıl-Üstü	5	5,7
Tekstil	7	8			
Diğer (Plastik,Mobilya,Otomotiv)	32	36,8	**Toplam**	**87**	**100**
Toplam	**87**	**100**			

Ankete katılan işletmelerin çoğunluğunu makine-imalat sanayi sektöründe ve plastik-mobilya sektöründe çalışna işletmelerin oluşturduğu belirlenmiştir.Bu işletmelerin yaklaşık yarısının (%43,7 sinin) ise daha yeni kurulan işletme oldukları saptanmıştır.

Tablo 5. Lojistik Faaliyetlerde Dış Kaynak Kullanımı Süreleri ve Maliyetleri

Lojistik faaliyetlerde dış kaynak kullanma süreleri	Frekans	Yüzde (%)	Lojistik Harcamalar İçindeki Dış Kaynak Kullanımı Maliyetleri	Frekans	Yüzde (%)
1 yıldan az	19	21,9	%1-%20	36	41,4
1-3 yıl	39	44,8	%21-%40	34	39,4
4-6 yıl	14	16,1	%41-%60	11	12,6
6 yıldan fazla	15	17,2	%61-%100	6	6,9
Toplam	**87**	**100**	**Toplam**	**87**	**100**

Ankete katılan işletmelerin %66,7 si ise yeni kurulan işletmelerin çoğunluklu olmasından dolayı lojistik faaliyetlerinde dış kaynak kullanımı sürelerini 1 ay ile 3 yıl arasında değiştiğini belirtmiştir ve genellikle bu işletmelerin lojistik harcamaları içerisindeki dış kaynak kullanım maliyetlerinin %1-%40 arasında olduğunu belirtmişlerdir.

Lojistik deyince ilk akla gelen faaliyetlerden biri olan taşımacılık hizmetleri, maliyetlerden kaliteye kadar çeşitli yollarla ürünü etkileyebilmektedir. Yapılan uygulama çalışmasına gore ankete

katılan işletmelerin büyük bir çoğunluğu karayolu taşımacalığını seçtikleri belirlenmiştir. İşletmelerin karayolu taşımacılığını neden seçtikleri sorulduğunda ise en önemli kriterlerin düşük maliyet, pazara hızlı ulaşım ve hizmet alanının geniş olması olduğu işletmeler

İşletmeler maliyetlerini düşürmek, müşteri memnuniyeti ve kaliteyi arttırmak istiyorlarsa lojistik hizmetlerden kesinlikle yararlanmak zorundadırlar. Lojistik hizmetlerin işletmeye sağladığı yararlar Tablo 6 da gösterilmektedir.

Tablo 6. Lojistik Hizmetlerin İşletmeye Sağladığı Faydalar

Lojistik Hizmetlerin İşletmeye Sağladığı Faydalar	Mod
A- Maliyetleri düşürme	5,00
B- Uzmanlık geliştirme ve pazar hakkında bilgilenme	5,00
C- Operasyonel etkinliğinin artırılması	5,00
D- Müşteri hizmetlerini geliştirme	3,00
E- Esas faaliyet konularına odaklanabilme	5,00
F -Yüksek esneklik	3,00
G -Stokların azaltılması	4,00
H -Pazara ulaşımın kısalması	5,00
İ- Kaynakları esas ve yeni iş alanlarına aktarma	5,00
J- Satın alma ve satış sonrası risk ve cezalardan korunma	3,00
K- Geç teslimat, ürün hasarı vb tazminatlardan korunma	5,00
L- Araçların ve işgücünün atıl kalma riskinden korunma	4,00

Lojistik hizmetlerin işletmeye sağladığı faydalar arasında işletmeler içinde en önemli olan kalemler maliyetleri düşürme, uzmanlık geliştirme ve pazar hakkında bilgilenme, operasyonel etkinliğin artması, esas faaliyet konularına odaklanabilme, pazara ulaşımın kısalması, kaynakları esas ve yeni iş alanlarına aktarma, geç teslimat, ürün hasarı vb gibi tazminatlardan korunma olarak belirlenmiştir.

İşletmeler katlanmak zorunda oldukları lojistik maliyetleri karşılamak için ürün satış bedelini arttırmak zorunda kalmaktadırlar. Küreselleşmeyle birlikte artan rekabet ortamında işletmeler için artık bütün maliyet kalemleri önemli bir noktaya gelmektedir. Lojistik maliyetlerde bu maliyet kalemleri içerisinde önemli bir yere sahiptir. Bu sorunun sorulmasındaki amaç işletmelerin lojistik maliyetlerinin ürün satış fiyatını etkileyip etkilemediğini öğrenmektir. Anketi cevaplayan işletmelerin vermiş olduğu cevaplar Tablo 7' de gösterilmektedir.

Tablo 7. Lojistik Maliyetlerin Satış Bedeli İçerisindeki Payı

Lojistik Maliyetlerin Satış Bedeli İçerisindeki Payı	Frekans	Yüzde (%)
%1-%5	24	27,6
%6-%10	43	49,4
%11-%15	13	14,9
%16-%20	3	3,4
%21 ve üstü	4	4,6
Toplam	**87**	**100**

Tablo 7'e göre anketi cevaplayan işletmelerin neredeyse yarısının ürün satış bedelleri içerisindeki lojistik maliyetlerinin oranı %6 ile %10 arasındadır.. Yapılan literatür çalışmalarında da bu oranının %5 ile %15 arasında olduğu sonucuna ulaşılmıştır. Aksaray ilinde yapılan bu anket çalışmasının sonuçları da literatür çalışmalarını destekler niteliktedir. İşletmeleri lojistik faaliyetlerde dış kaynak kullandırmaya iten faktörler Tablo 8'de gösterilmiştir.

Tablo 8. İşletmeleri Lojistik Faaliyetlerde Dış Kaynak Kullanmaya İten Faktörler

İşletmeleri Lojistik Faaliyetlerde Dış Kaynak Kullanmaya İten Faktörler	Mod
A-Kaliteli fiziksel araç ve donanıma sahip olması	5,00
B-İşlem sayısının fazla olması	3,00
C-Rekabet düzeyinde kaliteli hizmet sunması	5,00
D-Rekabetin yoğun olması	5,00
E-Alternatif kaynaklar ve pazar hakkında ek bilgiye maliyetsiz ulaşma isteği	3,00
F-Teknolojik belirsizliğin yüksek olması	5,00
G-Daha ileri tesis, donanım ve araç teknolojisine ulaşma gerekliliği	5,00

H-Faaliyet gösterilen bölgede lojistik hizmet veren tedarikçi firma sayısının fazla olması	3,00
İ-Talep belirsizliğinin yüksek olması	3,00
J-Yasal düzenlemelerin sıkı olması	3,00

İşletmeleri lojistik faaliyetlerde dış kaynak kullanmaya iten en önemli nedenler; lojistik hizmet sağlayıcılarının kaliteli fiziksel araç ve donanıma sahip olması, rekabet düzeyinde kaliteli hizmet sunulması, rekabetin yoğun olması, teknolojik belirsizliğin yüksek olması ve daha ileri tesis, donanım ve araç teknolojisine ulaşma gerekliliği seçenekleridir. Bu seçeneklerden de anlaşılacağı üzere ankete katılan işletmeler dış kaynak kullanımını küreselleşmeyle birlikte oluşan rekabet ortamında daha iyi hizmet sunmak ve gelişen teknolojiyle birlikte kendi araç ve donanımlarının yetersiz olması sebebiyle kullandıkları sonucu ortaya çıkmaktadır.

Lojistik faaliyetlerde dış kaynak kullanımını sağladığı avantajlar olduğu gibi getirdiği tehditlerde bulunmaktadır. Anketi cevaplayan işletmelerin vermiş oldukları cevaplar Tablo 9'da gösterilmiştir.

Tablo 9. Lojistik Faaliyetlerde Dış Kaynak Kullanımının Getirdiği Tehditler

Lojistik Faaliyetlerde Dış Kaynak Kullanımının Getirdiği Tehditler	Mod
A-Dış firmaya bağımlılık-kontrolü kaybetme tehlikesi	5,00
B-Maliyetleri yönetememe	3,00
C-İşletmede sistemin yeniden tasarımı	3,00
D-Olumsuz algılanan müşteri memnuniyeti	3,00

İşletmeler için lojistik faaliyetlerin getirdiği tehditler arasında en çok tercih edilen seçenek dış firmaya bağımlılık-kontrolü kaybetme tehlikesidir. İşletmeler dış kaynak kullandıklarında dış kaynak kullandıkları firmaya bağımlı olacaklarını ve bu yüzden kontrollerini kaybedeceklerini düşünmektedirler. Maliyetleri yönetememe seçeneği de kontrolü kaybetme seçeneği ile bağlantılıdır.

İşletmelerin lojistik maliyetlerinin ürün satış bedeli içerisindeki payı ile lojistik harcamalarının ne kadarlık bir kısmını dış kaynak kullanımı yüzünden hizmeti aldığı firmaya ödeme yaptığı arasındaki ilişkiyi inceleyebilmek için Tablo 10'da çarpraz tablolar ile gösterilmiştir.

Tablo 10. Lojistik Harcamaların Ne Kadarı Dış Kaynak Kullanımı Yüzünden Firmaya Ödenmekte ile Lojistik Maliyetler Ürün Satış Bedelinin Yüzde Kaçı Crosstabulation

			Lojistik maliyetler ürün satış bedelinin yüzde kaçı					Total
			0,01-0,05	0,06-0,10	0,11-0,15	0,16-0,20	0,21 ve ustu	
d3a-Lojistik harcamaların ne kadarı dış kaynak kullanımı yüzünden firmaya ödenmekte	0,01-0,20	Count	9	18	4	3	2	36
		% within d3a-Lojistik harcamaların ne kadarı dış kaynak kullanımı yüzünden firmaya ödenmekte	25,0%	50,0%	11,1%	8,3%	5,6%	100,0%
		% within c3a	37,5%	41,9%	30,8%	100,0%	50,0%	41,4%
		% of Total	10,3%	20,7%	4,6%	3,4%	2,3%	41,4%
	0,21-0,40	Count	9	17	7	0	1	34
		% within d3a-Lojistik harcamaların ne kadarı dış kaynak kullanımı yüzünden firmaya ödenmekte	26,5%	50,0%	20,6%	0,0%	2,9%	100,0%
		% within c3a	37,5%	39,5%	53,8%	0,0%	25,0%	39,1%
		% of Total	10,3%	19,5%	8,0%	0,0%	1,1%	39,1%
	0,41-	Count	4	6	1	0	0	11

	0,60	% within d3a-Lojistik harcamaların ne kadarı dış kaynak kullanımı yüzünden firmaya ödenmekte	36,4%	54,5%	9,1%	0,0%	0,0%	100,0%
		% within c3a	16,7%	14,0%	7,7%	0,0%	0,0%	12,6%
		% of Total	4,6%	6,9%	1,1%	0,0%	0,0%	12,6%
	0,61-0,80	Count	2	1	1	0	0	4
		% within d3a-Lojistik harcamaların ne kadarı dış kaynak kullanımı yüzünden firmaya ödenmekte	50,0%	25,0%	25,0%	0,0%	0,0%	100,0%
		% within c3a	8,3%	2,3%	7,7%	0,0%	0,0%	4,6%
		% of Total	2,3%	1,1%	1,1%	0,0%	0,0%	4,6%
	0,81-0,100	Count	0	1	0	0	1	2
		% within d3a-Lojistik harcamaların ne kadarı dış kaynak kullanımı yüzünden firmaya ödenmekte	0,0%	50,0%	0,0%	0,0%	50,0%	100,0%
		% within c3a	0,0%	2,3%	0,0%	0,0%	25,0%	2,3%
		% of Total	0,0%	1,1%	0,0%	0,0%	1,1%	2,3%
Total		Count	24	43	13	3	4	87
		% within d3a-Lojistik harcamaların ne kadarı dış kaynak kullanımı yüzünden firmaya ödenmekte	27,6%	49,4%	14,9%	3,4%	4,6%	100,0%
		% within c3a	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	27,6%	49,4%	14,9%	3,4%	4,6%	100,0%

Araştırmaya katılan işletmelerin %49,4'ünü lojistik maliyetleri ürün satış bedelinin %6'sı ile %10'u arasında bir değer ifade etmektedir. Bu %49,4'lük dilime karşılık gelen 43 işletmeden 18 tanesi lojistik faaliyetlerini dış kaynak yolu ile sağlamaktadır. Bu faaliyetlerin sonucunda dış kaynaktan alınan hizmet bedeli olarak, lojistik harcamalarının %1 ile %20 arasında bir bedel ödemektedir. Yine aynı şekilde lojistik harcaması ürün bedelinin %6'sı ile %10'u arasında olan işletmelerin 17 tanesi ise aynı bedel için %21 ile %40 arasında bir bedel ödemektedir. Geriye kalan 8 işletmenin dış kaynak kullanımına ödediği bedel ise %40'ın üzerindedir. Buda gösteriyor ki lojistik faaliyetlerini dış kaynak yoluyla gerçekleştiren işletmeler lojistik faaliyetleri için ayırdığı bütçenin en fazla %40'ını dış kaynak kullanarak ödemektedir.

Tablo 11. Ulaştırma-Nakliye-Taşımacılık-Sevkiyat Lojistik Faaliyeti ile Lojistik Harcamaların Ne Kadarı Dış Kaynak Kullanımı Yüzünden Firmaya Ödenmekte Crosstabulation

			d3a-Lojistik harcamaların ne kadarı dış kaynak kullanımı yüzünden firmaya ödenmekte					Total
			0,01-0,20	0,21-0,40	0,41-0,60	0,61-0,80	0,81-0,100	
d7a-Ulaştırma-Nakliye-Taşımacılık-Sevkiyat	Kullanmıyor	Count	0	2	0	0	0	2
		% within d7a-Ulaştırma-Nakliye-Taşımacılık-Sevkiyat	0,0%	100,0%	0,0%	0,0%	0,0%	100,0%
		% within d3a-Lojistik harcamaların ne kadarı dış kaynak kullanımı yüzünden firmaya ödenmekte	0,0%	5,9%	0,0%	0,0%	0,0%	2,3%
		% of Total	0,0%	2,3%	0,0%	0,0%	0,0%	2,3%
	Kullanıyor	Count	36	32	11	4	2	85
		% within d7a-Ulaştırma-Nakliye-Taşımacılık-Sevkiyat	42,4%	37,6%	12,9%	4,7%	2,4%	100,0%
		% within d3a-Lojistik harcamaların ne kadarı dış kaynak kullanımı yüzünden firmaya ödenmekte	100,0%	94,1%	100,0%	100,0%	100,0%	97,7%
		% of Total	41,4%	36,8%	12,6%	4,6%	2,3%	97,7%
Total		Count	36	34	11	4	2	87
		% within d7a-Ulaştırma-Nakliye-Taşımacılık-Sevkiyat	41,4%	39,1%	12,6%	4,6%	2,3%	100,0%
		% within d3a-Lojistik harcamaların ne kadarı dış kaynak kullanımı yüzünden firmaya ödenmekte	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	41,4%	39,1%	12,6%	4,6%	2,3%	100,0%

Araştırmaya katılan işletmelerin %97,7'si ulaştırma-nakliye-taşımacılık-sevkiyat lojistik faaliyetlerinde dış kaynak kullanımına gitmiştir. 36 işletme ulaştırma-nakliye-taşımacılık-sevkiyat lojistik faaliyetlerinde dış kaynak kullanımı neticesinde hizmet alınan firmaya %1-%20 arasında ödeme yapmaktadır. Diğer yandan 34 işletme ise satın aldığı hizmet karşılığında dış kaynak kullandığı işletmeye lojistik harcamalarının %21-%40 arasında ödeme yapmaktadır.Tablo 11'de de belirtildiği gibi ankete katılan işletmelerin taşımacılık-nakliye-sevkiyat lojistik faaliyetlerinde dış kaynak kullanımına yöneldiği fakat lojistik harcamaların içerisinde %1-%40 oranları arasında hizmet alınan firmaya ödeme yaptığı ve dolayısıyla işletmelerin taşımacılık-sevkiyat vs lojistik faaliyetlerinin tamamını dış kaynak kullanılan işletmeye devretmediğini kendi bünyesinde de lojistik faaliyetler sonucunda oluşan maliyetler bulunduğu sonucu ortaya çıkmaktadır.

Tablo 12. Depolama Lojistik Faaliyeti ile Lojistik Harcamaların Ne Kadarı Dış Kaynak Kullanımı Yüzünden Firmaya Ödenmekte Crosstabulation

			d3a-Lojistik harcamaların ne kadarı dış kaynak kullanımı yüzünden firmaya ödenmekte					Total
			0,01-0,20	0,21-0,40	0,41-0,60	0,61-0,80	0,81-0,100	
d7b-Depolama	Kullanmıyor	Count	4	4	0	0	1	9
		% within d7b-Depolama	44,4%	44,4%	0,0%	0,0%	11,1%	100,0%
		% within d3a-Lojistik harcamaların ne kadarı dış kaynak kullanımı yüzünden firmaya ödenmekte	11,1%	11,8%	0,0%	0,0%	50,0%	10,3%
		% of Total	4,6%	4,6%	0,0%	0,0%	1,1%	10,3%
	Kullanıyor	Count	32	30	11	4	1	78
		% within d7b-Depolama	41,0%	38,5%	14,1%	5,1%	1,3%	100,0%
		% within d3a-Lojistik harcamaların ne kadarı dış kaynak kullanımı yüzünden firmaya ödenmekte	88,9%	88,2%	100,0%	100,0%	50,0%	89,7%
		% of Total	36,8%	34,5%	12,6%	4,6%	1,1%	89,7%
Total		Count	36	34	11	4	2	87
		% within d7b-Depolama	41,4%	39,1%	12,6%	4,6%	2,3%	100,0%
		% within d3a-Lojistik harcamaların ne kadarı dış kaynak kullanımı yüzünden firmaya ödenmekte	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	41,4%	39,1%	12,6%	4,6%	2,3%	100,0%

Araştırmaya katılan işletmelerin %89,7 si (78 işletme) depolama lojistik faaliyetinde dış kaynak kullanımına yönelmiştir. 78 işletmenin 32'si dış kaynak kullanımı neticesinde hizmet aldıkları firmaya lojistik harcamalarının %1-%20 oranları arasında ödeme yapmaktadır. Bu işletmelere ilaveten 30 işletmede depolama lojistik faaliyetinde dış kaynak kullanımı yolunu seçtiği için lojistik harcamalarının %21-%40 arasında hizmet aldığı firmaya ödeme yapmaktadır. Geriye kalan işletmelerin depolama lojistik faaliyeti için dış kaynak kullanımı sonucunda ödediği bedel %40'ın üzerindedir.

Tablo 13. Satın Alma-Tedarik Lojistik Faaliyeti ile Lojistik Harcamaların Ne Kadarı Dış Kaynak Kullanımı Yüzünden Firmaya Ödenmekte Crosstabulation

			d3a-Lojistik harcamaların ne kadarı dış kaynak kullanımı yüzünden firmaya ödenmekte					Total
			0,01-0,20	0,21-0,40	0,41-0,60	0,61-0,80	0,81-0,100	
d7f-Satın alma-Tedarik	Kullanmıyor	Count	5	5	0	0	0	10
		% within d7f-Satın alma-Tedarik	50,0%	50,0%	0,0%	0,0%	0,0%	100,0 %
		% within d3a-Lojistik harcamaların ne kadarı dış kaynak kullanımı yüzünden firmaya ödenmekte	13,9%	14,7%	0,0%	0,0%	0,0%	11,5%
		% of Total	5,7%	5,7%	0,0%	0,0%	0,0%	11,5%
	Kullanıyor	Count	31	29	11	4	2	77
		% within d7f-Satın alma-Tedarik	40,3%	37,7%	14,3%	5,2%	2,6%	100,0 %
		% within d3a-Lojistik harcamaların ne kadarı dış kaynak kullanımı yüzünden firmaya ödenmekte	86,1%	85,3%	100,0%	100,0%	100,0%	88,5%
		% of Total	35,6%	33,3%	12,6%	4,6%	2,3%	88,5%
Total	Count		36	34	11	4	2	87
	% within d7f-Satın alma-Tedarik		41,4%	39,1%	12,6%	4,6%	2,3%	100,0 %
	% within d3a-Lojistik harcamaların ne kadarı dış kaynak kullanımı yüzünden firmaya ödenmekte		100,0%	100,0%	100,0%	100,0%	100,0%	100,0 %
	% of Total		41,4%	39,1%	12,6%	4,6%	2,3%	100,0 %

Ankete katılan işletmelerin %88,5'i satın alma-tedarik lojistik faaliyetinde dış kaynak kullanmanın son derece önemli olduğunu belirtmiş bu 88.5'lik dilime karşılık gelen 77 işletmenin 31'i için satın alma-tedarik lojistik faaliyetinde dış kaynak kullanımı neticesinde hizmet satın alınan firmaya ödenen bedelin lojistik harcamalar içerisindeki payı %1 ile %20 arasında değişmektedir. Diğer yandan 29 işletme ise dış kaynak kullanımı için ödediği bedelin lojistik harcamalar içindeki payı ise %21-%40 arasında olduğunu belirtmiştir. Geriye kalan 17 işletme ise dış kaynak kullanımı neticesinde lojistik harcamaların %41-%100 oranları arasında bir ödeme yapmaktadır. Bu rakamlardan da anlaşılacağı gibi satın alma-tedarik lojistik faaliyetinde dış kaynak kullanımı yoluna giden işletmelerin büyük bir çoğunluğu aldıkları hizmet karşılığında lojistik harcamaları içerisinde %1-%%40 arasında ödeme yapmakta lojistik harcamalarının tamamını satın alma ve tedarik faaliyet alanları için kullanmamaktadır.

Sonuç

İşletmeler lojistik maliyetlerin ürün satış bedelindeki payını ve işletme karlılığındaki etkisini minimum seviyeye çekmek için dış kaynak kullanımı yoluna gitmektedirler. Dış kaynak kullanımı, işletmelerin esas faaliyet konularını gerçekleştirmek için yerine getirmek zorunda olduğu birçok faaliyet alanının ortaya çıkması ile birlikte bu faaliyet alanlarını kendi bünyelerinde gerçekleştirmek istemeleri durumunda işletme yapılarının hantallaştığını ve işletmeye aşırı derece bir maliyet yükü getirdiğini tespit etmişlerdir.

Lojistik faaliyetlerde dış kaynak kullanımı ise işletmelerin mallarının müşterilerine ulaşması için kurduğu merkezleri başka işletmelerin kullanımına açarak hem maliyetlerini azaltıcı hem de gelirlerini arttırıcı bir işlem yapmış olacaklardır. İşletmelerin rekabet edebilme güçlerinin artmasından dolayı iş hacimlerinde meydana gelen artış firmaların kendi lojistik faaliyetlerini yürütemez hale gelmesine neden olmuş ve lojistik faaliyetler işletmeler için oldukça maliyetli olmaya başlamıştır. Bu yüzden işletmeler lojistik faaliyetlerde dış kaynak kullanımına yönelmişlerdir.

Aksaray Organize Sanayi Bölgesinde yapılan anket çalışmasına göre işletmelerin taşımacık-ulaştırma-dağıtım-sevkiyat lojistik faaliyetinde Aksaray ilinin jeopolitik konumu nedeniyle tercih ettikleri taşımacılık türünün karayolu taşımacılığı olduğu görülmüştür. İşletmelerin karayolu taşımacılığını seçme nedenleri arasında düşük maliyet, pazara hızlı ulaşım, hizmet alanının geniş olması seçenekleri ön plana çıkmaktadır.. Aksaray ilinin İç Anadolu bölgesinde yer alması, doğu ile batı bölgeleri arasında geçiş güzergâhında kilit rol oynaması ve siyasi otoritenin karayoluna verdiği önem ile Aksaray ili ve çevre iller arasında yer alan karayollarının duble yol olması nedeniyle de pazara hızlı ulaşım seçeneği son derece mantıklı bir seçenek haline gelmiştir. Aksaray ilinde demiryolu taşımacılığının yapılabilmesi için gerekli olan altyapının olmaması ve denizlere kıyısının olmamasından dolayı karayolu taşımacılığı ön plana çıkmaktadır. İşletmeler karayolu haricindeki taşımacılık yöntemini kullanmak istemeleri durumunda ilk etapta yine karayolunu kullanmak zorunda kalarak karma taşımacılık yapmak zorunda kalmaktadırlar. Karma taşımacılık yönteminin seçilmesi işletmelerin hem ürünlerini geç teslim etmelerine hem de maliyetlerini artırmalarına neden olmaktadır. Aksaray ilinde faaliyet gösteren işletmelerin küçük ve orta düzeyde işletme olmalarından dolayı maliyetlerin işletmeler için son derece önemli olması işletmelerin karma taşımacılık yöntemini seçmeden direkt karayoluyla taşımacılık faaliyetlerini gerçekleştirmesine neden olmuştur.

Araştırmaya katılan işletmelerin 85 adedi (%97,7) ulaştırma-nakliye-taşımacılık lojistik faaliyetinde dış kaynak kullanımı yoluna gittiğini belirtmiştir. Bu 85 işletmenin 36 tanesi (%41,4) dış kaynak kullanımı yüzünden hizmet aldığı firmaya lojistik harcamalarının %1-20 arasında ödeme yapmaktadır. 34 tanesi ise (%36,8) dış kaynak kullanımı yüzünden lojistik harcamalarının %21-40 arasında ödeme yapmaktadır. İşletmelerin lojistik maliyetlerinin %1-40 arasında hizmet alınan firmaya ödeme yapması işletmelerin sadece tek bir lojistik faaliyette dış kaynak kullanımına yönelmediğini işletmelerin büyük bir çoğunluğunun çeşitli lojistik faaliyetlerde de dış kaynak kullanımına yöneldiği sonucuna ulaşmamızı sağlamaktadır.

Ankete katılan işletmelerin 78 adedi (%89,7) depolama lojistik faaliyetinde dış kaynak kullanımına yönelmiştir. 78 işletmenin 32 adedi hizmet aldıkları firmaya lojistik harcamalarının %1-20 arasında ödeme yapmaktadırlar. Bu işletmelere ilaveten 30 işletme lojistik harcamalarının %21-40 arasında hizmet aldıkları firmaya ödeme yapmaktadır. Bu sonuçlardan da anlaşılacağı üzere işletmeler depolama lojistik faaliyetinde dış kaynak kullanımının lojistik harcamalar içerisindeki payı %1-40 arasında değişmektedir.

Ankete katılan işletmelerin 77 adedi (%88,5) satın alma-tedarik lojistik faaliyetinde dış kaynak kullanımına yönelmiştir. Bu işletmelerin 31 adedi hizmet aldıkları firmaya lojistik harcamalarının %1-20 arasında ödeme yapmaktadır. Bu işletmelere ilaveten 29 işletme ise %21-40 arasında hizmet aldıkları firmaya ödeme yapmaktadır. Bu sonuçlardan da anlaşılacağı üzere işletmeler satın alma-tedarik lojistik faaliyetinde dış kaynak kullanımının lojistik harcamalar içerisindeki payı %1-40 arasında değişmektedir.

Bu bulgulardan da anlaşılacağı üzere Aksaray ilinde faaliyet gösteren işletmelerde dış kaynak kullanımına gidilen lojistik faaliyetlerden en çok tercih edilenler sırasıyla ulaştırma-taşıma-nakliye, depolama ve satın alma-tedarik lojistik faaliyetleridir. İşletmeler bu faaliyetlerde dış kaynak kullanımına yönelmeleri neticesinde her bir faaliyet alanı için hizmet aldıkları firmaya lojistik harcamaları içerisinden %1-40 arasında ödeme yapmaktadır.

Araştırmaya katılan işletmelerin %49,4'ünün lojistik maliyetleri ürün satış bedelinin %6'sı ile %10'u arasında bir değer ifade etmektedir. Bu %49,4'lük dilime karşılık gelen 43 işletmenin 18 tanesi lojistik faaliyetlerde dış kaynak kullanımı yüzünden hizmet aldığı firmaya hizmet bedeli olarak lojistik harcamalarının %1-20 arasında bir ödeme yapmaktadır. Yine aynı şekilde lojistik harcaması ürün bedelinin %6'sı ile %10'u arasında olan işletmelerin 17 tanesi aynı bedel için %21 ile %40 arasında bir

ödeme yapmaktadır. Geriye kalan 8 işletmenin dış kaynak kullanımına ödediği bedel ise %40'ın üzerindedir. Bu bulgulardan anlaşılacağı üzere lojistik maliyetleri ürün satış bedeli içerisinde %6-10 arasında olan işletmeler lojistik faaliyetlerde dış kaynak kullanımı neticesinde hizmet aldıkları firmaya %1-%40 arasında bir ödeme yapmaktadırlar.

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Kayseri'deki Mimarlık Bürolarında Karşılaşılan Fiziksel ve Psikolojik Sorunlar

Z. Özlem Parlak Biçer

Erciyes University, Faculty of Architecture, Department of Architecture, 38039 Kayseri, Turkey
parlako@erciyes.edu.tr, parlakoz@yahoo.com

Selen Öztürk
ozturkselen@windowslive.com

Nur Selcen Karaaslan
selcenkaraaslan@gmail.com

Özet: Yapı sektörü içerisinde en öneli yer mimarlara aittir. Çünkü bir mimari proje olmadan hiçbir yapı başlayamaz. Mimarlık mesleğinin önemi ayrıca yapı sektöründe pek çok alanda hizmet vermesi ile pekişmektedir. Mimarlar; kamu kurumlarında ve özel sektörde çalışmalarını sürdürmektedirler. Her iki durumda yaptıkları işler; tasarım, uygulama proje çizimi, denetim, şantiye uygulamaları ve ihale dosyaları hazırlamak gibi ana kavramları kapsamaktadır. Mimarlar ayrıca yapı denetim firmalarında, başkasına veya kendine ait olan özel mimari bürolarda, inşaat firmalarında çalışmaktadırlar. Mimarların bir diğer sorumluluğu ise kanun ve yönetmeliklerin hazırlanması ve/veya uygulanmasını sağlamaktır. Bunlar arasında mimarlar için mimari bürolar, çalışma süresinin büyük kısmının geçtiği ortam olması sebebi ile büyük öneme sahiptir. Mimari büro, tasarım ve uygulamanın yapıldığı, bunlara yönelik gerekli örgütsel faaliyetlerin gerçekleştirildiği, farklı düzeylerde yönetici ve çalışanlar tarafından kullanılan bir mekândır. Tarihsel gelişim süreci içinde mimarlık büroları değişim geçirmiş ve algısı da değiştirmiştir. Gelişen teknoloji, çalışanların fiziksel ve psiko-sosyal ihtiyaçlarına bağlı olarak mimarlık bürolarının teknik ve fiziksel donanımı değişmektedir. Fiziksel ve teknik donanımın değişmesi, eğitimli iş gücünün artması, mimarlık bürolarına katkı sağladığı gibi bazı sorunların ortaya çıkmasına da sebep olmaktadır. Çalışma konusu kapsamında günümüzdeki mimari büro ortamını görmek ve farklı bürolar arasında karşılaştırma yapabilmek için Türkiye'den bir kısım mimarlık büroları hakkında bilgiler örnek olarak incelenmiştir. Çalışmaya örnek alan olarak Kayseri şehri seçilmiştir. Kayseri örnekleminde mimari büroların sorunlarını inceleyebilmek için anket çalışması düzenlenmiştir. Mimari bürolarda işveren ve çalışan personele yönelik anket soruları hazırlanmıştır. Bu anket sonuçları doğrultusunda, Kayseri kenti özelinde, mimari bürolarda karşılaşılan fiziksel ve psikolojik sorunların ortaya çıkarılması ve çözüm bulunması hedeflenmektedir. Çalışmaya örnek olan Kayseri mimarlık bürolarında yapılan bu araştırmanın, ülke ölçeğine de geçirilerek sektörün büro bazındaki sorunlarını ortaya koymakta temel olması umulmaktadır.

Anahtar Kelimeler: Kayseri, Mimarlık, Büro

Giriş

Mimarlık; insanların barınmaları, çalışmaları, eğlenmeleri ve dinlenmeleri için estetik olan mekânlar, yapılar tasarlama, organize etme ve düzenleme sanatıdır. Diğer bir deyişle; canlıların içinde bulunduğu çevreyi ve yapıları tasarlama inşa etme sanatıdır. Doğa şartlarından zarar görmemek ve barınmak için insanların ihtiyaç duydukları bazı mekânlar vardır. Bu mekânları kendilerine özgü zevklerle oluştururlar. Mimarlık, içinde bulunulan dönemin düşünce akımlarındaki, sosyal yapısındaki sonuçlardan doğan bir evredir. Mimari eserler içlerinde dönemlerin değerlerini barındırırlar. Bu nedenle meydana gelen mimari eserlerin gelecek kuşaklara aktarılması için korunmaları gerekmektedir (Wikipedia, 2014).

Mimarlıkla ilgili tarihin ilk çağlarından itibaren yapılan pek çok çalışmaya rastlamak mümkündür. MÖ 1. yüzyılda Romalı mimar Vitruvius "De Architecture" adlı kitabını yayınlamıştır. Burada başarılı bir mimarlık için "Utilitas, Firmitas, Venustas" (kullanışlılık, sağlamlık, güzellik) etmenlerinin olması gerektiğini savunmuştur. Rönesans zamanında gelindiğinde Vitruvius'un MÖ 1.yy'da yapmış olduğu tanım "Comodita, perpetuita, bellezza" (kullanışlılık, süreklilik- kalıcılık, güzellik) olarak değişmiştir. Sir Henri Watton "The Elements of Architecture" (1624) adlı kitabında mimarlığın kullanılışlılık, sağlamlık, güzellik kavramlarına cevap vermesi gerektiğini savunmuştur. Frank Llyod Wright'a göre ise "Mimarlık biçim haline gelmiş yaşamdır"(İzgi, 1994).

Mimarlık ve yapı sektörü arasında doğrudan bir ilişki vardır. Mimarlık mesleği mensupları makine mühendisi, inşaat mühendisi, peyzaj mimarı, iç mimar meslek grupları ile ilişki içindedirler ve proje için gerekli olan planlama, tasarlama, üretim gibi işlerin organizasyonunu yaparlar (Wikipedia, 2014).

Mimarlık okulundan mezun olan mimarlar, ilgi alanları geniş olduğu için çok farklı alanlarda çalışabilmektedirler (Wikipedia, 2014) Öğrencilerinde stajlarını yaptıkları ve ileride meslek erbabı olduklarında çalıştıkları mimari büro; kayıtların tutulduğu, danışma işlerinin yapıldığı ve yürütüldüğü yer olarak tanımlanabilir. Büronun ayrıca çalışma odası, yazı masası, şube gibi anlamları da mevcuttur (Terlik, 2010). Büro ve ofis kelimeleri genellikle eş anlamlı kullanılmaktadır. Fakat köken incelemesi yapıldığında farklı kökenlerden geldiği görülmüştür. Büro kelimesinin Latincedeki karşılığı "burro"dur. Bu kelime kaba giysi anlamına gelmektedir. Latincedeki "burro" kelimesi ile Fransızcadaki "Bur" kelimesi aynı anlamda kullanılmaktadır. 12.yüzyıla gelindiğinde ''bureau'' olan büro kelimesinin kökeni, yazı masalarını örtmek için kullanılan örtü anlamında kullanılmıştır (Yalçınpınar, 2009). Ofis kelimesi Latince'de "opus" demektir ve "iş", "yapıt" anlamında kullanılmaktadır. Çok farklı anlamları olan ofis kelimesi genel olarak "düşünce'' ve "daire" kavramları arasında bir bağlantı kurmaktadır. Bunların dışında bir topluluğun yerine getirdiği hizmetin, organizasyonların yapıldığı bina anlamı da vardır.(Yalçınpınar, 2009)

Büro ve ofis kelimeleri üzerine yapılmış araştırmalar sonucunda her ikisinde de bir işin yapıldığı ve bu işin yapıldığı bir mekânın olduğu saptanmıştır. Fakat ofis eylemin gerçekleştiği yer için geniş açılımlar getirilirken, büro eylemine yönetimsel bir içerik katılarak belirli bir mekân biçimlemesi yapılmıştır (Doğan, 2008). Bürolar çok farklı disiplinler tarafından kullanılmaktadır ve mimari bürolar bunlardan biridir. Mimari bürolar mesleki uzmanlık hizmeti sağladığı ve kendi başına tam bir iş yeri halinde çalıştığı için büro türlerinden "bağımsız büro" türüne girmektedir (Terlik, 2010)

1880'den sonra sanayi devriminin ardından ofis binaları inşa edilmeye başlanmıştır. İlk ofis binalarına 15. yüzyılda rastlanmıştır. 1560–1574 yılları arasında Floransa'da Giorgio Vasari tarafından inşa edilen "Uffizzi" ilk ofis binası olarak görülmektedir. 15. yüzyıl ile 19. yüzyıl arasında inşa edilmiş kraliyet sarayları, hükümetlerin büro işlerini yürüttükleri yapılar olmuşlardır. Bugün büro yapısı olarak isimlendirilen bu saraylar günümüz büro anlayışından oldukça farklıdır. Teknolojik gelişmeler sonucu 19. yüzyılın sonlarında çağdaş ofis kavramı ortaya çıkmıştır (Yalçınpınar, 2009). 19. yüzyılda modernizm kavramı ile birlikte mimarlık büroları da önem kazanmaya başlamıştır. Bu dönemde, Türkiye'de mimarlık bürolarının İstanbul'un Galata bölgesinde yer alan hanlarda yoğunlaştığı bilinmektedir. Ancak bu mimarlık büroları modern anlamda büro kavramından farklıdır. (Akay, Ardıçoğlu, 2014)

Türkiye'de yer alan mimarlık bürolarından Emre Arolat Architects, Bektaş Mimarlık, Hilmi Güner Mimarlık, Tabanlıoğlu Mimarlık bu kapsamda incelenmiştir. Cengiz Bektaş'ın işveren olduğu Bektaş Mimarlık küçük ölçekli bir bürodur. Mimarlık bürosunda işverenin yanı sıra iki mimar, bir sosyolog, bir iç yönetmen olmak üzere 5 kişi çalışmaktadır. Büroda eğitim amaçlı belirli periyotlarda geziler düzenlenmektedir. Büroda tasarım aşamasında eskiz ve maket kullanılmakta bilgisayar kullanılmamaktadır. Belli bir aşamadan sonra bilgisayar çizimine geçilmektedir (Arredamento Mimarlık, 2009). Hilmi Güner Mimarlık yaklaşık on kişinin çalıştığı orta ölçekli bir mimarlık bürosudur. Büroda mimarlar, iç mimarlar, peyzaj mimarları görev almaktadır. Dönemsel olarak projelerin gerektirdiği uzmanlık alanlarına göre çalışan sayısı artmaktadır. Ayrıca proje gereklerine göre farklı disiplinlerden

danışmanlık hizmetleri alınmaktadır. Proje üretim aşamalarında bilgisayar ve her türlü teknik cihaz kullanılmaktadır. Bunun yanı sıra eskizler ve çalışma maketleri de tasarım sürecinde kullanılan yöntemlerdir (Arredamento Mimarlık, 2009). Emre Arolat Architects; Emre Arolat ve Gonca Paşolar'ın işveren olduğu, 33 mimar, 3 teknik ressam, 1 grafik tasarımcı, 1 endüstri tasarımcı, 3 asistan, 2 lojistik sorumlusu, 2 mutfak görevlisi olmak üzere yaklaşık 55 kişinin çalıştığı büyük ölçekli bir mimari bürodur. Çalışan sayısının fazla olması nedeniyle büro 4 gruba ayrılmıştır. Birinci grup proje konusunun araştırılması, sayısal belirlemeler ve yapısal hazırlıkla sorumludur. İkinci grup mimari tasarım aşamasında görev almaktadır. Bu grupta yer alan çalışanlar belli aralıklarla tasarımlarını işveren Emre Arolat ile kritik etmektedir (Arredamento Mimarlık, 2009). Bir sonra ki aşamada ise genellikle işverenin nadiren çalışanların yaptığı hazırlıklar periyodik toplantılarla irdelenmektedir. Diğer gruplar ise uygulama projesinin çizilmesi ve sunuma hazırlanması kısmında görev almaktadırlar. Çalışanlara belli aralıklarla eğitimler verilmektedir. Bu eğitimlerde genellikle mimari tasarım gücünün geliştirilmesi amaçlanmıştır. Bilgisayar ve her türlü teknolojik araç proje üretim aşamalarının her birinde etkin olarak kullanılmaktadır (Arredamento Mimarlık, 2009). Tabanlıoğlu Mimarlık 80'i mimar olmak üzere yaklaşık 100 kişinin çalıştığı büyük ölçekli bir mimari bürodur. Çalışanlar yönetici mimarların liderliğinde beş ayrı grup olarak çalışmakta ve iş bölümü yapmaktadır. Büroda herkese ayrılmış birer bilgisayar ve bilgisayarlarda çalışanın ihtiyacına göre yüklenmiş tüm programlar yer almaktadır. Büroda oluşturulan ağ sistemi ile tüm projeler ve belgeler çalışanlar ve işveren tarafından takip edilebilmektedir. Proje üretim aşamasında bilgisayar ve teknolojik aletlerin yanı sıra çalışma maketler ve eskizler de kullanılmaktadır. Katıldığı yarışmalar, düzenlediği sergiler, yayınladığı kitaplar ve farklı yöntemler arayıcılığı ile mimarlık yaklaşımını ifade etmektedir (Arredamento Mimarlık, 2009).

Türkiye'de yapılan ve yukarıda bahsi geçen çalışmada yer alan mimari bürolar, İstanbul ve Ankara'da yer almaktadır. Bu bürolarda yapılan çalışma, tüm Türkiye için bir örnek teşkil edememektedir. Bahsi geçen çalışma, mimari büroların çalışma şeklini göstermektedir. Mimari bürolarda çalışan ve bu büroların işletimi gerçekleştiren kişilerin sorunlarına çok değinilmemiştir. Ancak yine de bir mimari büroyu tanımlamak için önemli görülmüştür. Türkiye'de mimari hizmet sektörü sadece Ankara ve İstanbul ile sınırlı değildir. Yapı sektörünün gelişmesi ve lokomotif olması sebebi ile tüm illerde bu sektöre yapılan yatırımlar büyüktür. Dolayısıyla mimarlık hizmetleri de tüm Anadolu'nun farklı şehirlerinde önemli bir yer tutmaktadır. Tarafımızdan yapılan çalışmada Kayseri kenti örneklem olarak seçilmiştir. Bu örneklem, Türkiye'nin diğer kentlerinde hizmet veren mimari büroların sorunlarını belirlemekte bir başlangıç olacaktır. Çalışmanın; mimari büroların Türkiye'deki durumlarının ve sorunlarının ortaya koyulmasında ve bürolarda çalışan kişilerin problemlerinin belirlenmesinde yapılacak bundan sonraki çalışmalara bir temel teşkil edilmesi umulmaktadır.

Materyal ve Metot

Bu çalışmada çoktan seçmeli anket uygulaması gerçekleştirilmiştir. Anket, işveren ve çalışanlara yönelik olarak iki formda hazırlanmıştır. Hazırlanan anketler, Kayseri'de 27 büroda çalışan ve büro sahiplerine yapılmıştır. Çalışanlar ve işverenler için 2 ayrı soru tipi hazırlanan ankete 85 büro çalışanı 44 işveren katılmıştır. Anket sonucu toplana veriler, Excel programı yardımı ile istatistiksel veri haline dönüştürülmüştür. Yapılan istatistikler ise anlaşılabilirliği ve okunabilirliği açısından grafiklerle ifade edilmiş ve sonuçlar yorumlanmıştır. Bu anket çalışmasıyla işverenlerin büronun kurulum aşamasında ne tür zorluklarla karşılaştıkları ve işletim aşamasında ne tür uygulamalar yapıkları analiz edilmeye çalışılmıştır. Büroda kullanılan sistem ve araçlar hakkında sorular sorulmuştur. Büro çalışanlarının hangi kademelerde görev aldığı anket konusu olmuştur. Ayrıca büro çalışanlarına karşılaşabilecekleri problemler hakkında sorular yöneltilmiştir. Bu sorunların kendilerini nasıl etkilediğine dair cevaplar da ankette yer almıştır.

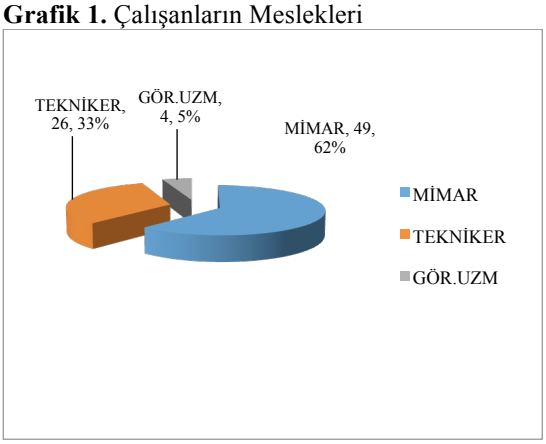
1. Bulgular

Yapılan anket sonucunda elde edilen bulgular, çalışan ve işveren olarak iki gurupta değerlendirilmiştir. Bulgular başlığı altında her iki gruba yapılan anket çalışması, alt başlıklara ayrılarak verilmiştir. Veriler, anket soruları bazında sıra ile incelenmiştir.

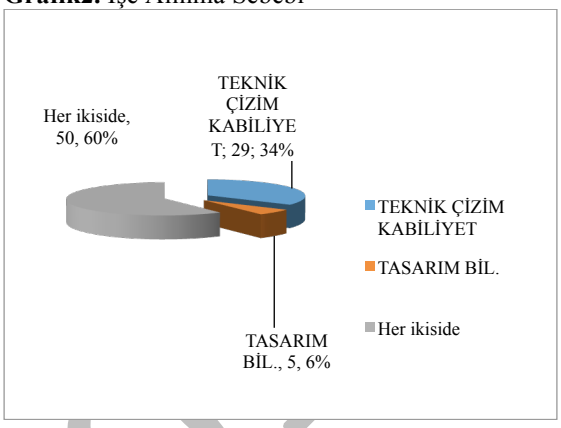
1.1. Mimari Büro Çalışanlarına Yapılan Anket Sonuçları

Anket, 27 büroda toplam 85 çalışana yapılmıştır. Mimari bürolarda birçok meslek grubundan kişi çalışmaktadır. Yapılan anket çalışması ile çalışanların %62'sinin mimar, %33'ünün görselleştirme uzmanı, %5'inin teknikerdir olduğu söylenmektedir (Grafik 1). Bürolara çalışanlar işe alınırken bazı özellikler aranmaktadır. Çalışanlar işe alınırken %34'ünün teknik çizim kabiliyetine göre, %6'sının tasarım bilgisine göre, %60'ının hem tasarım hem teknik çizim sebebi ile işe alındıkları saptanmaktadır (Grafik 2.).

Grafik 1. Çalışanların Meslekleri

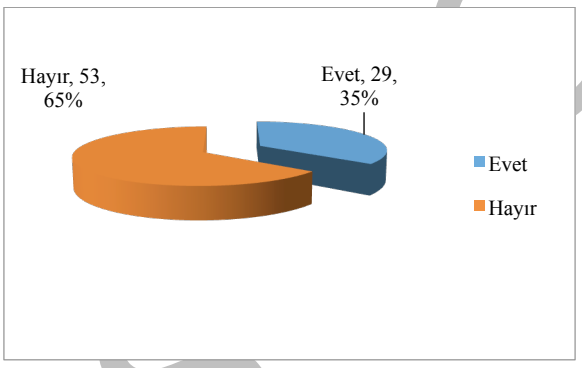


Grafik2. İşe Alınma Sebebi

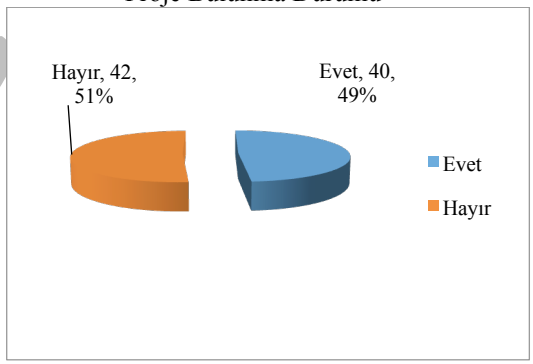


Bürolarda çalışanlar işe alınırken sözleşme imzalanması gerekmektedir. Sözleşme çalışan haklarının korunması açısından önemli bir belgedir. Çalışanların %35'i işe alınırken sözleşme imzalamış, %65'i sözleşme imzalamamaktadır (Grafik 3). Çalışanların mevcut durumda üzerlerinde olan ve sorumluluklarına bırakılan proje durumu incelenmiştir. Buna göre; %49 'unun bir mimari projeden sorumluyken, %51'inin üzerinde bir mimari proje olmadığı söylenmektedir (Grafik 4).

Grafik 3. İşe Girmede Sözleşme İmzalama Durumu

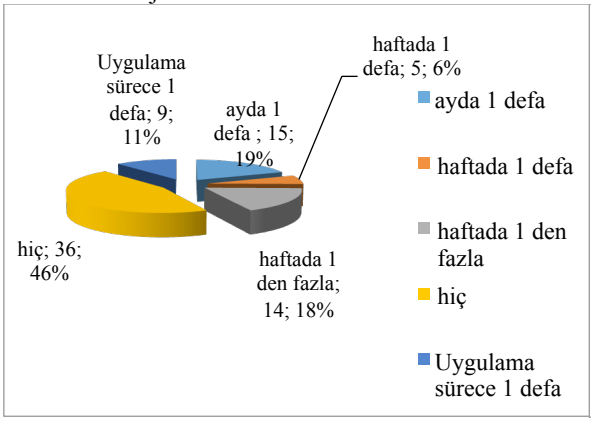


Grafik 4. Çalışanın Sorumluluğunda Mimari Proje Bulunma Durumu

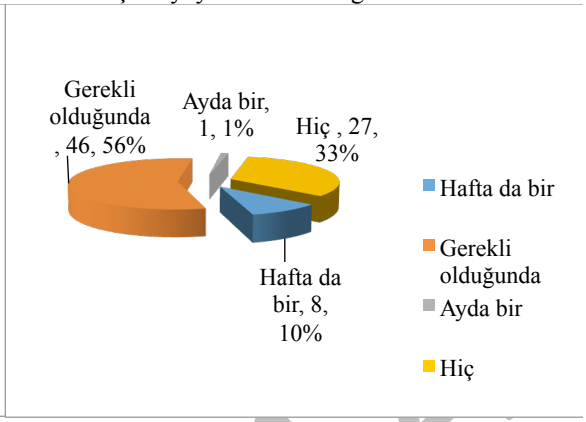


Çizilen projenin doğru bir şekilde yapılması için uygulama aşamasında da takip edilmesi gerekmektedir. Projelerin uygulama aşamasında çalışanlardan %19'unun ayda bir, %6'sının hafta da bir, %18'inin haftada birden fazla, %11'inin tüm uygulama sürecinde bir kez projeyi yerinde kontrol ettikleri belirlenmektedir. Çalışanların %46'sı ise projeyi uygulama yerinde hiç kontrol etmemektedir (Grafik 5). Projenin şantiyede de kontrol edilmesi gerekmektedir. Çünkü Proje çizimi ile uygulaması arasında farklılıklar olmaktadır ve yanlışlara anında müdahale edilmesi gerekmektedir. Eğer müdahale edilmezse ilerde daha büyük problemler ortaya çıkabilir. Çalışanların %1'i şantiyeye ayda bir, %10'u haftada bir, %45'i şantiyeye gerekli olduğunda giderken %33'ü hiç gitmemektedir (Grafik 6).

Grafik 5. Proje Kontrol Durumu

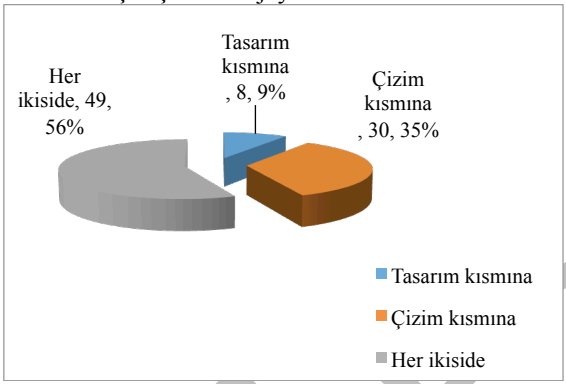


Grafik 6. Şantiyeye Gitme Sıklığı

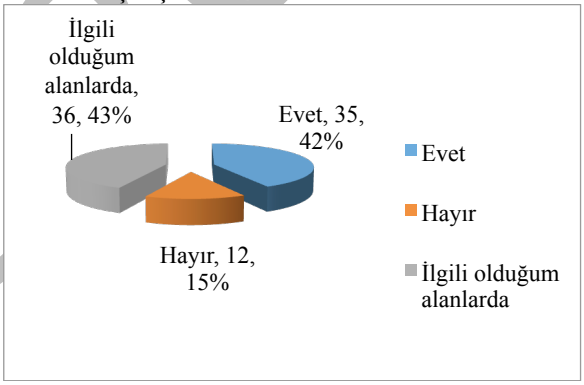


Proje tasarım ve çizim olarak ayrılmaktadır ve çalışanların farklı işleri vardır. Çalışanların %9'u ofise gelen projelere tasarım kısmında, %35'i çizim kısmında katkı sağlarken %56'sı çizim ve tasarımın her ikisinde de katkı sağlamaktadır (Grafik 7). Çalışanların %42'si tasarıma aktif olarak katıldığını; %15'i aktif olarak katılmadığını belirtmektedir. %43'ü ise ilgili olduğu konuda söz hakkı verildiğini söylemektedir (Grafik 8).

Grafik 7. Çalışanın Projeye Katkı Durumu

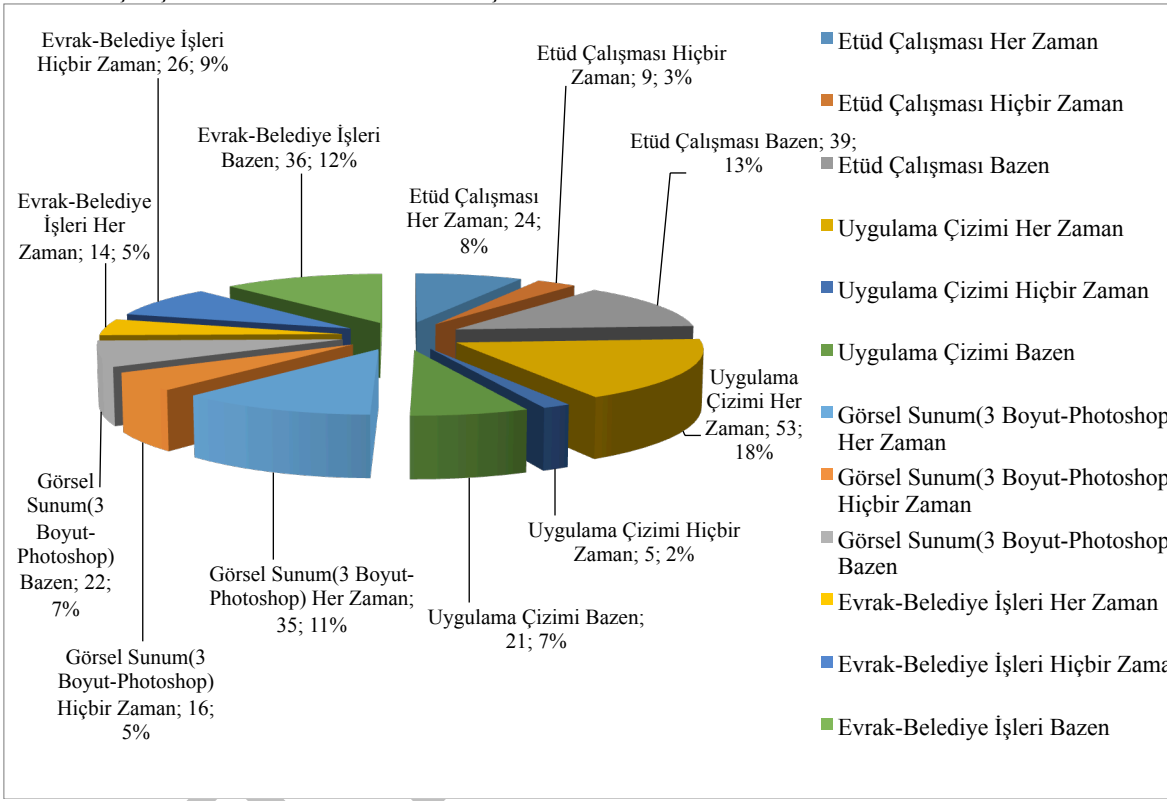


Grafik 8. Çalışanın Tasarımda Söz Hakkı Durumu



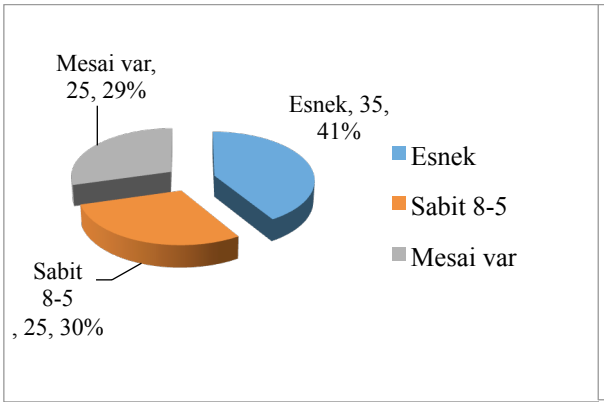
Çalışanlara projenin tasarım evrelerinin hangi aşamalarında bulundukları sorulmuştur ve etüt çalışmalarında %8'inin her zaman, %13'ünün bazen bulunurken %3'ü hiçbir zaman bulunmadığı saptanmaktadır. Uygulama çiziminde ise çalışanların %18'inin her zaman; %7'sininbazen bulunurken %2'sinin hiçbir zaman bulunmadığı saptanmaktadır. Görsel sunum hazırlama aşamasında çalışanların %11'i her zaman; %7'si bazen bulunurken %5'i hiçbir zaman bulunamamaktadır. Çalışanların evrak-belediye işlerinde %5'i her zaman; %12'si bazen bulunurken %9'u hiçbir zaman bulunmamaktadır (Grafik 9).

Grafik 9. Çalışanların Tasarım Evrelerinin Aşamalarında Bulunma Durumu

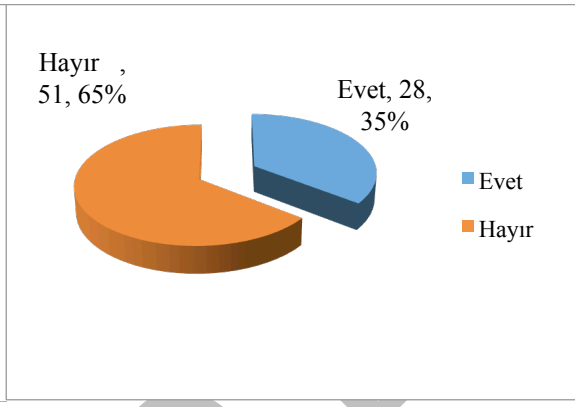


Mimari bürolarda yapılan işlerin belirli bir bitim zamanı yoktur. İşlerin tamamlanması için ek çalışmalara ihtiyaç duyulabilmektedir. Çalışanların %41'i çalışma saatleri esnek olduğunu, %29'u fazla mesai saatlerinin olduğunu, %30'u ise belirli çalışma saatleri olduğunu söylemektedir (Grafik 10). Çalışanlara fazladan yapılan mesailer ve çalışmalar için ücret ödenme durumu incelenmiştir. Bu doğrultuda çalışanların %35'ine fazla mesai saatlerine ücret ödenirken, %65'ine ücret ödenmemektedir (Grafik 11). Bürolarda finans akışı farklı şekillerde sağlanmaktadır. Bu finans akışının sürekliliği bozulduğu takdirde bürodaki diğer işlerde de sorun çıkmaktadır. Çalışanların %90'ı ofisteki mali sorunların maaşlarına etki etmediğini, %10'u etki ettiğini söylemektedir (Grafik 12).

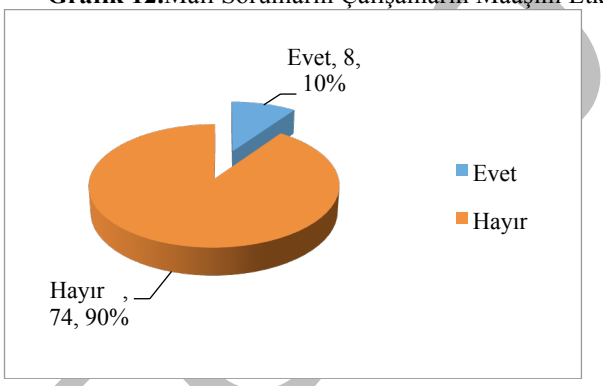
Grafik 10. Çalışanların Gün İçinde Çalışma Saati



Grafik 11. Çalışanlara Fazla Mesai Ücreti Ödenme Durumu

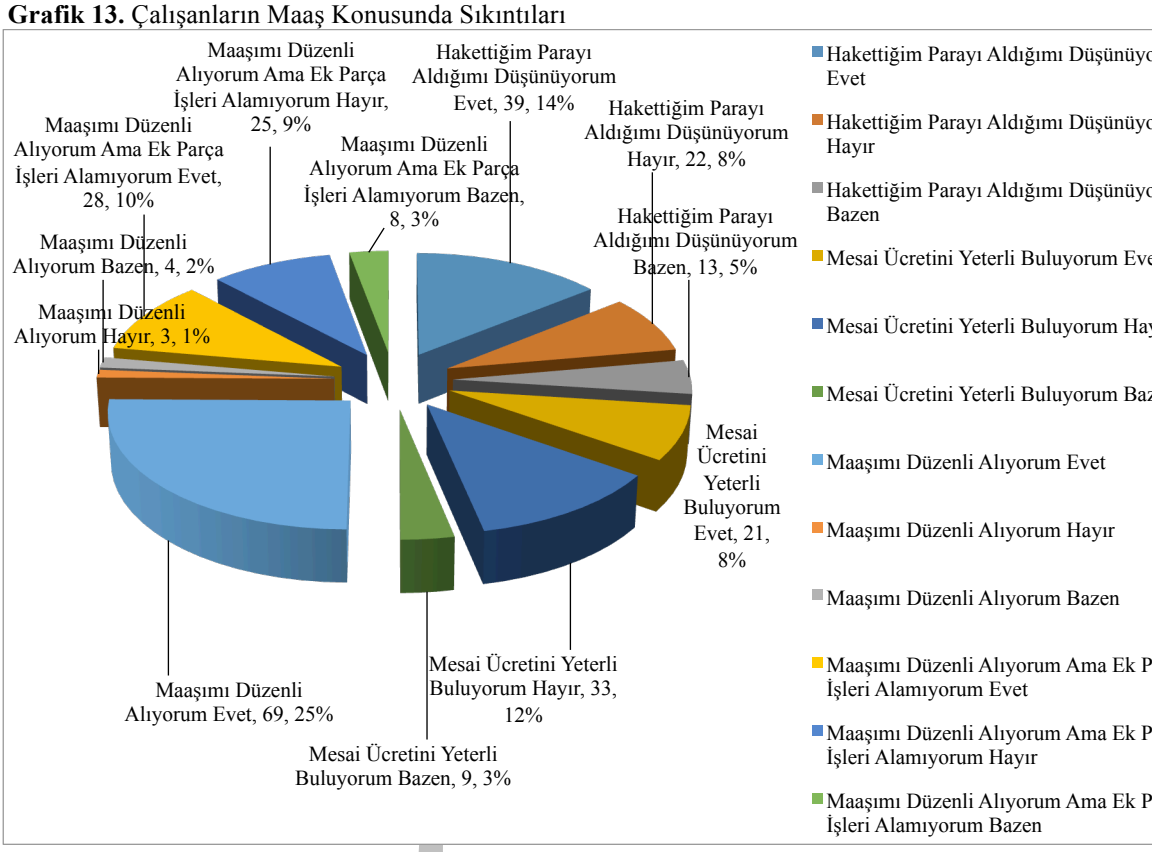


Grafik 12. Mali Sorunların Çalışanların Maaşını Etkileme Durumu



Çalışanların ücret durumlarından memnuniyetleri sorgulanmıştır. Çünkü bu durum, çalışanların motivasyonunu, işe bağlılığı, işi sevmemeleri vb pek çok psikolojik durumu etkilemektedir. Çalışanların %14'ü hak ettiği parayı aldığını; %5'i hak ettiği parayı bazen aldığını düşünmekte, % 8'i hak ettiği parayı almadığını düşünmektedir. Çalışanların %8'i mesai ücretini yeterli bulduğunu, %3'ü bazen yeterli bulduğunu, %12'si yeterli bulmadığını belirtirken, %25'i maaşlarını düzenli aldığını, %2'si bazen düzenli aldığını, %1'i düzenli almadığını söylemektedir. Çalışanların %9'u maaşını düzenli aldığını ve ek iş parçaları aldığını, %3'ü bazen aldığını, %10'u maaşını düzenli aldığını ancak ek iş parça alamadığını söylemektedir (Grafik 13).

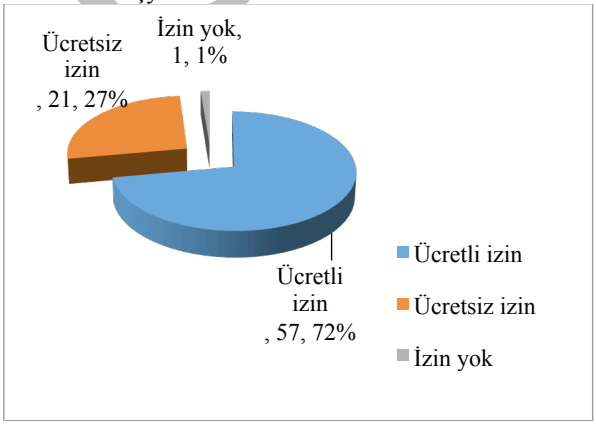
Grafik 13. Çalışanların Maaş Konusunda Sıkıntıları



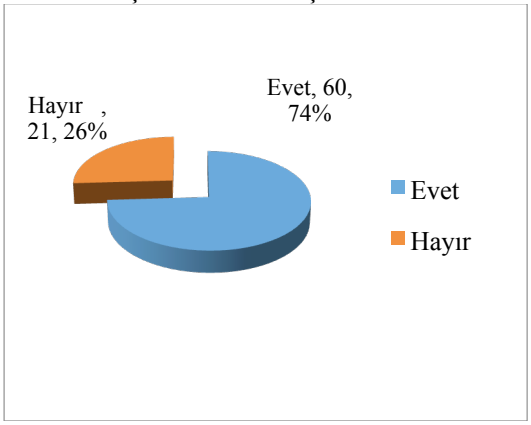
İş yerindeki hastalıklara ve bu durumdaki izinler de çalışan motivasyonunu dolayısıyla psikolojisini etkilemektedir. Bu durum göz önüne alınarak ankette izin durumu da sorgulanmıştır. Çalışanların % 27'si ücretsiz izin, % 72'si ücretli izin, % 1'i izin yok seçeneğini işaretlediği belirlenmektedir (Grafik 14).

Bir firmanın markalaşması hem çalışan hem işvereni etkilemektedir. İşyerinin markalaşmaya gidilme durumu sorgulandığında çalışanların % 26'sı hayır gidilmiyor, % 74'ü evet gidiliyor seçeneğini işaretlemiştir (Grafik 15). Markalaşmanın etkililiği sorulduğunda ise çalışanların % 30'u etkilemiyor, % 29'u motive oluyorum, % 23'ü gurur duyuyorum, yüzde 18'i mutlu oluyorum seçeneğini işaretledikleri gözlenmektedir (Grafik 16).

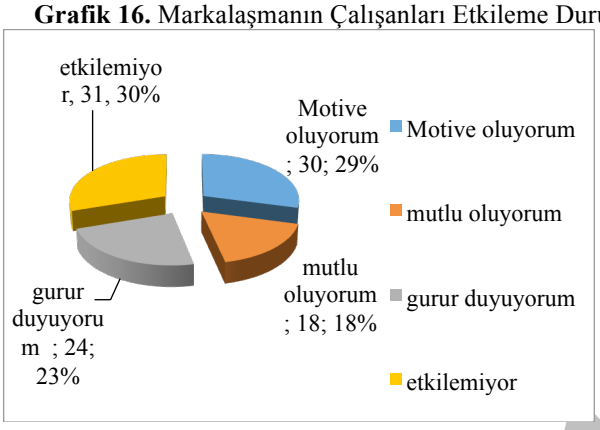
Grafik 14. İşyerinin Hastalık İzin Politikası



Grafik 15. Şirketin Markalaşma Durumu



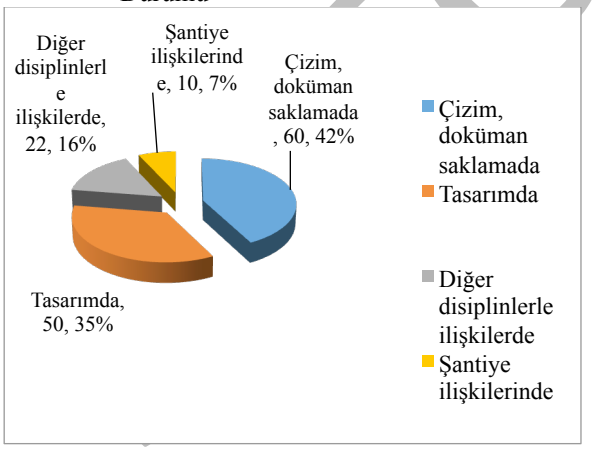
Grafik 16. Markalaşmanın Çalışanları Etkileme Durumu



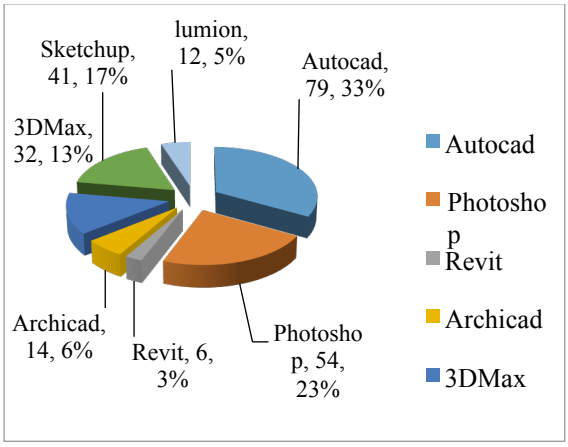
Çalışanlara bir büroda hangi durumlarda bilgisayarı kullandıkları sorulmuştur. Çalışanların % 7'si şantiye ilişkilerinde, % 16'sı diğer disiplinlerle ilişkilerde, % 35'i tasarımda, % 42'si çizim doküman saklamada seçeneğini işaretlemiştir (Grafik 17). Günümüzde çizim programlarında hızlı bir gelişme ve değişme vardır. Çalışanların bilgisayarda kullandıkları çizim programları da belirlenmeye çalışılmıştır. Buna göre çalışanların % 5'i lumion, % 17'si sketchup, % 13'ü 3D max, % 6'sı archicad, % 3'ü revit, % 23'ü photoshop, % 33'ü autocad programını kullandıkları gözlenmektedir (Grafik 18).

Büroda kullanılan çizim programlarına rağmen çalışanların tasarımda fikirlerini işverene ifade etmekte sıkıntıya düşebilecekleri göz önüne alınarak bu yönde sorgulama da yapılmıştır. Kendini ifade edemeyen çalışanın psikolojik olarak da iyi hissetmeyeceği düşünülmektedir. Çalışanların % 27'si bazen, % 7'si evet, % 66'sı hayır seçeneğini işaretlemiştir(Grafik 19). Tasarımlarını işverene anlatma da çalışanlar farklı modellemeler tercih etmektedirler. Çalışanların % 35'i 3D modeller, % 46'sı 2D çizimler, % 19'u sketch-up seçeneğini işaretlemişlerdir (Grafik 20).

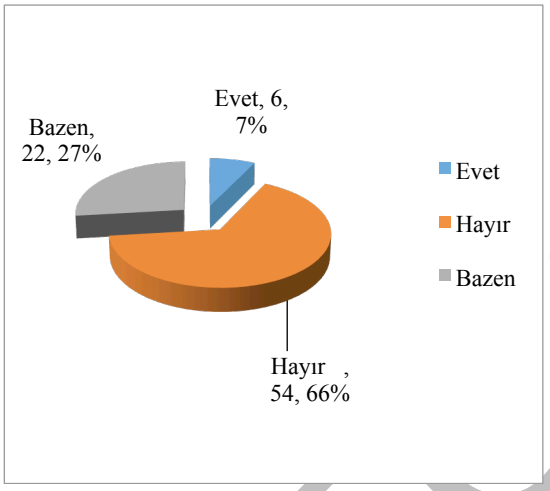
Grafik.17. Mimari Projede Bilgisayarı Kullanma Durumu



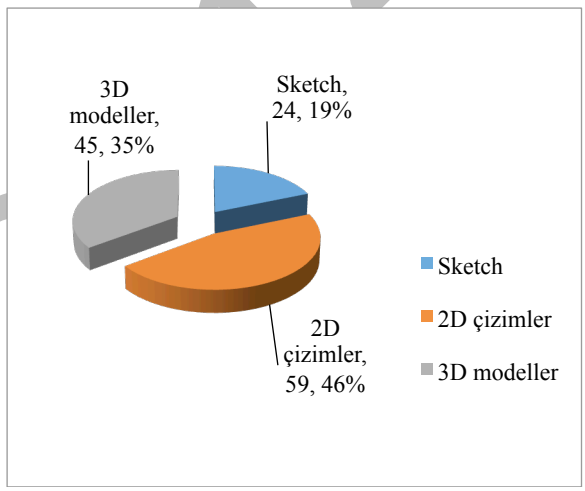
Grafik 18. Kullanılan Çizim Programları



Grafik 19. Tasarımı İşverene Anlatırken Zorlanma Durumu



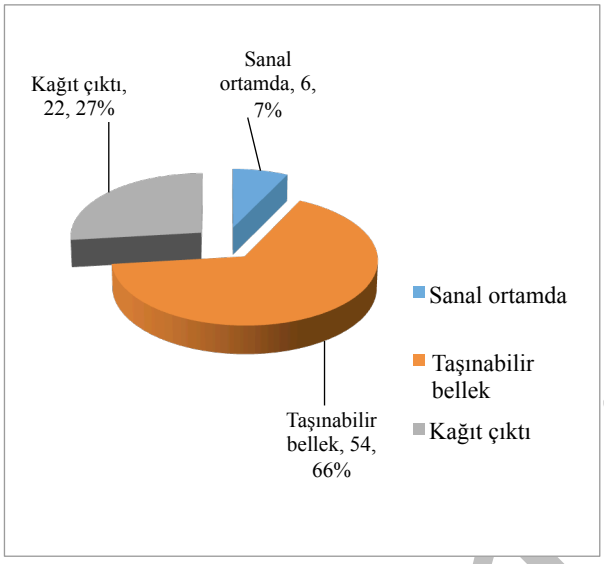
Grafik 20. Tasarımı İşverene Anlatma Şekli



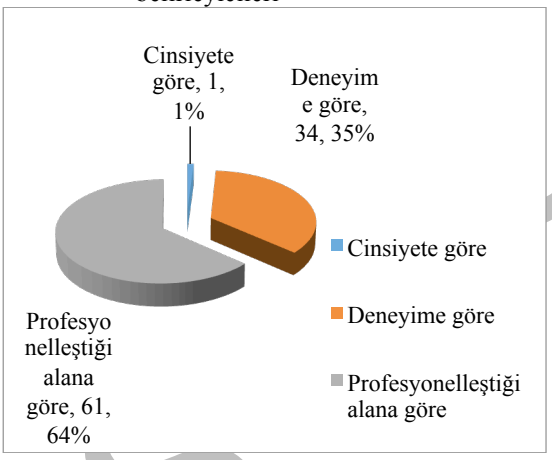
Bir büro tek başına bir uygulamayı yapamaz. Bu yüzden diğer disiplinleri içerir bürolarla ortak çalışmak durumundadır. Bu durum düzenli iletişimi gerektirdiği için çalışanlarda iletişim becerisi ve yaratacağı stres de söz konusudur. Çünkü diğer bir disipline kendini anlatması beklenmektedir. Çalışanların % 27'si kâğıt çıktı, % 7'si sanal ortamda, % 66'sı taşınabilir bellek seçeneğini işaretlemiştir (Grafik 21).

Büroda farklı işler ve süreçler görülmektedir. Bu işlerde işi alanın belirleyici özelliğinin ne olduğu irdelenmiştir. Çalışanların profesyonelliğine göre mi yoksa farklı olgulara göre mi ekip çalışmasında iş paylaşımı yapılıyor yani ayrımcılık var mı belirlenmeye çalışılmıştır. Ayrımcılık çalışma ortamındaki stres kaynağı olacaktır. Çalışanların % 64'ü profesyonelleştiği alana göre, % 1'i cinsiyete göre, % 35'i deneyime göre seçeneğini işaretledikleri saptanmaktadır(Grafik 22). Çalışanlar stres içerisinde ve yoğun çalışma ortamında tükenmişlik sendromunu da hissedebilmektedirler. Bu duyguyu yaratan çalışma ortamı etkileri anket kapsamında sorgulanmıştır. Çalışanların %45'i üst üste gelen projelerde, % 2'si proje başlangıç aşamasında, %29'u uzun süren mesai saatlerinde, %5'i toplantı sonraları, % 19'u hiçbir zaman cevabını verdikleri belirlenmektedir (Grafik 23).

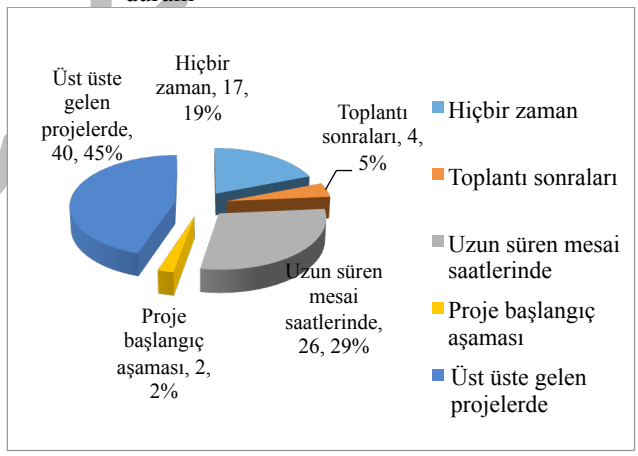
Grafik 21. Disiplinler Arası Çalışmaları Paylaşma Şekli



Grafik 22. Ekip çalışmalarında iş paylaşımının belirleyicileri

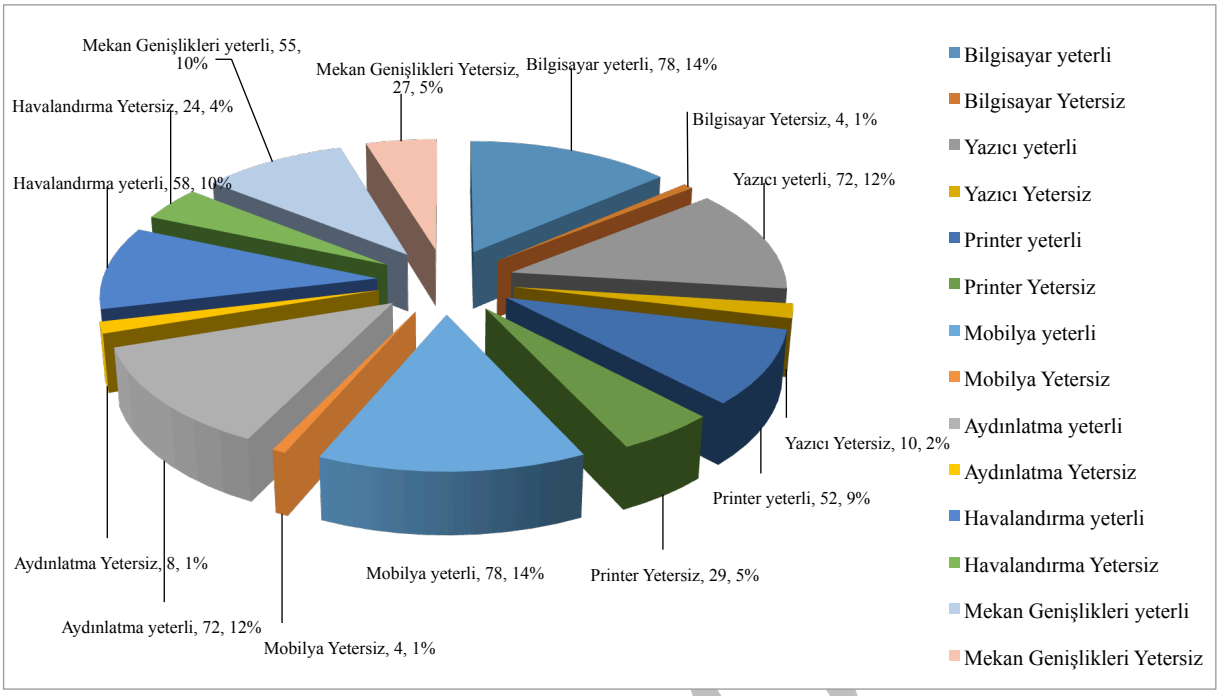


Grafik 23.Tükenmişlik duygusuna kapılmaya sebep olan durum



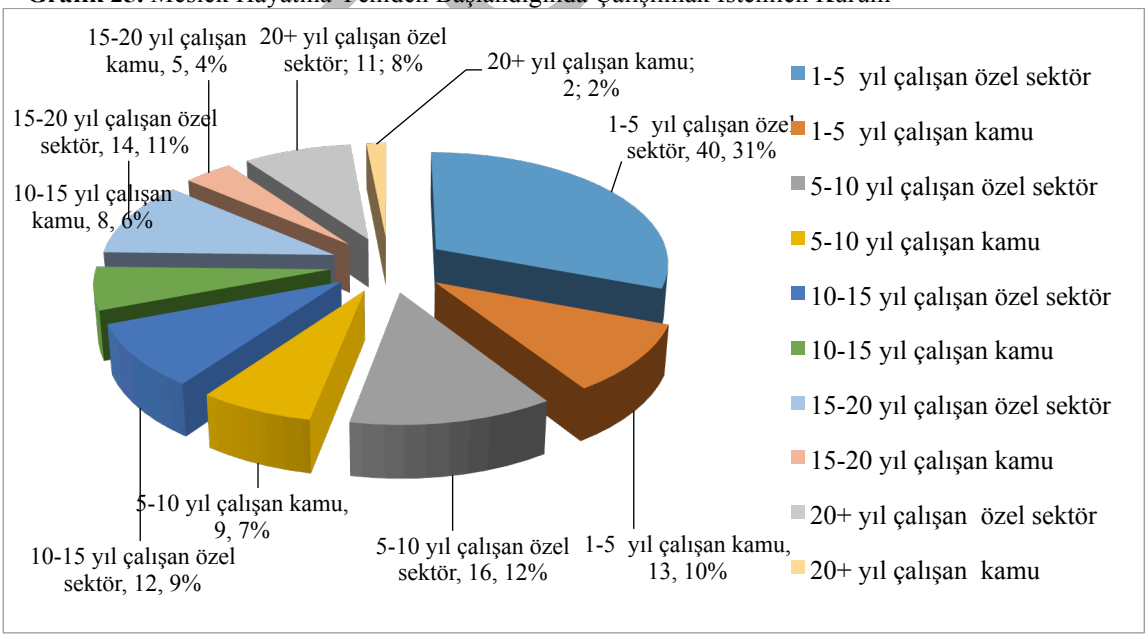
Modern büro kavramına uygun olarak büro çalışanlarının çalışma koşullarına uygun donatı ve ekipmanların bulunması önemlidir. Günümüzde teknolojinin gelişmesi ile mimari bürolarda bilgisayar ve yazıcı kullanımı oldukça yaygınlaşmıştır. Çalışanlardan %78'i bilgisayarların yeterli olduğunu, %4'ü yetersiz olduğunu, %72'si yazıcının yeterli olduğunu, %10'u yazıcının yetersiz olduğunu, %52'si printerın yeterli olduğunu, % 29'u yetersiz olduğunu, %78'i mobilyaların yeterli, %4'ü yetersiz olduğunu, %72'si aydınlatmanın yeterli, %8`i yetersiz olduğunu, %58` i havalandırmanın yeterli olduğunu, %24'ü havalandırmanın yetersiz olduğunu, %55'i mekân genişliklerinin yeterli, %2'si yetersiz olduğunu belirtmektedir (Grafik 24).

Grafik 24. Bürodaki Teknik Donatı Ve İç Mekân Kalitesi



Büro ortamında karşılaşılan sorunlar, çalışanların mesleklerini ve kendilerini tekrar sorgulamalarına neden olmakta hatta mesleklerini değiştirmeyi düşünmektedirler. Buna göre 1-5 yıl çalışanlardan %40'ı özel sektör, %13'ü kamu sektörünü, 5-10 yıl çalışanlardan %16'sı özel sektör, %9'u kamu sektörünü, 10-15 yıl çalışanlardan %12'si özel sektör, %8'i kamu sektörünü, 15-20 yıl çalışanlardan %14'ü özel sektör, %5'i kamu sektörünü tercih edeceklerini belirtmektedir (Grafik 25).

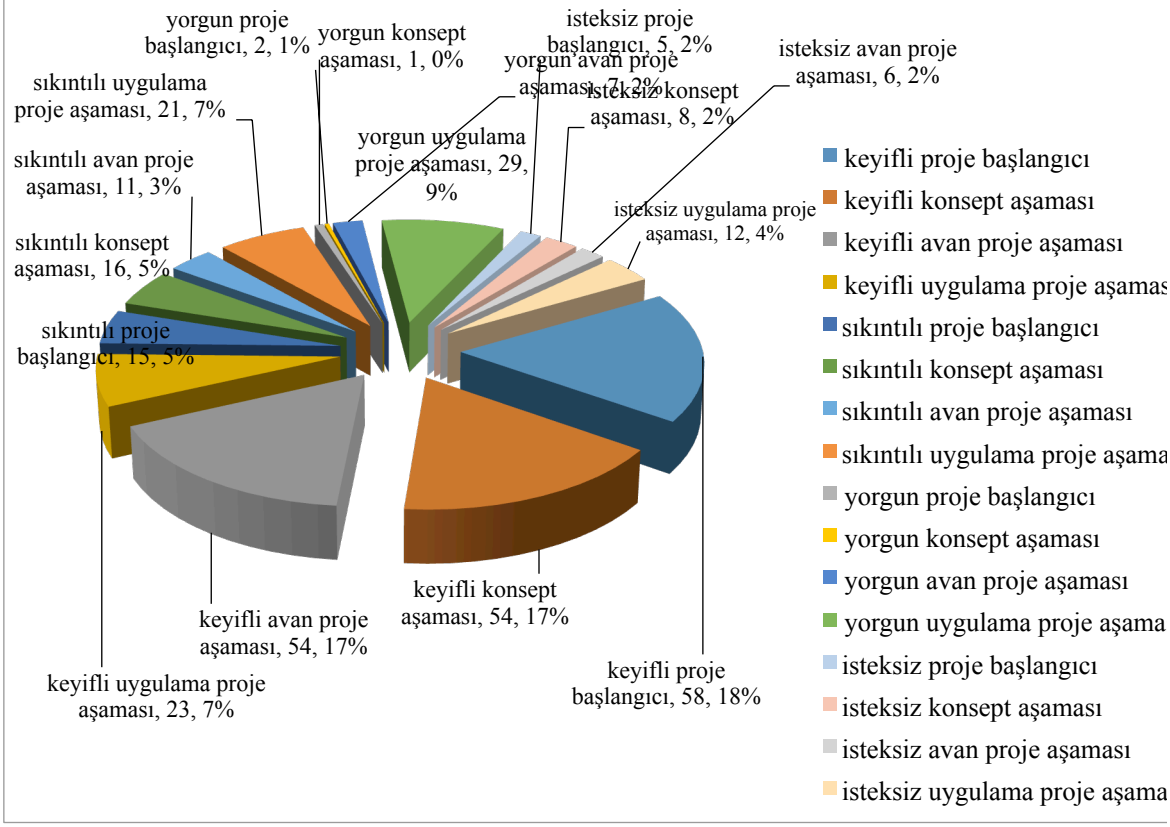
Grafik 25. Meslek Hayatına Yeniden Başlandığında Çalışılmak İstenilen Kurum



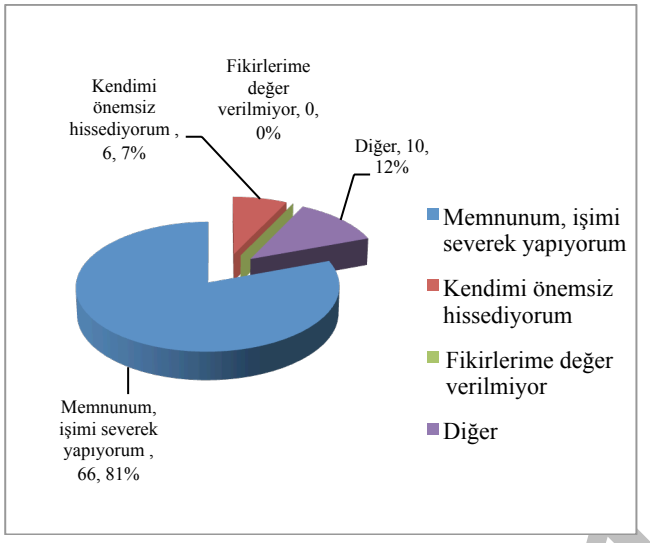
Mimari proje aşaması uzun bir süreçtir. Bu süreçte farklı düzeylerde çalışmalar yapılmaktadır. Proje başlangıcında çalışanların %58'i keyifli, % 15'i sıkıntılı, % 2'si yorgun, %5'i isteksiz, konsept aşamasında çalışanların %17'si keyifli %5'i sıkıntılı, %2'si isteksiz, avan proje aşamasında çalışanların

%17'si keyifli, %3'ü sıkıntılı, %7'si yorgun, % 6'sı isteksiz, uygulama proje aşamasında çalışanların %23'ü keyifli, %21'i sıkıntılı %29'u yorgun, %12'si isteksiz bir ruh hallerinde olduklarını belirtmektedirler (Grafik 26). Bu çalışanların % 81'i memnunum işimi severek yapıyorum, % 7'si kendimi önemsiz hissediyorum, % 12'si diğer, cevaplarını vermektedir (Grafik 27).

Grafik 26. Proje Aşamalarında Hissedilen Ruh Hali



Grafik 27. Yapılan İş İçin Hissedilen Duygu Durumu

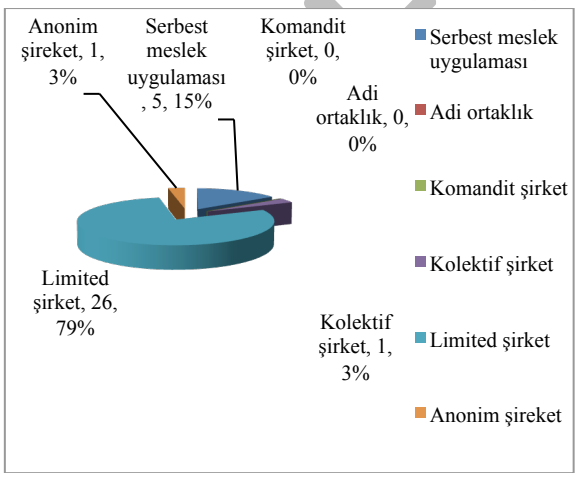


1.2.Mimari Büro İşverenlerine Yapılan Anket Sonuçları

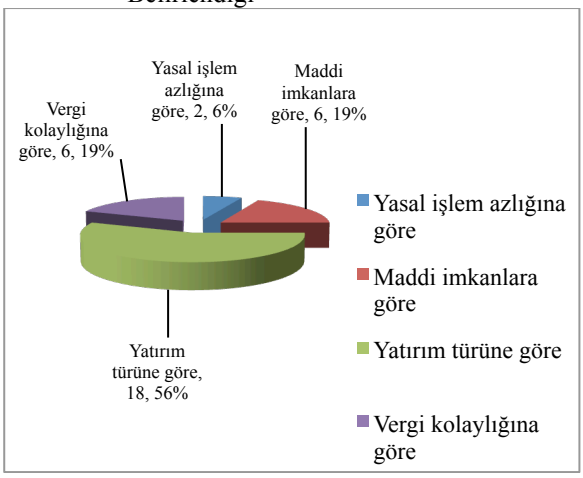
Anket 27 büroya yapılmıştır. Bu büroların bazılarında tek işveren bulunurken ortaklı olarak kurulan ve işletilen bürolarda ise birden fazla işveren vardır. Bürolardaki işverenlerin tamamına anket uygulaması yapıldığı için toplam 44 işveren çalışmada yer almıştır.

İşverenlere bürolarının ticari varoluş biçimleri sorulmuştur. Bu sayede büroların hangi şekillerde kurulabilecekleri belirlenmiştir. Büroların %3'ünün anonim, %15'inin serbest meslek uygulaması, %0'ının komandit, %0'ının adi ortaklık, %3'ünün kolektif, %79'unun ise limited şirket şeklinde kuruldukları belirlenmektedir (Grafik 28). Bürolar kurulurken seçtikleri ticari varoluş biçimlerinin de sebepleri bulunmaktadır. Büroların %56'sı yatırım türüne göre, %19'u vergi kolaylığına göre, %19'u maddi imkânlara göre, %16'sı yasal işlemin azlığına göre ticari varoluş türlerini seçtikleri saptanmaktadır (Grafik 29).

Grafik 28. Büronun Ticari Varoluş Biçimi



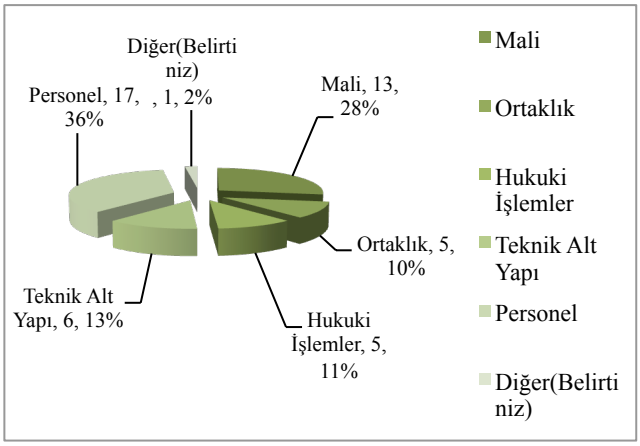
Grafik 29. Ticari Varoluş Türünün Seçim Sebebi Belirlendiği



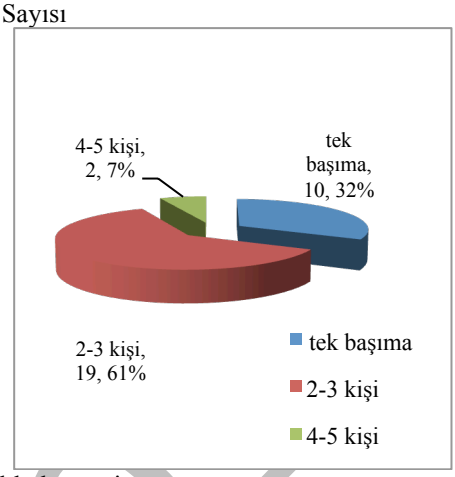
Büroların kuruluş aşaması en fazla sorun yaşanılan aşamadır. Bu sorunlar çok farklı yerlerden karşımıza çıkmaktadır. Bürolarda işverenlerin %36'sı personel, %28'i mali,%13'ü teknik alt yapı, %11'i hukuki işlemler, %10'u ortaklık, %2'si diğer cevabını vererek kuruluş aşamasında hangi sorunlarla karşılaştıklarını belirtmektedirler (Grafik 30). Bürolar tek kişi veya birkaç kişi olarak kurulabilmektedir. İşverenlerin %61'i 2-3 kişi, %32'si tek başına, %7'si 4-5 kişi ile bürolarını kurduklarını belirtmektedirler (Grafik 31).Bürolar birden fazla kişi ile kurulurken ortak seçimi de önemli bir kriterdir. Yapılan çalışma

ile ortakların %59`unun arkadaş, %32'sinin aile, %9'unun akraba oldukları için ortak oldukları belirlenmektedir (Grafik 32).

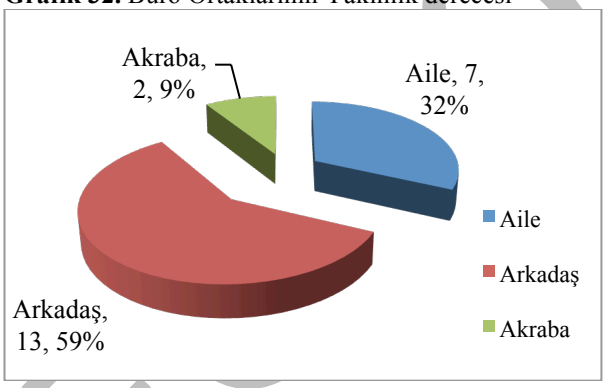
Grafik 30.Büro Kurulurken Karşılaşılan Sorunlar



Grafik 31.Büronun Kuruştaki Ortak Sayısı



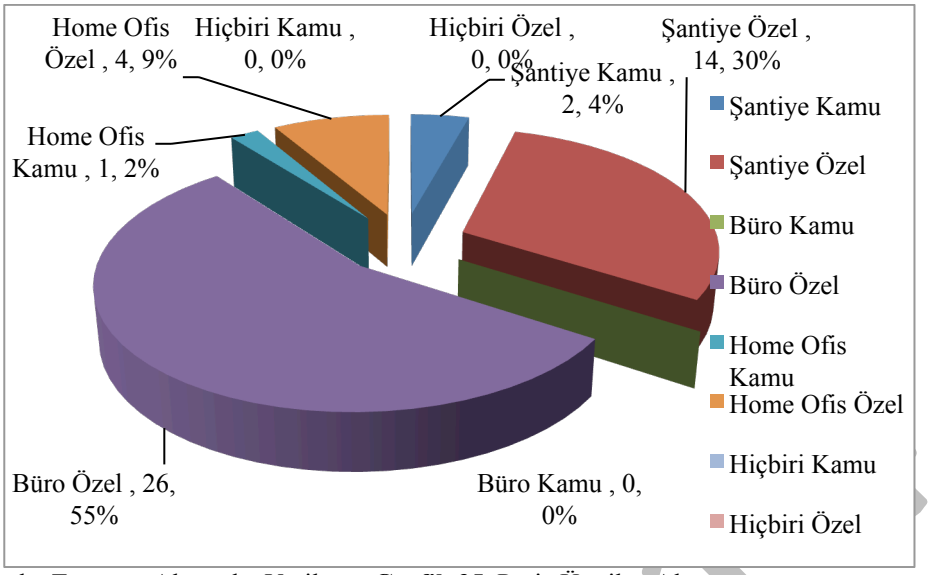
Grafik 32. Büro Ortaklarının Yakınlık derecesi



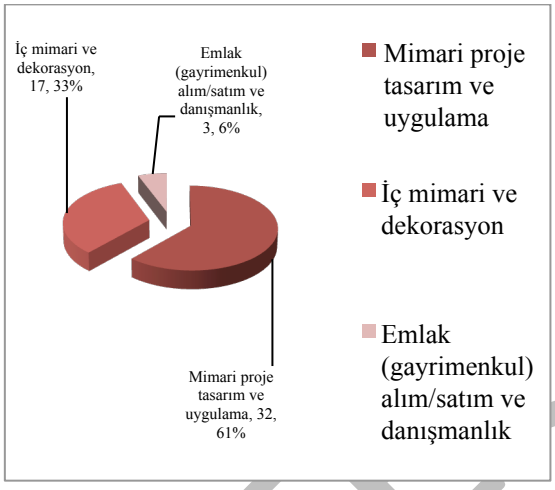
Bürolar mezun olunca hemen kurulabildiği gibi meslek deneyimi ardından da kurulabilmektedir. İşverenlere büro açmadan önce hangi işleri yaptıkları sorulmuştur. İşverenlerin %55'i büro özel, %30'u şantiye özel, %9'u home-ofis özel, %2'si home-ofis kamu, şeklinde çalıştıklarını belirtmektedirler (Grafik 33). Bürolar sadece proje tasarımı ve çizimi yapmamaktadır. Birçok iş ile ilgilenebilmektedirler. Büroların %61'i mimari proje tasarım ve uygulama, %33'ü iç mimari ve dekorasyon.% 6'sı emlak gayrimenkul alanlarında hizmet verdiklerini belirtmektedirler (Grafik 34).

Bürolarda tek bir alanda değil birçok alanda tasarım yapılmaktadır. Bürolardaki işlerin %59'unun konut, %25'inin kamusal yapılar(sağlık, eğitim, spor yapıları), %16'sının kültürel yapılar olduğu belirlenmektedir(Grafik 35).

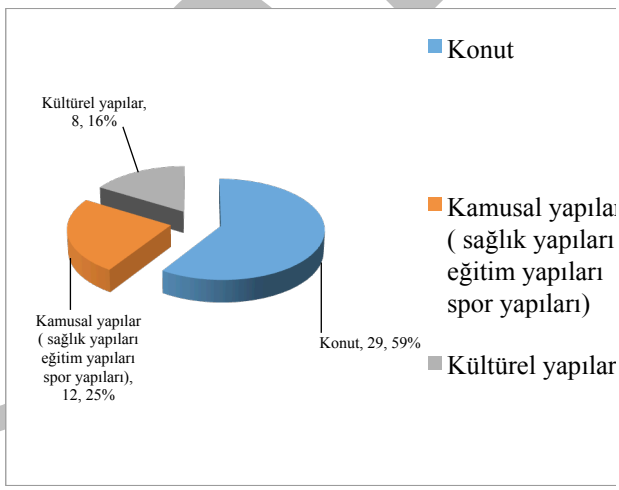
Grafik 33.Büro Açmadan Önce Yapılan İşler



Grafik 34. Büroda Tasarım Alanında Verilen Hizmetler



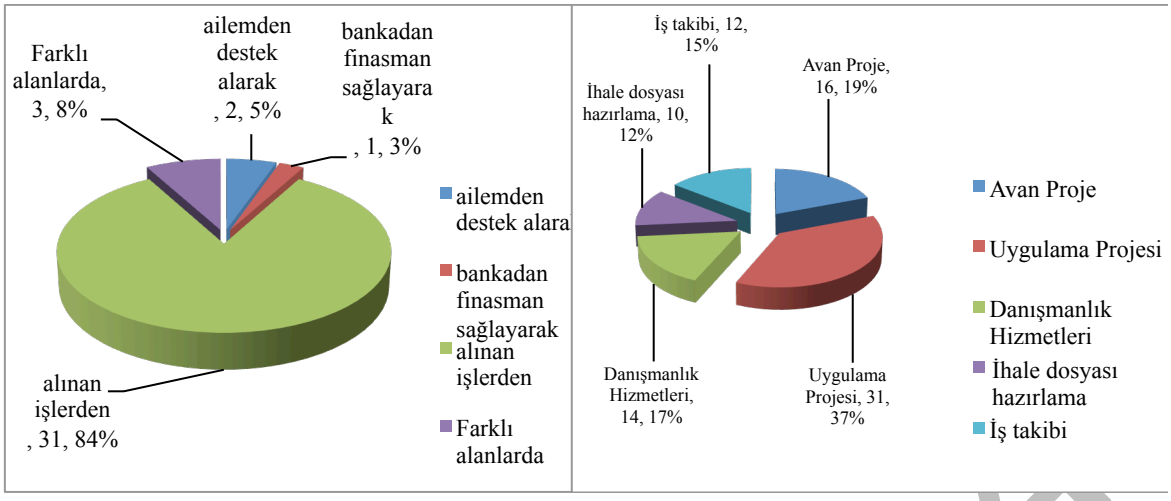
Grafik 35. Proje Üretilen Alan



Bürolarda işlerin yürütülebilmesi için bir finans akışı olmalıdır. Bürolardaki finans kaynaklarına bakılacak olursa, %84'ünün alınan işlerden, %8'inin farklı alanlardan, %3'ünün bankadan finans sağlayarak, %5'i ailesinden destek alarak sürekli finans akışını sağladıkları saptanmıştır (Grafik 36). Bürolarda yapılan farklı işlerle finans kaynağı sağlanmaktadır. Bürolardan; %37'si uygulama projesinden, %17'si danışmanlık hizmetlerinden, %19'u avan projesinden, %15'i iş takibinden, %12'si ihale dosyası hazırlama işinden ücret aldıkları saptanmaktadır (Grafik 37).

Grafik 36.Sürekli Finans Kaynakları

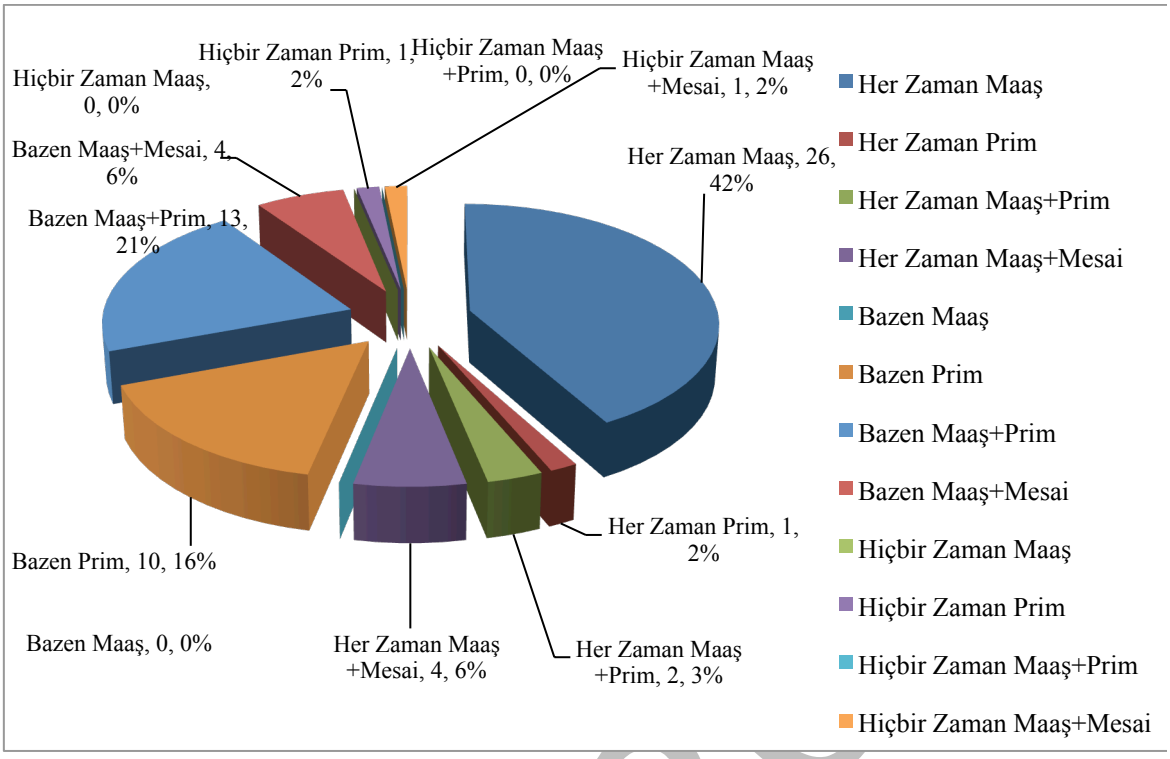
Grafik 37. Ücret Alınan İşlemler



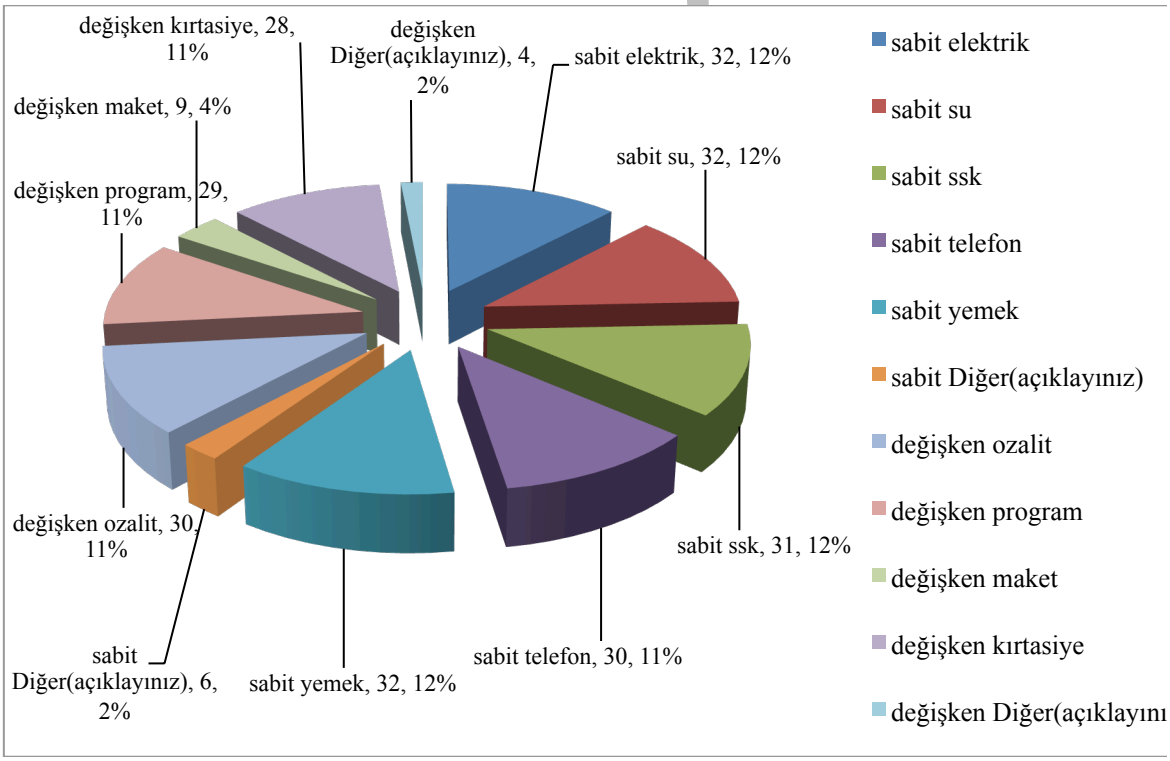
İşverenler çalışanlarına maaş ödemek zorundadırlar. Bunun yanında bazı bürolarda mesai de ücretlendirilebilmektedir. İşverenlere sorulan sorular sonucunda %42'si her zaman maaş, %2'si her zaman prim, %2'si her zaman maaş+ prim, %6'sı her zaman maaş+ mesai, %16 bazen prim, %21'i bazen maaş+ prim, %6'sı bazen maaş+ mesai, %2'sı hiç bir zaman prim, %2'si hiçbir zaman maaş+ mesai şeklinde maaş ödedikleri saptanmaktadır (Grafik 38). Bürolarda birçok gider bulunmaktadır.

Büroların giderlerinin %12'sinin sabit elektrik, %12'sinin sabit su, %12'sinin sabit SSK, %11'inin sabit telefon, %12'sinin sabit yemek, %2'sinin diğer, %11'inin değişken ozalit, %11'inin değişken program, %4'ünün değişken maket, %11'inin değişken kırtasiye, %2'sinin değişken gider olduğu saptanmaktadır (Grafik 39).

Grafik 38.Çalışanların Maaşlarının Verilme Şekli



Grafik 39. Büro Giderleri

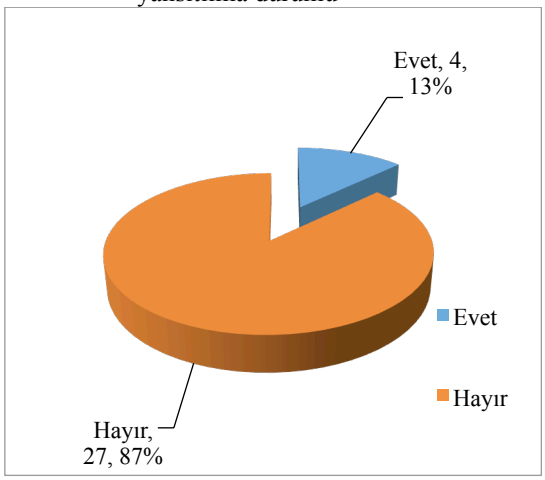


Bürolarda en önemli unsurlardan biri finans unsurudur. Eğer finans akışı düzenli olmazsa sorunlar yaşanabilir ve bu durum çalışanlara da yansıyabilmektedir. İşverenlerin %13'ünün çalışanlarına maddi sorunlarını yansıtmakta, %87'sinin çalışanlarına maddi sorunlarını yansıtmamakta olduğu saptanmaktadır (Grafik 40).

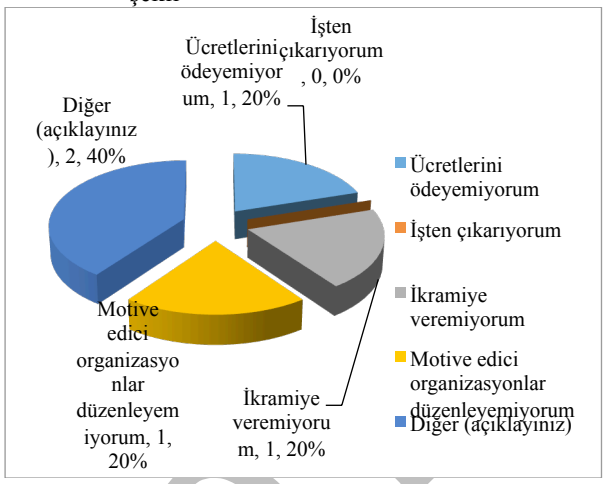
Maddi sorunlar çalışanlara farklı şekillerde yansımaktadır. İşverenlerin %20'sinin çalışanların ücretlerini ödeyemediklerini, %20'sinin çalışanlarına ikramiye veremediklerini, %20'sinin çalışanlarına

motive edici organizasyonlar düzenleyemediklerini, %40'ının çalışanlarına diğer yöntemlere başvurduklarını ve çalışanlarını işten çıkarmadıkları saptanmaktadır (Grafik 41).

Grafik 40. Maddi sorunların çalışanlara yansıtılma durumu

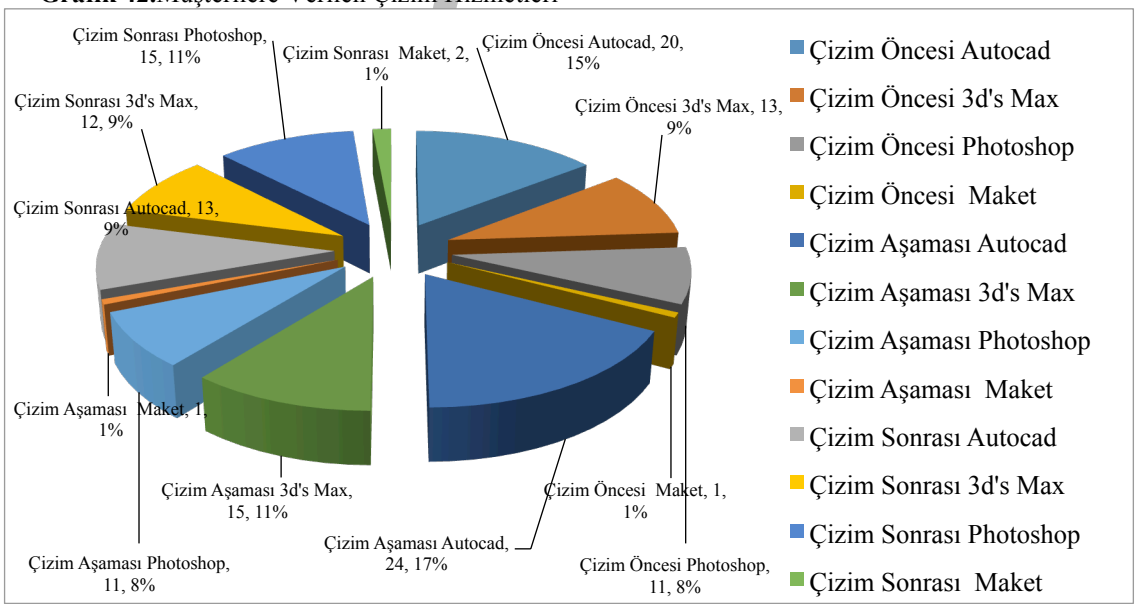


Grafik 41. Maddi sorunların çalışanlara yansıtılma şekli



Projeler müşterilere çizim öncesinde, çizim aşamasında ve çizim sonrasında anlatılmaktadır. Anlatımlar yapılırken farklı yöntemler kullanılmaktadır. Büroların; %15'inin çizim öncesi Autocad hizmeti, %9'unun çizim öncesi 3D Max hizmeti, %8'inin çizim öncesi Photoshop hizmeti, %1'inin çizim öncesi maket hizmeti, %17'inin çizim aşamasında Autocad hizmeti, %11'inin çizim aşaması 3D Max hizmeti, %8'inin çizim aşamasında Photoshop hizmeti, %1'inin çizim aşamasında maket hizmeti, %9'unun çizim aşamasında Autocad hizmeti, %9'unun çizim sonrası 3D Max hizmeti, %11'inin çizim sonrası Photoshop hizmeti, %1'inin çizim sonrası maket hizmeti verdiği saptanmaktadır (Grafik 42).

Grafik 42.Müşterilere Verilen Çizim Hizmetleri



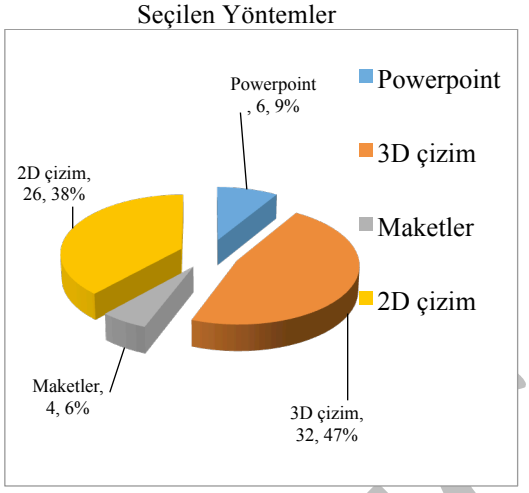
Müşterilere tasarımlar farklı şekillerde anlatılabilmektedir. Anlatım şekillerinin %9'unun powerpoint, %47'sinin 3D çizim, %6'sının maket, %38'inin ise 2D çizimden oluştuğu saptanmaktadır (Grafik 43).

Markalaşma bir ürünün veya hizmetin ayırt edici özelliklerinin ön plana çıkarılması için yapılan çalışmalardır. Büroların %78'inin şirkette markalaşmaya gittiklerini düşünmekte, %22'sinin şirkette markalaşmaya gitmediklerini düşünmekte olduğu belirlenmektedir (Grafik 44). Markalaşma her insanı veya büroyu aynı şekilde etkilememektedir. Markalaşmaya giden bürolarda; %48'i bu durumdan motive

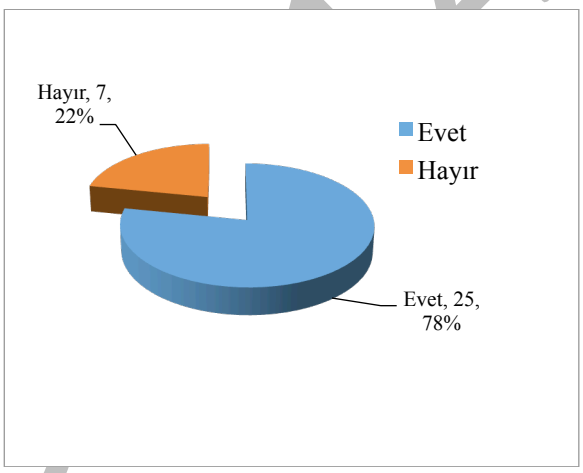
olmakta, %20'si bu durumdan mutlu olmakta, %25'i gurur duymakta, %7'si etkilenmemektedir (Grafik 45).

Bürolarda işleri tasarım ve uygulama olarak ayırabiliriz. İşverenler veya çalışanlar bu aşamaların farklı kısımlarında farklı zamanlarda bulunabilirler. İşverenlerin; %83'ü projenin her adımında bulunmaktadır, %11'i yalnızca tasarım evresinde bulunmaktadır, %6'sı uygulama aşamasında bulunmaktadır fakat her işveren projenin ilerleyişinden haberdar olmaktadır (Grafik 46). Bürolarda farklı mesleklerden farklı sayılarda çalışan bulunmaktadır. Çünkü mimari bürolar birden fazla meslek grubu ile çalışılması gereken bir iş kurumudur. Büroların %39'unda 2-5 kişi mimar, %5'inde 6-9 kişi mimar, %1'inde 10-15 kişi mimar; %11'inde 2-5 kişi inşaat mühendisi, %24'ünde 2-5 kişi tekniker, %1'inde 6-9 kişi tekniker, %15'inde 2-5 kişi muhasebeci, %14'ünde 2-5 kişi farklı elemanlar olarak çalışan olduğu belirtilmiştir (Grafik47).

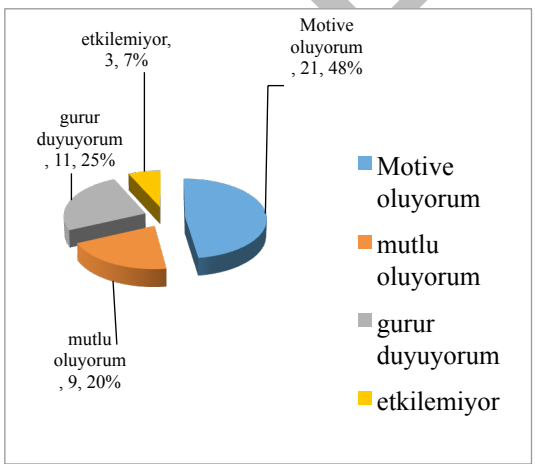
Grafik 43. Müşteriye Tasarım Anlatırken Seçilen Yöntemler



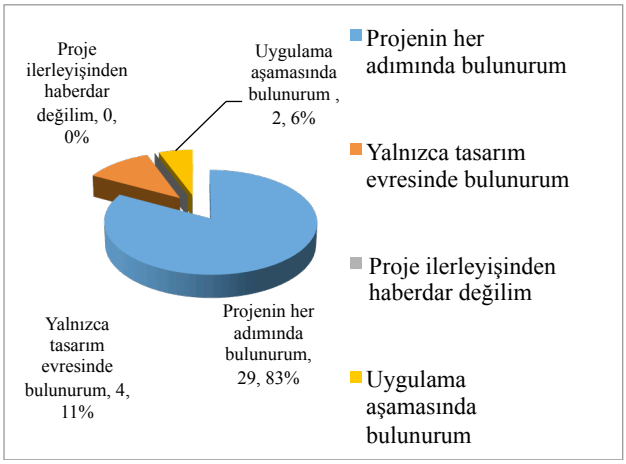
Grafik 44. Şirkette Markalaşmaya Gidilme Durumu

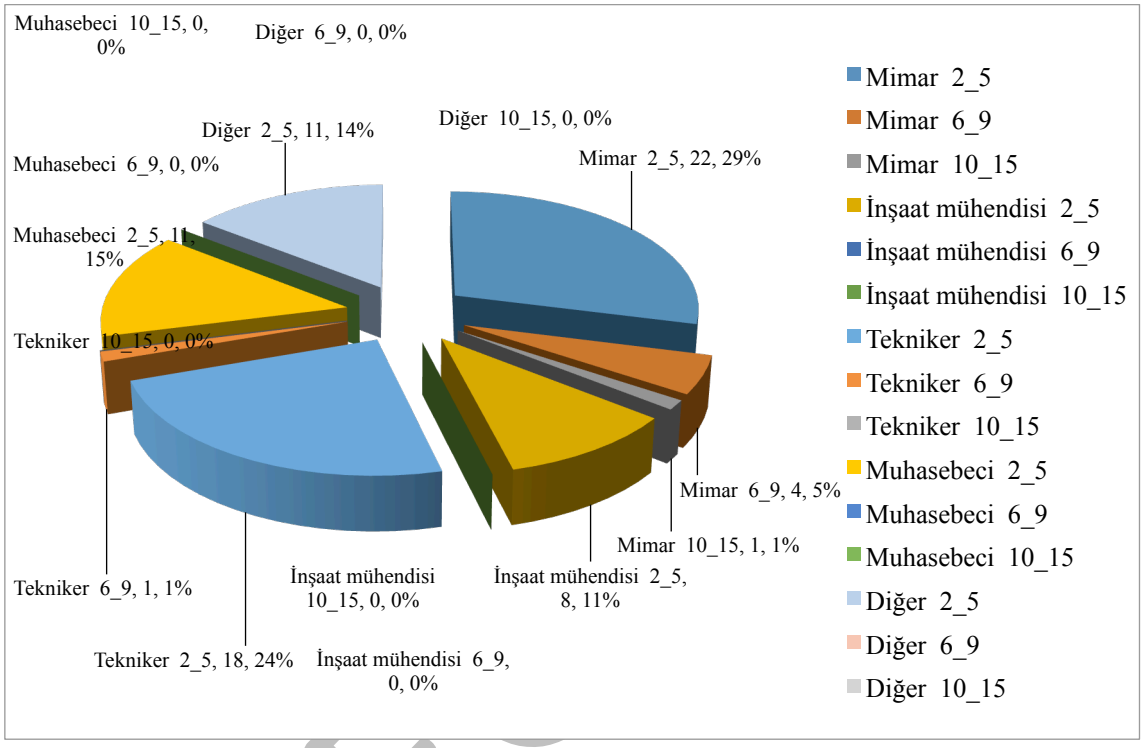


Grafik 45. Markalaşmanın Etkileme Durumu



Grafik 46. Büro İşlerinin İlerleyişi Sırasındaki İşte Yer Alma Durumu



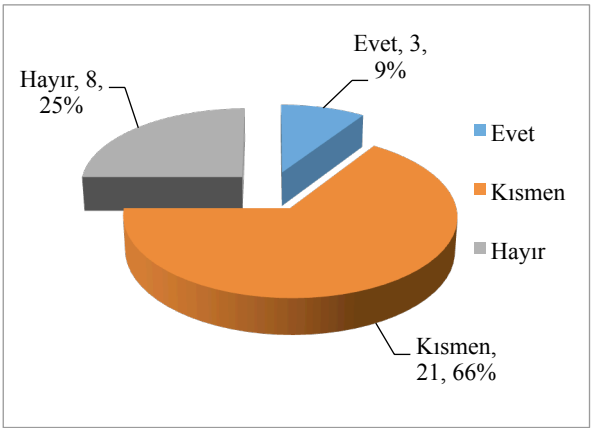


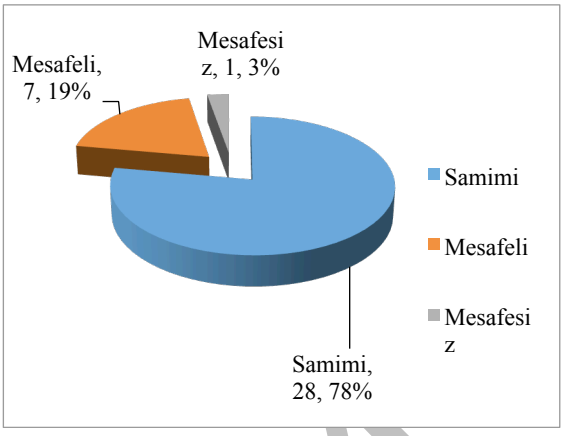
Grafik 47.Çalıştırılan Kişi Sayısı

İşverenler çalışanlarını işe alırken sözleşme imzalamak zorundadırlar. Sözleşme imzalanması çalışan haklarının verilmesi için önemli bir belgedir. İşverenle çalışan arasında işe alım sırasında; %9'unun sözleşme imzaladığı, %25'inin sözleşme imzalamadığı, %66'sının kısmen sözleşme imzaladığı söylenmektedir (Grafik 48).Bürolarda birçok kişi çalıştığı için sosyal bir ortam oluşmaktadır. İşverenlere çalışanlarla sosyal ilişkileri ile ilgili soru sorulduğunda işverenlerin %19'unun çalışanları ile mesafeli, %78'inin samimi, %3'ünün ise mesafesiz davrandığı söylenmektedir (Grafik 49).

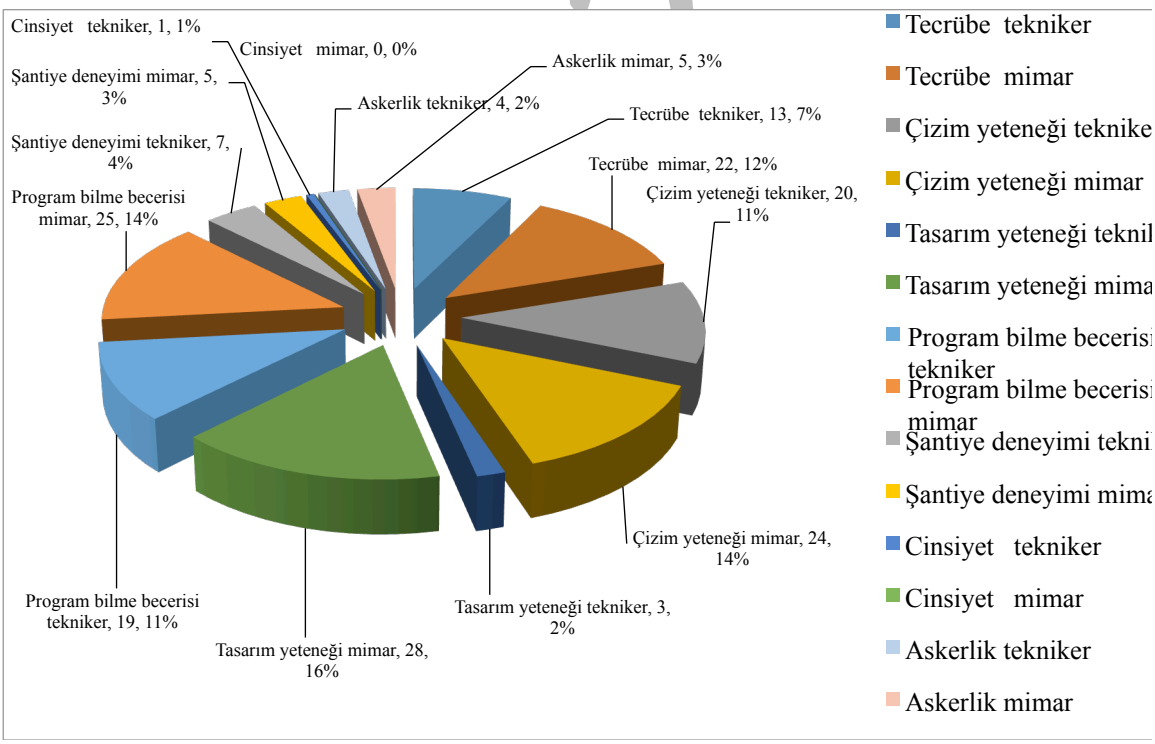
Grafik 48.Çalışanlarla Sözleşme İmzalama Durumu

Grafik 49.Çalışanlarla Sosyal İlişkiler





İşverenler çalışanlarını işe alırken bazı özellikler aramaktadır. Her büronun kendine özgü çalışan kriterleri olmaktadır. İşverenler çalışanların %18'inde tasarım yeteneği aramakta, %25'inde çizim yeteneği aramakta, %19'unda tecrübeli olmasını aramakta, %5'inde askerlik yapmış olma, %1'inde cinsiyet, %7'sinde şantiye deneyimi, %25'inde program bilme yeteneğini aramaktadır (Grafik 50).

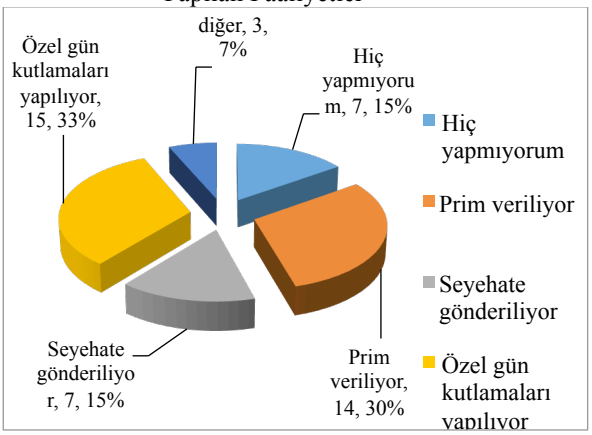


Grafik 50.Çalışanlarda Aranan Özellikler

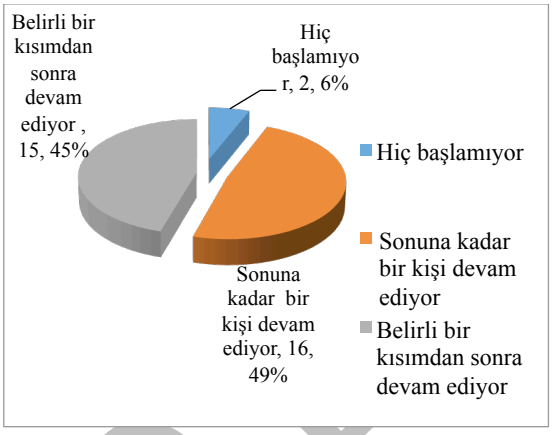
Bürolar yoğun olarak çalışılan ortamlardır. Bu yoğunluk çalışan ve işverenlerde strese ve yoğunluğa neden olmaktadır. Büroların bazılarında bu gibi durumları azaltmak ve verimi artırmak için çeşitli etkinlikler yapılmaktadır. İşverenlerin %33'ü çalışanlarının verimini artırmak için özel gün kutlamaları yapmakta, %15'i seyahate göndermekte, %30'u prim vermekte, %15'i hiçbir şey yapmamakta, %7'si ise diğer faaliyetlerde bulunmaktadır (Grafik 51). Bürolarda sorunlar çıkabilir ve

çalışanların projeye devam durumu değişebilir. İşverenlere sorulan sorular doğrultusunda çalışanlarının %6'sının alınan projelere hiç başlamadığı, %45'inin belirli bir kısımdan sonra devam ettiği, %49'unun sonuna kadar devam ettiği görülmüştür (Grafik.52).

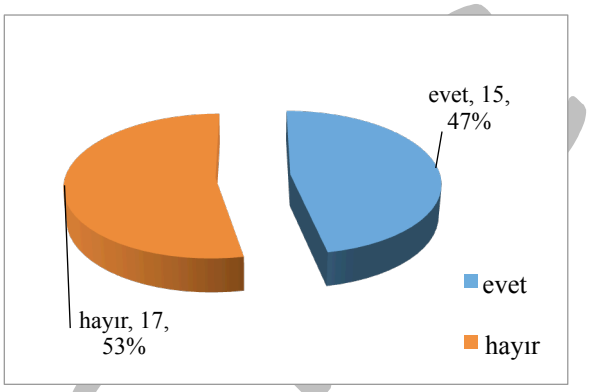
Grafik 51. Çalışanların Verimini Yükseltmek İçin Yapılan Faaliyetler

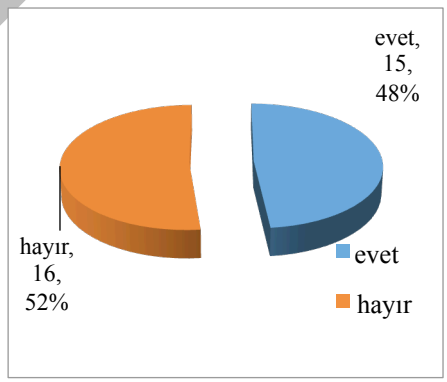


Grafik 52. Çalışanların Mimari Projeye Devam Durumu



Şirketler kurulurken belirli hedefler doğrultusunda kurulmaktadır. Zaman geçtikçe hedeflere yaklaşılır ve uzaklaşılır. İşverenlerin %53'ü hedeflerinde istediği noktaya henüz ulaşamamış, %47'si ise istediği noktaya ulaşmış durumda olduklarını söylemektedir (Grafik 53). Bürolarda işler her zaman yolunda gitmeyebilir ve çalışanlardan dolayı veya işverenlerden dolayı işlerde değişiklikler olabilmektedir. Büroların %48'inde çalışanların dâhil olduğu proje olmasına rağmen çalışanlar işten ayrılmış, %52'sinde ise bu şekilde bir durumla karşılaşılmadığı belirlenmektedir (Grafik 54).





Grafik 53. Kuruluşta Belirlenen Hedeflere Ulaşma Durumu

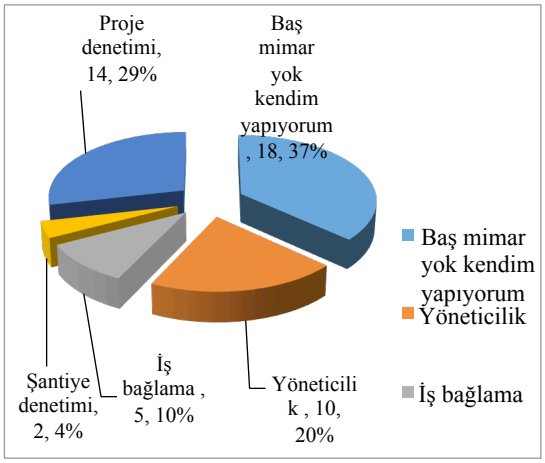
Grafik 54. Çalışanların Dâhil Olduğu Bir Projeden Ayrılma Durumu

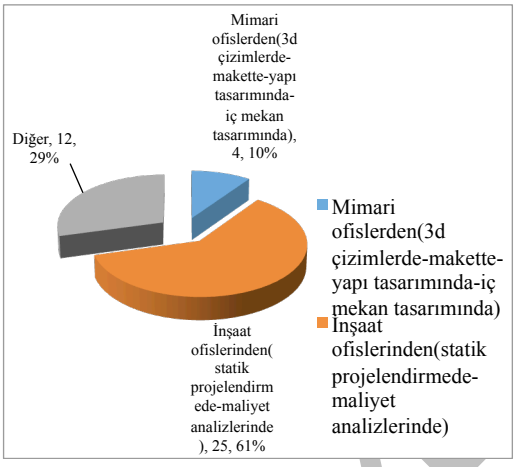
Büroların %37'sinde baş mimar bulunmamakta ve bu görevi işveren kendi yapmaktadır. %29'unda baş mimar proje denetimi yapmakta, %4'ünde şantiye denetimi yapmakta, %10'unda iş bağlama görevinde bulunmakta, %20'sinde ise yöneticilik görevi yapmaktadır (Grafik 55).

Bürolarda projenin bütün işleri yapılamaz ve başka bürolarda yardım alınmaktadır. Büroların %61'i statik projelendirme ve maliyet analizi için inşaat ofislerinden, %10'u 3D çizimler ve iç mekân tasarımları için mimari ofislerden, %29'u ise diğer birimlerden yardım almaktadır (Grafik 56).

Grafik 55. Büroda Baş Mimarın Sorumlu Olduğu İşler

Grafik 56. Farklı Ofislerden Yardım Alma Durumu

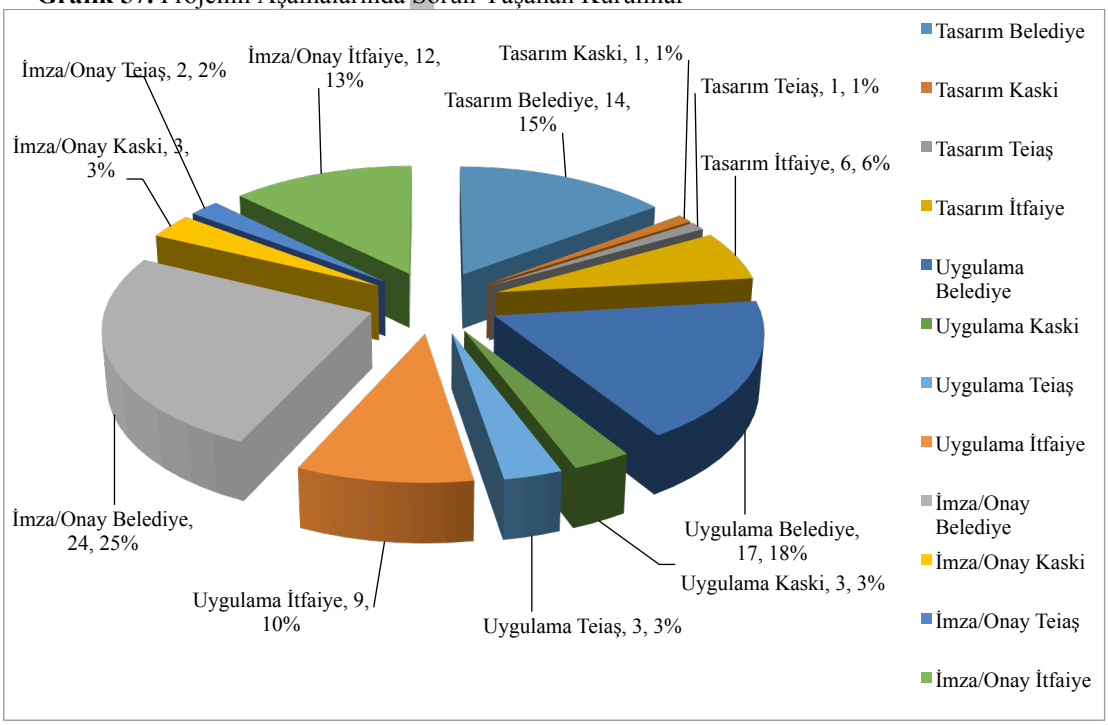




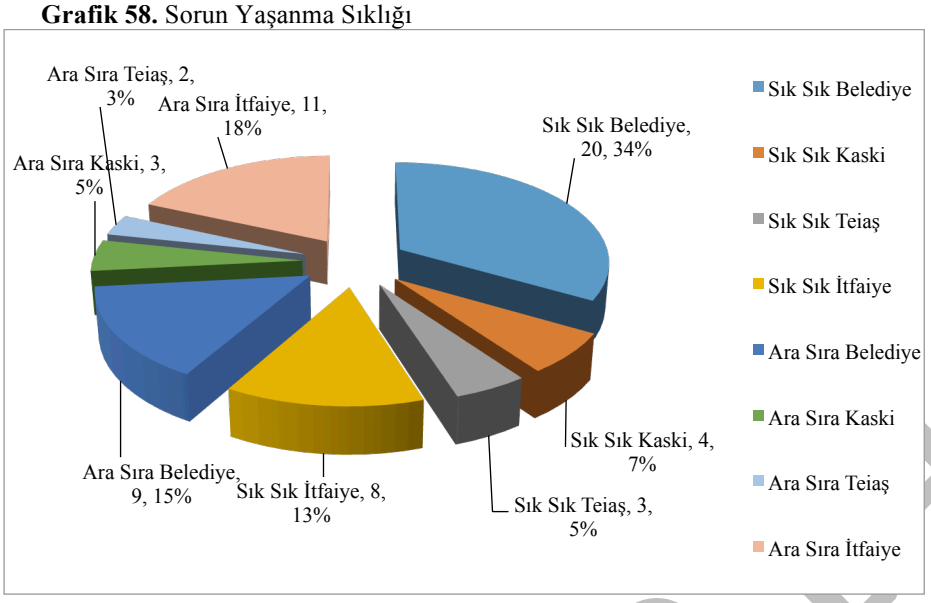
Projenin tasarım, uygulama ve imza/onay aşamaları bulunmaktadır. Bu aşamalarda bürolar ilgili kurumlarla sorun yaşayabilmektedir. Tasarım aşamasında işverenlerin %15'i belediye ile %1'i KASKİ ile %1'i TEİAŞ ile ve %6'sı İtfaiye ile sorun yaşamaktadır. Uygulama aşamasında büroların %18'i belediye ile %3'ü KASKİ ile %3'ü TEİAŞ ile ve %10'u İtfaiye ile sorun yaşamaktadır. İmza/onay aşamasında ise, %25'i belediye ile %3'ü KASKİ ile %2'si TEİAŞ ile ve %13'ü İtfaiye ile sorun yaşamaktadır (Grafik 57).

Bürolar proje aşamalarında kurumlarla sorunlar yaşamaktadır. İşverenlere hangi kurumlarla ne sıklıkla sorun yaşandığı konusunda soru sorulmuştur ve işverenlerin %34'ü sık sık belediye ile , %7 si sık sık KASKİ ile, %5'i sık sık TEİAŞ ile, %13'ü sık sık itfaiye ile sıkıntı yaşamaktadır. İşverenlerin %15'i ara sıra belediye ile , %5'i ara sıra KASKİ ile , %3'ü ara sıra TEİAŞ ile , %18'i ara sıra belediye ile sıkıntı yaşamaktadır (Grafik 58).

Grafik 57. Projenin Aşamalarında Sorun Yaşanan Kurumlar

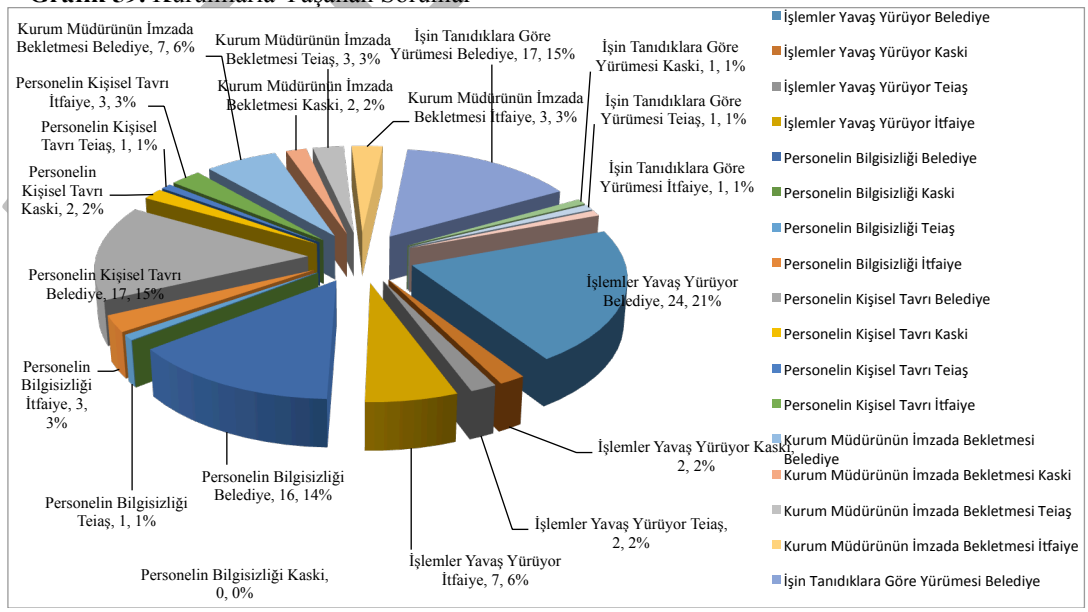


Grafik 58. Sorun Yaşanma Sıklığı



Bürolara kurumlarla ne gibi sorunlar yaşadığı konusunda soru sorulmuştur ve işverenlerden %21'i işlemlerin belediyede yavaş yürüdüğünü , %2'si KASKİ de yavaş yürüdüğünü, % 2'si TEİAŞ'ta yavaş yürüdüğünü, %6'sı itfaiye de yavaş yürüdüğünü söylemektedir. İşverenlerin % 14'ü personellerin; belediyede bilgisiz olduğunu, %1'i TEİAŞ'ta bilgisiz olduğunu , %3'ü itfaiye de bilgisiz olduğunu söylemektedir. KASKİ'de çalışan personeller için bilgisiz olduklarını söylenmemektedir. İşverenlerin %15'i personelin kişisel tavrının belediye de sıkıntılı olduğunu, %2'si KASKİ de sıkıntılı olduğunu, %1'i TEİAŞ'ta sıkıntılı olduğunu , %3'ü itfaiyede sıkıntılı olduğunu söylemektedir. İşverenlerin %6'sı belediyede belgelerin kurum müdürü tarafından imzada bekletilmesinden, %2'si KASKİ'de bekletilmesinden, %3'ü TEİAŞ'ta bekletilmesinden, %3'ü itfaiyede bekletilmesinden şikâyet etmektedir. İşverenlerin %15'i belediyede işlerin tanıdıklara göre yürümesinden, %1'iKASKİ de tanıdıklara göre yürümesinden %1'i TEİAŞ'ta tanıdıklara göre yürümesinden %1'i itfaiyede tanıdıklara göre yürümesinden rahatsız olduklarını söylemektedir (Grafik 59).

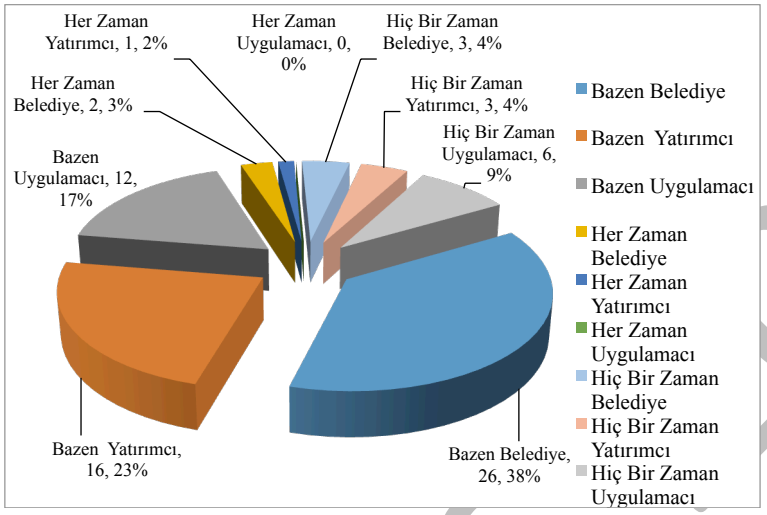
Grafik 59. Kurumlarla Yaşanan Sorunlar



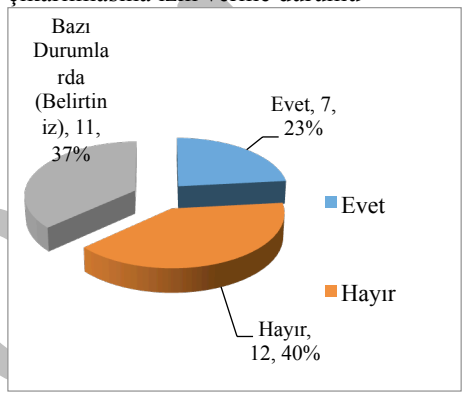
Bürolar hazırladıkları projeleri ilgili kurum veya kişilere anlatmaktadır. Proje anlatımlarında zorluklar yaşanmaktadır. İşverenlerin %38'i projeyi bazen belediyeye, %23'ü bazen yatırımcıya, %17'si bazen uygulamacıya kabul ettirmekte zorlandıklarını belirtmişlerdir. İşverenlerden %3 ü projeyi her zaman belediyeye, %2'si her zaman yatırımcıya kabul ettirmekte zorlandıklarını belirtmektedir. Hiçbir işveren uygulamacıya projeyi hiçbir zaman kabul ettirmekte zorlanmadıklarını söylemektedir. İşverenlerin %4'ü projeyi hiçbir zaman belediyeye, %4'ü hiçbir zaman yatırımcıya, %9'u hiçbir zaman uygulamacıya kabul ettirmekte zorlanmadıklarını belirtmişlerdir (Grafik 60).

Bürolarda projeler tasarlanmakta ve çizilmektedir. İşverenlerin %23'ü avan projenin dışarıya çıkmasına izin verirken, %40'ı avan projenin büro dışına çıkmasına izin vermediklerini söylemektedir. %37'lik kısmı ise bazı durumlarda çıkmasına izin verdiklerini belirtmektedir (Grafik 61).

Grafik 60. Proje Kabul Aşamasında Zorlanılan Kurumlar



Grafik 61. Yapılan avan projenin dışarı çıkarılmasına izin verme durumu



Tartışma

Anket çalışması, 27 büro zerinden 85 çalışana ve 44 işverene gerçekleştirilmiştir. Bu çalışma ile Kayseri'de bulunan mimari bürolardaki her iki taraf için sorunların neler olabileceği ortaya koyulmaya çalışılmıştır. Bir mimari büro kurulurken bazı hedefler doğrultusunda kurulmaktadır. Yapılan çalışma ile büroların çoğunluğu kurulum aşamasındaki hedeflerine ulaştıkları tespit edilmiştir. Bürolarda çalışan kişilerin büyük bir çoğunluğunu mimarlar oluşturmaktadır. Bunun yanı sıra görselleştirme uzmanı ve teknikerler de mimari bürolarda görev almaktadırlar. Mimarların ve diğer teknik elemanların işe alınmalarında tasarım yetenekleri ve teknik çizim kabiliyetleri önemli yer tutmaktadır. Bürolarda görev alan kişilerin büyük çoğunluğu işe alım sırasında sözleşme imzalamamış, sözlü olarak işveren ile anlaşma yolunu tercih ettikleri görülmektedir.

Anket çalışmasına katılan çalışanlardan yaklaşık yarısı bir mimari projeden sorumludurlar. Projelerin uygulama aşamasında ise çalışanların küçük bir bölümü ayda bir, haftada bir veya tüm uygulama aşamasında bir kez olmak üzere projeyi yerinde kontrol etmektedir. Çalışanların büyük bir çoğunluğu şantiye sahasına gitmeyi tercih etmemektedir. Şantiye sahasına giden çalışanların büyük bir kısmı ise gerekli olduğu için gittiklerini belirtmişlerdir. Proje üretim aşamasında, çalışanların büyük çoğunluğu hem tasarım hem de çizim kısmında aktif görev alırken tasarım aşamasında görev alamayan çalışanların oranı oldukça düşüktür. Mimari projenin üretilmesi ve gerekli onayların alınması sırasında çalışanlar etüt, uygulama projesi çizimi, görsel sunum hazırlama aşamalarında ve belediye evrak işlerinin düzenlenmesi aşamalarında görev almaktadırlar.

Fazla mesai ve çalışmaya ücret ödenme durumu da incelenmiştir. Çalışanların bir kısmı çalışma saatlerinin esnek olduğunu ancak ek mesai ücreti alamadıklarını bir kısmı ise ek ücret aldığını belirtmiştir. Anket çalışmasına katılan çalışanların bir bölümü ise çalışma saatlerini belirli olduğunu ifade etmiştir. Büroda karşılaşılan mali sorunlar çalışanların maaş ve ücretlerine etki etmemektedir. Çalışanların ücret

durumlarından memnuniyetleri de çalışma kapsamında sorgulanmıştır. Çalışanların bir kısmı aldığı maaşı yeterli bulurken bir kısmı ise yeterli bulmamıştır. Ek mesai ücreti alan çalışanlardan ise bir kısmı aldığı ücreti yeterli bulmamıştır. Çalışanların hastalık vs. gibi durumlardaki izin durumları da çalışma kapsamında incelenmiştir. Bürolarda çalışan insanların büyük bir kısmı ücretli izin kullanabilmesine karşın az da olsa belli bir kesim çalışan izin kullanamamaktadır.

Büroların markalaşma durumları da çalışma kapsamında incelenmiştir. Büroların büyük kısmı markalaşmaya doğru gitmektedir. Bu durum çalışanların bazılarını etkilememekteyken büyük çoğunluğunu olumlu anlamda motive etmektedir. Çalışanların motivasyonunu etkileyen faktörlerden biri de proje üretim aşamasında kullandıkları yöntemin kendilerini ifade etme konusunda yeterli olup olmadığıdır. Büro ortamında genellikle Lumion, Sketch-Up, 3D Max, Archicad, Revit, Photoshop, Autocad gibi programlar kullanılmaktadır. Bu programlar genellikle şantiye ilişkilerinde, tasarımda, çizim doküman saklama ve diğer disiplinlerle ilişkilerde kullanılmaktadır. Ancak bu programlar işverene tasarım fikirlerini anlatma konusunda yeterli olmamaktadır. Tasarımlarını işverene anlatmak için 3D modeller, 2D çizimler, sketch-up gibi yöntemler de kullanılmaktadır. Diğer disiplinlerle iletişim konusunda ise kâğıt çıktı, taşınabilir bellek, sanal ortam gibi yöntemler kullanılmaktadır. Proje üretimi uzun ve yorucu bir süreçtir. Bu süreçte çalışanların psikolojileri değişkenlik göstermektedir. Ayrıca çalışanların profesyonelleştiği alana göre, cinsiyetine göre ve deneyimlerine göre ayrımcılık da görülebilmektedir. Bu durum çalışanlarda tükenmişlik sendromuna neden olmaktadır. Bu duyguyu uzun süren mesai saatleri, uzun süren toplantılar da tetiklemektedir. Yapılan çalışma ile projenin müşteri ile projenin çizim öncesinde, çizim aşamasında, çizim sonrasında paylaşıldığı saptanmıştır. Proje müşteri ile paylaşılırken Autocad, Photoshop, 3D Max ve maketin kullanıldığı görülmektedir. Bütün aşamalarda genellikle Autocad kullanıldığı görülmektedir. Müşterilere hazırlanan çalışmaların sunumu powerpoint, 3D çizim, maket, 2D çizim gibi yöntemlerle yapılmaktadır. Bunlar arasında ise çoğunlukla 2D çizimin kullanıldığı saptanmıştır. Bürolar genellikle statik ve maliyet analizi için inşaat ofislerinden yardım alırken, 3D çizim ve iç mekân tasarımı ve diğer konulardan da yardım alınmaktadır.

Bürodaki işler tasarım ve uygulama evresi olarak ayrılabilir. Yapılan çalışma ile işverenlerin çoğunun projenin hem tasarım hem uygulama evresinde bulundukları saptamıştır. Mimari bürolarda birçok meslek dalından çalışanlar bulunmaktadır ve çalışanların çoğunluğu mimardır. Bürolarda farklı disiplinlerden pek çok insanın çalıştığı ortamlardır. Çalışanlar arasında veya işverenlerle çalışanlar arasında farklı ilişki şekilleri bulunmaktadır.

Bürolarda çoğunlukla işverenlerin çalışanlarına samimi davrandığı belirlenmiştir. İşverenler çalışanları işe alırken tasarım yeteneği, çizim yeteneği, tecrübeli olma, askerlik yapmış olma, cinsiyet, şantiye deneyimi, program bilme yeteneği gibi özellikler aramaktadırlar. Çizim yeteneği ve program bilme becerisinin olması en çok aranan özelliklerdendir.

Yapılan çalışmada çalışanların çoğunun işe alınırken işverenle sözleşme imzalamadığı tespit edilmiştir. Bürolar yoğun çalışılan mekânlardır ve bu yoğunluk çalışanlar da yorgunluğa, verim düşüklüğüne neden olmaktadır. İşverenler çalışanların verimini artırmak için genellikle özel gün kutlamaları yapmaktadırlar.

Çalışanların projeye devam durumuna bakıldığında büyük çoğunluğunun projeye sonuna kadar devam ettiği görülmektedir. Bir büroda işler her zaman olumlu gitmeyebilir ve çalışanlar veya işverenler bir proje devam ederken işten ayrılabilmektedir. Yapılan çalışma ile büroların çoğunda işten ayrılma gibi bir problemle karşılaşılmadığı ortaya çıkmıştır. Büroların büyük bir kısmında baş mimar bulunmamaktadır ve işveren bu görevi kendisi yapmaktadır. Bir büroda proje hakkındaki bütün işler yapılamaz ve başka bürolardan yardım alınmaktadır.

Projenin tasarım, uygulama ve imza/onay aşamaları bulunmaktadır ve bürolar bu aşamalarda ilgili kurumlarda problem yaşamaktadırlar. Üç aşamada da büroların çoğunluğu belediye ile sorun yaşamaktadır. Çalışmada sorun yaşanması sıklığına bakıldığında ise yine belediye ile sorun yaşandığı ortaya çıkmaktadır. Proje aşamalarında yaşanan sorunların nedenlerine bakıldığında, büroların çoğunluğu işlerin belediyede yavaş yürüdüğünden dolayı, belediye personelinin bilgisiz olduğundan dolayı, belediye personelinin kişisel tavrından dolayı, belediyede işlerin kurum müdürü tarafından bekletildiğinden dolayı, belediyede işlerin tanıdıklara göre yürüdüğünden dolayı sorun yaşandığını söylemektedir. Ayrıca bürolarda bir diğer sorun ise; müşteri ilişkileridir. Bürolar projelerini kabul ettirirken de zorlanabilmektedirler. Yapılan çalışma ile büroların çoğunluğunun her zaman belediyeye kabul ettirmekte zorlandıkları saptanmıştır. Uygulamacının proje kabulünde sorun yaşanmamaktadır.

Sonuç

Tarihi gelişim süreci içerisinde çalışma ortamı olarak büro kavramında gelişmeler olmuştur. Mimari büro olgusu da bu gelişmelerden payını almıştır. Özellikle teknoloji ve getirileri ile mimari büroda kullanılan araç-gereç değişmiştir. Bunun yanı sıra mimari büroda çalışan teknik personelin bilmesi ve kullanması gereken teçhizat ve programlar da farklılaşmıştır. Mimari bürolar çağın gerektirdikleri forma ulaşmışlardır. Ancak bu durum mimari büro çalışanlarının sorunlarında ve/veya olumlu durumlarında etkililik göstermemektedir. Mimari büro çalışanlarının bildikleri ve kullandıkları teknik bilgileri sadece işe alımlarda etkili olmaktadır. Çalışma ortamlarında maaş, stres ya da psikolojik durumlarını etkilememektedir. Mimari projede tasarım aşamasında çalışanlar hem tasarım becerilerini hem de bildikleri teknik çizim becerilerini kullanmak durumundadırlar. Ancak bazen çalışanlar kendilerini bildikleri teknik bilgi ile de ifade edememektedirler. Ayrıca çalışanlar, büro içerisinde bir projenin tamamlanması için gerekli olan yasal işlerin takibini de gerçekleştirmektedirler. Çalışanlar büro işlerinde sorumluluk alırken uygulama aşamasında gerekli olmadıkça şantiyeye gitmeme eğilimindedirler. Bu durum çalışanların uygulama bilgisinin eksilmesine neden olmaktadır. Dolayısıyla mimari büronun sorunu olmaktadır. Çalışanlar, tüm bu yoğun çalışmaya karşılık fazla ödeme alamamalarına rağmen aldıkları maaşı yeterli görmektedirler. Kayseri'deki mimari bürolarda ödenen ücret çalışanlar tarafından tatminkâr bulunmuştur. Tüm bunlara karşılık Türkiye'nin bir sorunu olan işe alımlarda sözleşme imzalamama durumu Kayseri'deki mimari büro çalışanlarının sorunları arasındadır. Bu durumun çalışanlar üzerinde olumsuz psikolojik etkileri olacağı açıktır. Ayrıca cinsiyet, deneyim ve profesyonelleşmelerine göre çalışanlara ayrımcılık yapılmaktadır. Bunun da çalışanlar üzerindeki baskıyı arttıracağı ve çalışanların verimini düşüreceği ortadadır.

Proje üretim ve uygulama süreci uzun ve yorucu bir süreçtir. Bu süreçte büroda çalışan mimar ve teknik elemanlar farklı yöntemler ve programlar kullanmaktadırlar. Teknik gelişmelerle birlikte kullanılan yöntemler çeşitlense de çalışanlar işverene tasarımlarını ifade etmekte zorlanmaktadırlar. Bu da bürolarda sorunların ortaya çıkmasına neden olmakta ve iş verimini düşürmektedir. Ancak yoğun çalışma ortamında çalışanların motivasyonunu arttırmak için işverenler özel gün kutlamaları yapmaktadır. Proje süreci devam ederken yapılan sosyal faaliyetler ve ödüllendirmelerin çalışanların projeden ayrılmasının önüne geçeceği düşünülmektedir. Çünkü süreç devam ederken çalışanların işten ayrılması mimari bürolarda ciddi bir sıkıntıdır. Bu durum projenin başarı ile sürdürülmesine engel olmaktadır.

Bir çalışma ortamına aidiyet hissedilmesi, çalışanın verimini etkilemektedir. Markalaşma ile bu durum pekişmektedir. Kayseri'deki mimari bürolarda genel olarak markalaşmaya gidildiği gözlenmiştir. Çalışanlar, çalıştıkları firmanın bilinirlilik düzeyleri arttıkça gurur duymakta ve işe daha yüksek moral ile sarılmaktadırlar.

Mimari bürolar farklı disiplinlerin bir arada yer aldığı bir ortamdır. Çeşitli disiplinlerde ve düzeylerde birlikte çalışılan bu ortamda, işveren ve çalışanlar arasında farklı ilişki düzeyleri olması olumsuz bir sonuç yaratmamaktadır. İşverenlerin çalışanlara samimi davranması çalışanların iş verimini ve aidiyet duygusunu arttıracaktır. Bir mimari projenin oluşturulması karmaşık işlem ve uygulamaları kapsamaktadır. Konsept ve avan projenin oluşturulması ile başlayan süreç, mimari uygulama projesinin hazırlanması ile devam etmektedir. Mimarlar bu süreçte inşaat mühendisleri, harita mühendisleri, makine mühendisleri gibi farklı meslek grupları ile de ortak çalışmaktadırlar. Genel olarak tasarım, uygulama ve imza süreci olarak değerlendirebilecek yoğun sürecin ardından hazırlanan projeler belediyelerin onayına gitmektedir. Yapılan çalışmada mimari büroların büyük çoğunluğunun belediyelerle imza sürecinde sıkıntı yaşadıkları ortaya çıkmıştır. Belediyelerde görevli personelin yeterli donanımda olmaması ve iş yükünün fazla olmasından dolayı işlerin yavaş gitmesi nedeniyle imza süreci uzun bir zamana yayılmaktadır. Bu durum, mimarlık bürolarında zaman ve mali kayıplara yol açmakta ve gerek işveren gerekse çalışanları olumsuz etkilenmekte ve özellikle büroda çalışanlar için fazladan iş yükü getirmektedir.

Bu çalışma kapsamında Kayseri özelinde mimarlık bürolarında karşılaşılan fiziksel ve psikolojik sorunlar ele alınmıştır. Kayseri örnek alanında, mimari bürolara yapılan bu çalışma ile büyük şehirlerdeki mimarlık büroları dışında Anadolu'da yer alan mimarlık bürolarında çalışan ve işverenlerin fiziksel ve psikolojik sorunları ortaya koyulmaya çalışılmıştır. Yapılan çalışmanın bundan sonra yapılacak olan mimarlık büroları ile ilgili çalışmalara katkıda bulunması hedeflenmiştir.

Teşekkür

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Laborator Toxicity and Activity Ovicidal of Insect Growth Regulator Triflumuron (BAY SIR 8514) Against Mosquitoes

REHIMI Nassima [1] and SOLTANI Noureddine [2]

1 Department of Biological Sciences, University of Badji Moukhtar,23000-Annaba, Algeria.

Abstract: Insect growth regulators (IGRs) offer alternatives to conventional chemical larvicides that pose problem of resistance and environmental safety. However, only a limited number of IGRs have been approved for use in mosquito control. Laboratory experiments were conducted to determine the effectiveness of Triflumuron (BAY SIR 8514), insect growth regulators with molt inhibiting activity on developmental stages of Culex pipiens pipiens L (Diptera: Culicidae). In the present study, Triflumuron, a benzoylphenylurea derivative, was applied in doses ranging from 16 to79 ng/l. The compound was tested on newly fourth instars larvae for 24 h and against eggs. Treatment resulted in a dose-dependent reduction in adult emergence. However, death as larvae was relatively important compared with the mortality recorded for the other later developmental stages. The treatment also caused morphological aberrations upon the importance of larval-adult transformation. The bioassay perturbed the development and induced many morphogenetic types. In addition, the compound reduced the percentage-hatchability of eggs**.** A histological study conducted on fourth instar larval integument, revealed that triflumuron caused a significant reduction in the thickness of cuticles secreted compared to controls.

Key words: Mosquitoes, Triflumuron, Culex pipiens pipiens, Insect growth regulators, larvicidal, ovicidal.

Maliyet Yönetimi Açısından Lojistik Köy Faaliyetlerinin TMS/TFRS'ye Göre Muhasebeleştirilmesi[33]

Haluk Duman[1], Mehmet Yücenurşen[2]

[1]Aksaray University, Turkey,
halukduman70@hotmail.com

[2]Aksaray University, Turkey,
yucenursen@hotmail.com

Özet: Son yıllarda küreselleşmenin etkisini gittikçe artırmasıyla birlikte ulusal ve uluslararası pazarlarda yoğun rekabet ortamı meydana gelmiştir. Gelişen teknoloji ile birlikte taşıma sistemlerinde oluşan gelişmeler, işletmeler için bütün dünyayı bir pazar haline getirmiştir. Böylece lojistik faaliyetlerin önemi gittikçe artmıştır. Lojistik faaliyetlerin maliyetlerini düşürmek ve kentlere verdiği olumsuz etkilerden arındırmak üzere lojistik köylerin kurulması planlanmış ve hayata geçirilmiştir. Bu bağlamda bu çalışmada son derece önemli amaçlara sahip lojistik köylerin bir muhasebe dönemi içerisinde gerçekleştirdiği faaliyetlerin muhasebeleştirilmesi incelenmiştir. TMS/TFRS kapsamında lojistik köylerde oluşabilecek mali işlemler çerçevesinde muhasebeleştirme işlemleri yapılmıştır.

Anahtar Kelimeler: Lojistik, Lojistik Köy, TMS/TFRS

Giriş

Son yıllarda yaşanan teknolojik gelişmeler ve küreselleşmenin etkisini artırmaya başlaması ile pazarlar arasındaki farklılıklar birleşmiş ve tek bir pazar haline gelmiştir. Örneğin McDonalds, Coca-Cola, Lacoste gibi markalar tüm dünyada tüketici istek ve ihtiyaçlarını birleştirmeyi başarmıştır. Dünyada ticari sınırların kalkmasıyla birlikte rekabet ortamı sürekli olarak değişmektedir. Böyle bir ortamda işletmelerin katlandığı maliyetlerin rekabet avantajı sağlamada ve karlılığı artırmadaki etkisi büyük önem arz etmektedir. Bu bağlamda lojistik faaliyetlerin kapsamının küreselleşme ile genişlemesi, lojistik maliyetlerin toplam genel maliyetleri içerisindeki payının önemli hale gelmesine zemin hazırlamıştır.

Lojistik faaliyetler yürütülürken kentlere ve çevreye verdiği olumsuz etkiyi ve işletme üzerindeki maliyet boyutunu asgari seviyeye indirebilmek lojistik köyler sayesinde mümkün olabilmektedir. Dolayısıyla tüm dünyada özellikle Avrupa'da 1970'li yıllardan itibaren kurulan lojistik köyler, 2005 yılından itibaren Türkiye'nin de gündemine gelmiştir. İşletmeler lojistik maliyetleri düşürmek için lojistik köylerle işbirliği yapmak durumundadırlar. Bu bağlamda bu çalışmanın amacı TMS/TFRS uygulamaları çerçevesinde lojistik köy faaliyetlerinin bir muhasebe dönemi içerisinde muhasebeleştirilmesini araştırmaktır.

[33] Bu çalışma Aksaray Üniversitesi Sosyal Bilimler Enstitüsü İşletme ABD Yüksek Lisans Tezinden türetilmiştir.

Lojistik ve Lojistik Köy Kavramları

Lojistik, üreticiden nihai tüketiciye kadar olan zincirde, doğru malzemenin doğru yerde olmasını sağlayan faaliyetlerin bütünüdür. Bir başka tanıma göre lojistik, " ürün, hizmet ve bilgi üretiminde kullanılacak girdilerin; süreç içerisindeki stokların; süreci tamamlanmış olan ürün, hizmet ve bilginin; çıkış noktasından tüketim noktasına kadar etkin ve verimli varabilmesini hedefler." (Çevik & Gülcan, 2011). Lojistik faaliyetleri, doğru ürünün, doğru yer ve zamanda doğru müşteriye ulaştırılmasına olanak veren faaliyetlerdir (Kotler & Armstrong, 2004:419).

Dünya ekonomisinde küreselleşmeye bağlı olarak oluşan rekabet yoğun pazarlar ve buna paralel olarak işletmelerin bu pazarlara uyum çabaları lojistik faaliyetlerin önemini artırmış ve günümüzdeki entegre lojistik kavramını ortaya çıkarmıştır. Lojistik faaliyetler, lojistik kavramına yüklenen anlamın genişlemesiyle birlikte zamanla işletme içerisinde daha fazla yer almaktadır (Tutar, Tutar & Yetişen, 2009). Lojistik köy kavramı sanayileşmenin de etkisiyle ilk olarak Amerika'da ortaya çıkmıştır. Lojistik köylerin sanayi faaliyetlerinin geliştiği Avrupa ülkeleri ve Japonya'da da artan ticari hacme bağlı olarak şehir içinde oluşan trafik sıkışıklığı için bir çözüm olarak önerildiği bilinmektedir. Avrupa'da 1970'li yılların başlarında 'yük köyü' (freight village) kavramı gündeme gelmiştir. Fransa, Almanya, İtalya, Hollanda, Belçika'da lojistik köyler 1980-90'lı yıllarda gelişim göstermiş ve Avrupa'da benimsenmiştir (Tsamboulas & Dimitropoulos, 1999).

Lojistik köy, ulusal ve uluslararası geçiş güzergâhlarında kurulan, dağıtım, depolama, elleçleme, sipariş işleme, gümrükleme, ithalat/ihracat ve transit işlemler, bankacılık ve sigortacılık hizmetleri, danışmanlık vb. birçok bütünleşmiş lojistik faaliyetlerin belirli bir alanda çeşitli uzman işletmenler tarafından yerine getirildiği özel merkezlerdir (Tsamboulas & Kapros, 2003).

Literatürde lojistik köyler; lojistik merkez, lojistik odak, lojistik alan, lojistik üs, lojistik park gibi farklı kavramlarla ifade edilebilmektedir. Lojistik köyler, yük taşımacılığı ile ilgili faaliyetlerin, ortak bir alan içerisinde kümelenmesini hedeflemektedir.

TCDD'nin yaptığı tanıma göre lojistik köy, ''farklı işletici ve taşıyıcılarla ulusal ve uluslararası, yük taşımacılığı, dağıtımı, depolama ve diğer tüm hizmetlerin yapıldığı alan'' olarak tanımlanmaktadır. Bu bağlamda lojistik köy kavramı, nakliye, lojistik ve dağıtım ile ilgili tüm işlemlerin ulusal, uluslararası ve transit olmak üzere farklı operatörler tarafından yapıldığı bölgeler olarak tanımlanabilir. Lojistik köy kavramı 3 ana unsura bağlı olarak şekillenmektedir (Europlatforms, 2013);

- **Yer Seçimi:** Belirli bir alanı lojistik köy olarak belirlemek suretiyle söz konusu alanın kullanımını optimum hale getirecek altyapı çalışmalarını tamamlamaktır.
- **Kaliteli Nakliye:** Etkisini giderek artıran küreselleşme işletmeleri daha etkin ve verimli lojistik çözümler üretmeye sevk etmektedir. Lojistik faaliyetlerinin etkin ve verimli bir şekilde gerçekleştirilmesi toplam maliyetlerin azalmasını sağlayacaktır.
- **Intermodal Nakliye Sistemi Geliştirme:** Lojistik köylerin kuruluş sebeplerinden bir tanesi de gittikçe talebi artan karayolu taşımacılığının yükünü deniz ve havayoluna aktarabilmektir.

Dünyada ve ülkemizde entegre hizmet anlayışının gelişmesi lojistik köylerin yapısının belirlenmesinde etkili olmuştur. Böylece lojistik köyler geleneksel anlamda taşımacılık hizmeti veren merkezlerden ziyade lojistik ile ilgili her türlü talebe cevap verebilecek ve çözüm üretebilecek kapasitede merkezler konumuna gelmişlerdir. Bu bağlamda lojistik köylerde bulunması gereken alanlar genel olarak aşağıdaki gibi sıralanabilir (Wu & Haasis, 2013),

- Depolar, antrepolar, ambarlar,
- Araç park alanları, tır parkları, konteyner depo alanları,
- Gümrük hizmetleri,
- Yükleme/boşaltma, demiryolu/karayolu aktarma işlemleri için gerekli temel alanlar,
- Dinlenme/konaklama tesisleri,
- Postane, telefon hizmetleri, otobüs hizmetleri,
- Benzin, bakım onarım istasyonları vb.

Bu bağlamda lojistik köyler şehir içi yük trafiğini azaltmakta ve lojistik faaliyetleri gerçekleştiren işletmelerin şehrin çeşitli yerlerine yayılmasına engel olmaktadır.

Türkiye'de 2005 yılında telaffuz edilmeye başlanan lojistik köy kavramı 2006 yılında TCDD tarafından oluşturulmaya başlanmıştır. Daha sonraki süre zarfında özel sektör tarafından kabul gören lojistik köyler kurulmaya başlanmıştır.

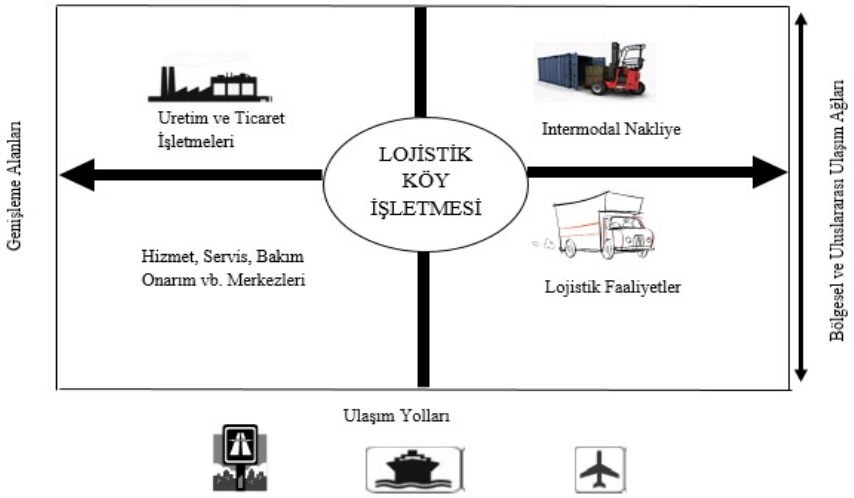
Lojistik köylerin konumu incelendiğinde birçok lojistik köyün merkezi taşıma ve dağıtım

faaliyetlerinin merkezinde kurulduğu görülmektedir. Çünkü lojistik köyleri cazip hale getiren temel faktörlerin başında ulaşım ağlarına yakınlığı ve bu ulaşım ağları arasında koordinasyon sağlayan bir fonksiyona sahip olması gelmektedir. Ayrıca işletmeler ve enerji bağımlılığı olan ülke ekonomileri açısından lojistik köylerin pazara yakın olması hem maliyet ve zaman avantajı sağlayacak hem de faaliyetlerde verimliliği artıracaktır.

Lojistik köylerin planlanmasında ve inşa edilmesinde en önemli neden, lojistik hareketlere ilişkin tüm faaliyetlerin tek elden yönetilebilmesidir. Bu nedenle bir lojistik köyün ihtiyaçları karşılayabilmesi için çok iyi organize edilmiş altyapı sistemlerine sahip olması gerekmektedir. Lojistik köyler içerisindeki altyapı sistemlerinin en önemlileri depolar ve intermodal terminallerdir. Bu bağlamda lojistik köylerde gerçekleştirilen faaliyetler temel olarak 6 başlıkta toplanmaktadır (Wu & Haasis, 2013);

- Altyapı sistemi ihtiyaçlarının belirlenmesi,
- Lojistik köyün yapı planının belirlenmesi,
- İş planının oluşturulması,
- Altyapı sisteminin oluşturulması,
- Lojistik faaliyet yürüten işletmelere arazi/depo/ofis kiralanması/satışı,
- Lojistik köyün işletilmesi.

Lojistik köylerde gerçekleştirilen temel faaliyetler Şekil-2'de gösterilmektedir.



Şekil 2: Lojistik Köylerde Gerçekleştirilen Temel Faaliyetler
Kaynak: Wu & Haasis, 2013.

Lojistik köylerin taşıması gereken en önemli özelliği dağıtımın tek elden yapılması ve gümrük işlemlerinin kolayca yürütülebilmesidir. Lojistik köylerin diğer özellikleri aşağıda sıralanmaktadır (Ballis & Mavrotas, 2007; Tsamboulas & Dimitropoulos, 1999);

- Tek bir merkezden yönetilmelidir,
- Etkin bir master planı olmalıdır,
- Geleceğe dair sağlam tahminler ile kurulmalıdır,
- Organize lojistik bölgesi yapısı taşımalıdır,
- Şehrin yakınında kurulmalıdır,
- Açık/kapalı depolama alanları bulunmalı ve destek hizmetleri vermelidir,
- Lojistiğin tüm taraflarının kolaylıkla ulaşabileceği şekilde inşa edilmelidir.

10 Kasım 2008 tarih ve 27050 sayılı Resmi Gazete'de yayınlanan "Organize Sanayi Bölgeleri (OSB) Kanununda Değişiklik Yapılması Hakkında Kanun" ile mevcut OSB tanımlarına 'İhtisas OSB' tanımı eklenmiştir. Lojistik köyler, lojistik amacıyla kurulan OSB olarak kanunda yer almaktadır.

Lojistik köylerin kuruluş nedenlerinden biri de gittikçe artan ticaret hacminin ve bu yüzden meydana gelen lojistik hareketliliğin şehirlere verdiği olumsuz etkilerdir. Küreselleşme ile canlanan iş dünyasının ağır taşıtları daha fazla kullanması nedeniyle hava kirliliği ve şehir trafiğinde aksaklıklar meydana gelmiştir. Bu durumun çözümü lojistik merkezlerin kurularak hava kirliliğinin ve şehir trafiğine verilen olumsuzluğun önüne geçilmesi olmuştur. Bunun yanında lojistik köylerin sağladığı başlıca faydalar şunlardır (Elgün, 2011; Winkler & Seebacher, 2011);

- Tek bir merkezden yönetim oluşturmak mümkündür,
- Tek bir merkezden planlama yapılabilir,

- Bütün faaliyetler için güvenli bir ortam oluşturulabilir,
- Araç, depo ve insan gücü kullanımının en uygun hale getirilebilir,
- Destek/yardımcı hizmetler sunulabilir,
- Nakliye ve personel maliyetlerinde düşüş sağlanabilir,
- Kaliteli bir çalışma ortamı sağlanabilir,
- Yük taşımacılığı ile ilgili tüm faaliyetlerin tek bir merkezde toplanmasından dolayı lojistik zincirin hizmet kalitesi artırılabilir,
- Trafik yükü ve çevre kirliliği azaltılabilir,
- Bölgesel kalkınmaya destek sağlanabilir.

Lojistik köyler, şehir merkezlerine etkili ve sürdürülebilir dağıtım gerçekleştirmekte ve yükün teslimini kolaylaştırıcı bir fonksiyon üstlenmektedir. Günümüz rekabet ortamında işletmelerin, lojistik faaliyetlerini lojistik köy aracılığıyla yürütmesi;

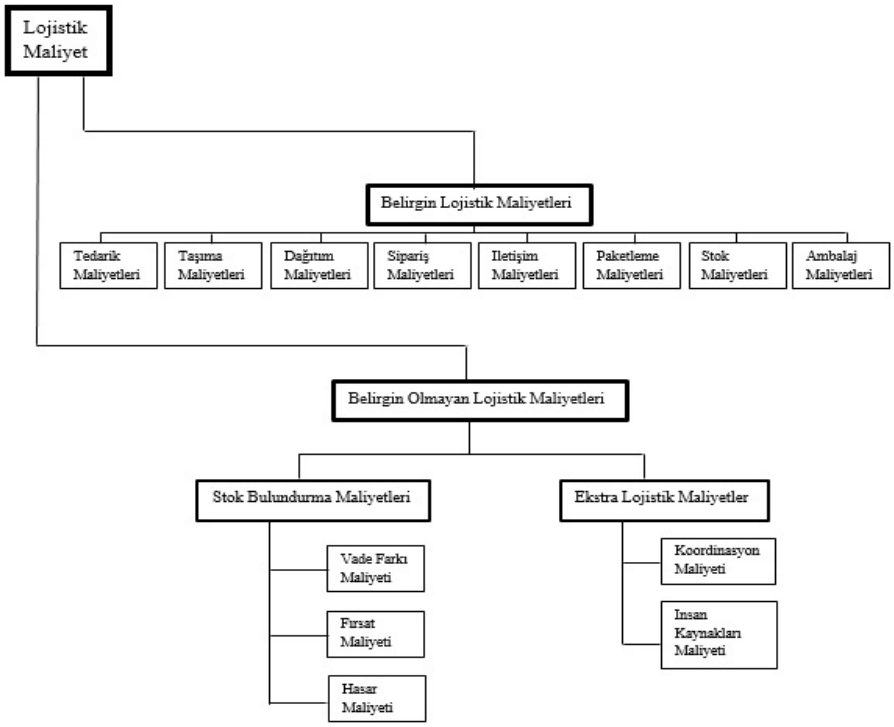
- Kıt kaynaklarını daha etkin ve verimli alanlara yatırabilme,
- Maliyet, zaman ve işgücü avantajı vb. avantajlar sağlayabilmektedir.

Lojistik maliyet, işletmelerin lojistik faaliyetler için katlandıkları fedakârlıkların parasal toplamıdır. Tokay, Deran ve Aslan (2011) lojistik maliyetlerin, "bir ürünün tedarik edilmesine ilişkin girişimlerde bulunulmasından, müşteriye teslim edildiği ana kadar yapılan tüm faaliyetlere ilişkin maliyetler olup, depolama, ambalajlama, sevkiyata hazırlama, taşıma, montaj ve ilişkili tüm hizmet maliyetleri ile fatura hazırlama, işlemin muhasebeleştirilmesi ve tahsilât maliyetlerinden oluştuğunu" ifade etmektedir.

Lojistik maliyetler; işletmenin büyüklüğü, faaliyet gösterdiği sektörün özellikleri, yönetim anlayışı gibi faktörlere göre farklılık göstermektedir. Örneğin bir mermer işletmesinin hammadde kaynaklarına yakın kurulması gerektiğinden, çıkarılan hammaddenin pazara uzaklığı nedeniyle lojistik maliyetlerde meydana gelecek artışlar büyük önem arz etmektedir. Söz konusu hammadde katma değere sahip bir ürüne dönüştürülmeden hammadde olarak pazara sevk edildiği takdirde lojistik maliyetlerin önemi daha da artmaktadır. Bir turizm işletmesi için lojistik maliyetler ile ilgili aynı yorumu yapmak mümkün değildir. Çünkü pazara yakın yerlerde hizmet sunumu söz konusu olmaktadır. Bu bağlamda işletmeler günümüz yoğun rekabet ortamında rekabet stratejilerine bağlı olarak ortaya çıkacak lojistik maliyetleri tespit etmeli ve yönetmelidir. Bu maliyetleri (Bezirci & Dündar, 2011);

- Navlun, sigorta, gümrükleme ve ara taşıma maliyetleri,
- Depolama ve ardiye maliyetleri,
- Bozulma, hasar ve kayıp, tazminat maliyetleri,
- Gecikmiş teslimat maliyetleri,
- Ceza, hata maliyetleri,
- Bilgi sistemleri ve bilgi iletişim maliyetleri,
- Personel ve işgücü maliyetleri,
- Optimum olamayan sipariş miktarları maliyetleri,
- Ekonomik olmayan stok bulundurma maliyetleri,
- Atıl kapasite maliyetleri,
- Kullanılan araç ve donanımın amortismanı veya kirası,
- Her bir taşıma istasyonuna göre maliyetler,
- Taşıma ve depolama amaçlı paketleme maliyetleri,
- Elleçleme ve istifleme vb. ürün aktarım maliyetleri,
- Birleştirme, ayrıştırma, etiketleme vb katma değerli işlem maliyetleri,
- Lojistik yönetim maliyetleri şeklinde ifade edilebilir.

Lojistik maliyetlerin yapısı Şekil-3'de gösterilmektedir.



Şekil 3: Lojistik Maliyetlerin Yapısı
Kaynak: Fu & Yang, 2009.

Şekil-3'de görüldüğü üzere lojistik maliyetler işletmenin faaliyetlerinde belirgin ve belirgin olmayan maliyetler olmak üzere ortaya çıkmaktadır. Belirgin lojistik maliyetler işletme bünyesinde ortaya çıkmakta ve yönetilebilmektedir. Bu bağlamda işletme bu faaliyetleri organizasyon içinde etkin kontrol ile minimize edebilme yeteneğine sahiptir. Örneğin iletişimin işletme içinde ve dışında internet üzerinden yapılması, tedarik ve üretim süreleri ile talebe bağlı stokların düşürülmesi, paketleme ve ambalajlama teknik ve malzemelerinde tasarımlar geliştirilerek maliyet minimizasyonu sağlanabilmektedir.

Belirgin olmayan lojistik maliyetler ise işletmenin yönetiminde olmayan ve katlanmak zorunda kaldığı maliyetlerdir. Örneğin vadeli alım sonucunda ortaya çıkan faiz giderleri, kazalara dayalı meydana gelen hasarlar ve bir karar sonucunda vazgeçilen yatırımlardan mahrum kalınan gelirler sayılabilir. Bu noktada önemli olan husus işletmenin gelecekte karşılaşacağı belirgin ve belirgin olmayan lojistik maliyetleri optimal seviyeye getirecek lojistik yönetim merkezi ve/veya tekniğini işletme bünyesinde kurulması ve yürütülmesidir.

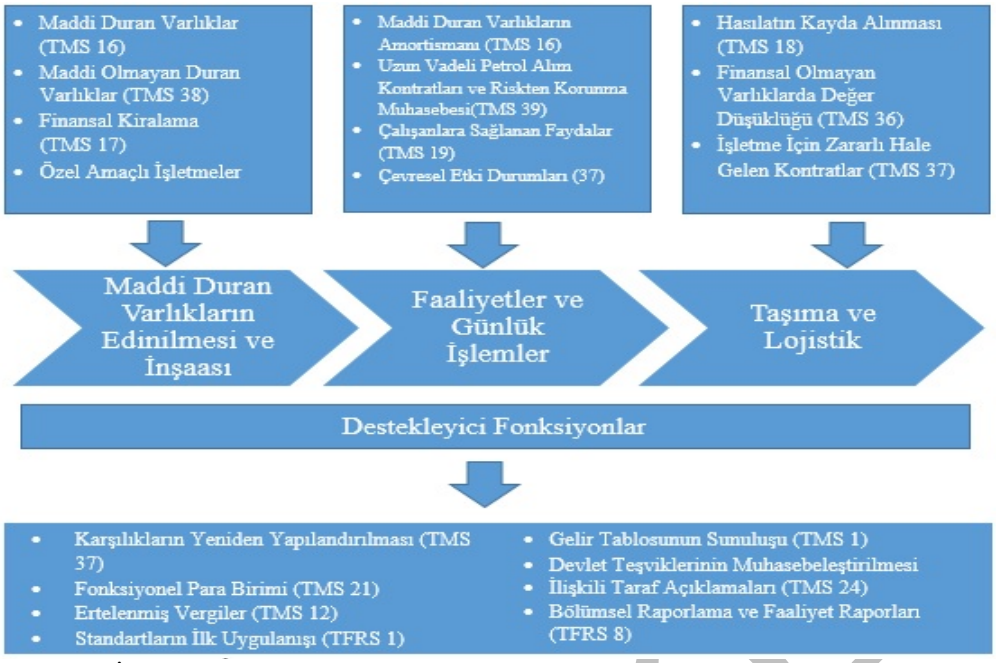
Lojistik maliyet yönetiminin ve kontrolünün gerçekleşebilmesi lojistik faaliyetlerin muhasebe sürecine entegre edilebilmesine bağlıdır.

Lojistik Köy Faaliyetlerinin TMS/TFRS'ye Göre Muhasebeleştirilmesi

UFRS'ye uygun olarak 1 Ocak 2013 tarihinde yürürlüğe giren TFRS ve TMS'nin yine Türkiye'de taşımacılık sektöründe yeni bir uygulama olarak ortaya çıkan "lojistik köyler" üzerinde bir çalışma ile etkilerini ortaya koymak temel amaçtır.

Muhasebe ve finansal raporlama standartları sektörlere özel standartlar değildir. Bu bağlamda lojistik işletmeleri de aynı standartlara bağlı olarak işlemlerini gerçekleştirmek ve raporlama yapmak zorundadır. Ancak içerisinde faaliyet gösterilen sektör gereği bazı hususlar ön plana çıkmaktadır. Lojistik işletmelerinde değer zinciri ile hangi hususların öne çıktığı Şekil 4'te gösterilmektedir. 1 Temmuz 2012 tarihinde yürürlüğe giren yeni TTK[34] ile birlikte muhasebe ve finans konularında önemli ve köklü değişiklikler meydana gelmiştir. Bu kapsamda 1 Ocak 2013 tarihinde yürürlüğe giren UFRS[35] ile uyumlu TMS ve TFRS'nin uygulanması anonim ve limited şirketler için zorunlu hale gelmiştir.

[34] Türk Ticaret Kanunu
[35] Uluslararası Finansal Raporlama Standartları



Şekil 4: Lojistik İşletmelerinde Değer Zinciri ve Muhasebe-Finansal Raporlama Standartları
Kaynak: Price Waterhouse Coopers, 2013.

Şekil 4'te verilen lojistik işletmelerinde değer zinciri ve muhasebe-finansal raporlama standartları çeşitli faaliyetler için kullanılması gereken standartları göstermektedir. Bu bağlamda lojistik köy işletmeleri için önem arz eden standartlar ve örnek uygulamaları anlatılmaya çalışılmıştır.

Lojistik Köyler İçin Örnek Muhasebe Uygulamaları

Örnek 1: Alfa lojistik köy işletme ortaklarından Bay A 03.01.20xx tarihinde, noter, tescil vb. işlemleri için kuruluş gideri olarak 200 TL ödemiştir. VUK[36]'a göre kuruluş ve örgütlenme giderleri 770 GENEL YÖNETİM GİDERLERİ" hesabında izlenirken TMS'ye göre "262 KURULUŞ VE ÖRGÜTLENME GİDERLERİ" hesabında izlenmektedir.

03.01.20xx			
770 GENEL YÖNETİM GİD.		200	
770.01 Kuruluş Giderleri			
	331 ORTAKLARA BORÇLAR		200
	331.01 Ortak A		
Kuruluş Giderleri İçin Ortak A'ya Borçlanılması			

03.01.20xx			
262 KUR. VE ÖRG. GİD.		600	
262.01 Kuruluş Giderleri			
	331 ORTAKLARA BORÇLAR		600
	331.01 Ortak A		
Kuruluş Giderleri İçin Ortak A'ya Borçlanılması			

Örnek 2[37]: Alfa lojistik köy işletmesi, işyeri olarak kullanmak ve faaliyetlerini yürütmek amacıyla 01.01.20xx tarihinde bir gayrimenkul satın almıştır. Gayrimenkul alımı için 200.000 TL'lik kısmı arsa payı olmak üzere 500.000 TL banka hesabından havale edilmiştir. Satın alım işlemleri için 3.500 TL

[36] Vergi Usul Kanunu
[37] Muhasebe kayıtlarında Katma Değer Vergisi (KDV) ihmal edilmiştir.

komisyon ve %0.6 tapu harcı olan 3000 TL ayrıca ödenmiştir. VUK[38] çerçevesinde gayrimenkul satın alım bedelinin maliyeti 500.000 TL olacaktır. Ancak TMS 16 hükümleri uyarınca varlık olarak muhasebe koşullarını sağlayan bir maddi duran varlık, maliyet bedeli ile ölçülmelidir (TMS 16, md. 10). TMS 16 uygulaması çerçevesinde toplam maliyet;

- ✓ Bina Satın Alma Bedeli 500.000 TL
- ✓ Komisyon 3.500 TL
- ✓ Tapu Harcı 3.000 TL
- ✓ **Toplam Maliyet** **506.500 TL** olarak hesaplanacaktır**.**

01.01.20xx			
250 ARAZİ VE ARSALAR		200.000	
250.01 Arsa			
252 BİNALAR		306.500	
252.01 Bina			
	102 BANKALAR		506.500
	102.01 X Bankası		
Bina Satın Alımı			

Örnek 3: Alfa lojistik köy işletmesi faaliyetlerinde kullanmak amacıyla 01.01.20xx tarihinde 25.000 TL'lik 4000 kg sabit taşıma kapasitesine sahip palet, 2 adet 50.000 TL'lik otomatik paletleme makinası ve 150.000 TL'ye 3 adet otomatik çemberleme makinası satın almıştır.

01.01.20xx			
256 DİĞ. MAD. DURAN VAR.		25.000	
256.01 Palet			
253 MAKİNE, TESİS VE CİHAZLAR		200.000	
253.01 Otomatik Paletleme Mak. 50.000			
253.02 Otomatik Çember. Mak. 150.000			
	102 BANKALAR		225.000
	102.01 X Bankası		
Palet, Paletleme Makinası, Çemberleme Makinası Satın Alınması			

Örnek 4: Alfa lojistik köy işletmesi paletleme, yükleme ve boşaltma makinaları, tesis içi lojistikte kullanılan araçların daha az yakıt kullanmasını sağlayacak teknik geliştirme işlemini gerçekleştirmesi nedeniyle 11.01.20xx tarihinde Akıllı Mühendislik İşletmesine 100.000 TL senet keşide etmiştir. VUK'a göre söz konusu bu işlem "263 ARAŞTIRMA VE GELİŞTİRME GİDERLERİ" hesabında izlenirken "TMS'de 262 GELİŞTİRME GİDERLERİ" hesabında izlenmektedir.

11.01.20xx			
262 GELİŞTİRME GİDERLERİ		100.000	
	321 BORÇ SENETLERİ		100.000
Geliştirme Gideri			

Örnek 5: Alfa lojistik köy işletmesi 01.01.20xx tarihi itibariyle 100.000 TL bedelle müşteri takibini kolay yapabilmek, depolarda stoklanan malların durumu hakkında bilgi sahibi olmak için Logistics V. 1.0. programını satın almıştır. Alfa lojistik köy işletmesi yazılımın faydalı ömrünü 5 yıl ve kalıntı değerini sıfır olarak belirlemiştir. Varlığın ömrü sınırsız değildir çünkü her yıl teknolojik gelişmelere ve işletme faaliyetlerindeki değişikliklere bağlı olarak güncellenmektedir. Bu yüzden itfa payı ayrılmasına karar verilmiştir. VUK'a göre söz konusu bu işlem "267 DİĞER MADDİ OLMAYAN DURAN VARLIKLAR" hesabında izlenmektedir.

01.01.20xx			
263 YAZILIM PROGRAMLARI		100.000	
263.01 Logistics V. 1.0.			
	102 BANKALAR		100.000
	102.01 X Bankası		
Lojistik V. 1.0. Programının Satın Alınması			

Örnek 6: Alfa lojistik köy işletmesi 01.06.20xx tarihi itibariyle ilk kez çalışanları için kıdem tazminatı hesaplamaya karar vermiştir. Toplam kıdem tazminatı 48.000 TL olarak hesaplanmış olup bu tutarın yarısı pazarlama yarısı ise yönetim departmanlarında çalışan personele aittir.

[38] Vergi Usul Kanunu

01.06.20xx		
760 PAZ. SATIŞ VE DAĞ. GİD.	24.000	
760.02 Kıdem Tazminatları		
770 GENEL YÖNETİM GİD.	24.000	
770.02 Kıdem Tazminatları		
472 KIDEM TAZ. KARŞ.		48.000
Kıdem Tazminatı Ayrılması		

Ticari kar/zararın gerçek tutarlara göre tespitini amaçlayan TMS'ye göre kıdem tazminatı karşılığı ayrılması gerekmekle birlikte, yürürlükteki vergi mevzuatı gereği kıdem tazminat karşılıkları dönem kazancının tespitinde kanunen kabul edilmeyen gider olarak sayılmamış, kıdem tazminatlarının ancak ödendikleri dönemde gider olarak dikkate alınacağı yönünde düzenleme yapılmıştır. Bu sebeple ayrılan karşılıklar nazım hesaplarda izlenmesi gerekmektedir.

01.06.20xx		
900 KANUNEN KABUL EDİL. GİD.	48.000	
901 KANUNEN KABUL EDİL. GİD. KARŞ.		48.000
20xx yılı geçici vergi ve kurumlar vergisi beyannamesinde ticari kara ilave/zarardan tenzil edilecek tutar		

Örnek 7: Alfa lojistik köy işletmesi Doğu A.Ş.'nin ürettiği X mallarını 1 ay süresince depolamak üzere anlaşmaya varmıştır. Alfa lojistik işletmesi 01.12.20xx tarihinde peşin ödemesi 20.000 TL olan hizmet bedelini 91 günlük vadeli senet karşılığı 25.000 TL'ye kiralamıştır. VUK'a göre söz konusu vade farkı "600 YURTİÇİ SATIŞLAR" hesabında izlenmektedir.

01.12.20xx		
121 ALACAK SENETLERİ	25.000	
121.01 Doğu A.Ş.		
600 YURT İÇİ SATIŞLAR		20.000
600.02 Doğu A.Ş.		
127 TİCARİ ALACAKLAR REESKONTU (ERTELENMİŞ GELİRLER)		5.000
Vadeli Hizmet Satışı		

Aralık ayına ait faiz geliri: 5000/91*31 = 1703,30 TL

Ocak-Şubat ayına ait faiz gelir: 5000-1703,30 = 3296,70 TL

31.12.20xx		
127 TİCARİ ALACAKLAR REESKONTU (ERTELENMİŞ GELİRLER)	1703,30	
642 FAİZ GELİRLERİ		1703,30
Vadeli Hizmet Satışından Doğan Faiz Geliri		

Örnek 8: Alfa lojistik köy işletmesine kayıtlı olan bir taşıt 15.01.20xx tarihinde kaza yapmıştır. Kaza sonucunda araçta oluşan hasarın 10.000 TL olduğu öngörülmektedir. Araç kaskoludur ve aracın tamirat işini üstlenen servise herhangi bir ödeme yapılmamıştır. Ekspertiz raporuna göre kasko şirketinden alınacak tutar 7.500 TL'dir. VUK uyarınca kasko şirketin alınacak tutar "136 DİĞER ÇEŞİTLİ ALACAKLAR" hesabında izlenmektedir.

15.01.20xx		
760 PAZ. SATIŞ VE DAĞ. GİD. 760.04 Araç Kaza Giderleri VEYA 810 TAŞIMA MALİYETLERİ 810.05 Bakım-Onarım Maliyetleri	10.000	
379 DİĞER BORÇ KARŞ. 379.01 Araç Kaza Giderleri Karşılığı		10.000
Hasar İçin Karşılık Ayrılması		

15.01.20xx		
136 DİĞER İLİŞKİLİ TAR. ALACAKLAR	7.500	
649 DİĞER OLAĞ. GEL. VE KAR.		7.500
Kasko Şirketinden Alınacak Tutar		

Sonuç ve Tartışma

Yaşadığımız her alanda etkisini gösteren küreselleşme muhasebe alanında da etkisini göstermiştir. Bu etkiye yönelik olarak Uluslararası Muhasebe Standartları Komitesi tarafından UFRS[39] yayınlanmıştır. Ülkemizde de söz konusu bu gelişmelere paralel olarak UFRS ile tam uyumlu TMS yayınlanmış ve yürürlüğe girmiştir. TMS'nin yayınlama amacı, ihtiyaç duyulan bilgiyi tam, doğru ve güvenilir bir şekilde karşılamaktır. UFRS ve TFRS'ye göre hazırlanan finansal raporların anlaşılabilir, doğru ve karşılaştırılabilir olması gerekmektedir.

Lojistik sektöründe gerçekleştirilen faaliyetlerin kapsamının genişlemesi ve çeşitlenmesi; yük taşımacılığı akışlarının etkin ve verimli bir şekilde organize olması ve çoklu ulaşım sistemleri ile uyumlu olabilmesini gerektirmiştir. Bu da ancak lojistik köylerin varlığı ile mümkün olabilecektir.

Kentlerdeki lojistik hareketlerin en az maliyet ve en kısa sürede gerçekleştirilebilmesi ve lojistik faaliyetlerin özel alanlarda toplanarak kentlere verilen olumsuz etkilerin asgari seviyeye indirilebilmesi için lojistik köyler büyük önem taşımaktadır.

Lojistik köylerin en önemli işlevi dağıtımın tek merkezden yapılabilmesi, akıllı depolama sistemlerine sahip olması ve gümrük işlemlerinin kolayca halledilebilmesidir.

Ülkemizin stratejik konumu sayesinde sahip olduğu 'Lojistik Üs' özelliği ile beraber lojistik köy kavramı gündeme gelmiştir. TCDD ve özel sektör işbirliği ile ülkemizin çeşitli bölgelerinde lojistik köyler kurulmaya başlanmıştır. Ancak lojistik köy yatırımlarının bir an önce hayata geçirilmesi gerekmektedir. Bu bağlamda yapılacak bu yatırımların uzman eğitim kadrosu ile desteklenmesi uygun olacaktır.

Günümüz yoğun rekabet ortamında işletmelerin lojistik faaliyetlerinden kaynaklanan ihtiyaçları ve bu duruma bağlı olarak işletmenin toplam maliyetlerin içindeki lojistik maliyetlerin payı artmıştır. Lojistik köyler işletmelere lojistik imkânı sağlamakta ve buna bağlı olarak işletmeler lojistik maliyetleri azaltmakta ve karlılık hedeflerini daha kısa sürede gerçekleştirebilmektedirler. Bu bağlamda bu çalışma lojistik köy faaliyetlerinin muhasebeleştirilmesi ile ilgili alanında ilk çalışma olduğundan lojistik köy işletmeleri için emsal niteliği taşımaktadır.

Lojistik köyler ile işbirliği içerisine giren işletmeler için yapılacak bir takım yasal düzenlemeler ile lojistik köylerin kurulması teşvik edilmeli, desteklenmelidir. Lojistik işletmeleri teşvik edecek yasal düzenlemeler ile birlikte çeşitli ulaşım yolları (karayolu, denizyolu vb.) maliyetlerinden kurtulacak ve sürdürülebilir işletmeciliğin gereği olan ekolojik dengeye zarar vermeyecek, yeşil maliyetlere katlanmak zorunda kalmayacaktır.

Lojistik köylerin yönetimindeki etkinlik ve verimlilikten bahsedebilmenin koşullarından biri de maliyetlerin doğru bir biçimde belirlenmesi, kontrol edilmesi ve yönetilmesidir. Bu maliyetlerin kontrol edilmesinde toplam maliyet analizlerinin yapılması ve toplam maliyetlerin satış gelirleri üzerindeki etkisinin ölçülmesi gerekmektedir. Ancak bu iki analizin yanında lojistik köy işletmeleri gerek uygulamada gerekse literatürde kullanılan diğer yöntemleri de başarıyla uygulayabilmelidirler.

Sonuç olarak, lojistik köy işletmelerinin lojistik faaliyetlere ilişkin daha ayrıntılı analizler yapabilmesi stratejik maliyet yönetimi araçlarını uygulamaya alması önerilmektedir.

[39] Uluslararası Finansal Raporlama Standartları

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Mycorrhizal status of main spontaneous or introduced forest trees in El Tarf province (Algerian North-east)

Arifa Beddiar, Mériem Adouane, Imène Boudiaf and Adem Fraga

Laboratory of Plant Biology and Environment,

Department of Biology, Badji Mokhtar University,

PB12, 23000 Annaba, Algeria

fragbed@yahoo.fr

Abstract: In Algeria, often, serious imbalances of the forest ecosystems caused by the badly led exploitations, the repeated fires, the overgrazing involve the disappearance of the timbered state on vast territories. Within the framework of the plantation and restoration programs of these degraded forests, we plan to contribute to it by tests of controlled mycorrhization of forest tees in nursery. But to realize these tests, it is necessary to know beforehand the natural symbiotic status of the studied species.

We present there, the first stage of our work which consisted in establishing the mycorrhizal status of main spontaneous or introduced forest species into Algerian North-east. The study was carried out in El Tarf province and related to all the species of pine, oaks and other leafy trees existing in this area.

The results show that all the species observed have either ectomycorrhizas (ECM) or arbuscular endomycorrhizas (AM) or both at the same time. In addition, the introduced species of the Acacia or Casuarina genus carry AM and also nitrogen fixing nodules. It should be noted the remarkable diversity of ectomycorrhizal morphotypes associated to the pines and to the oaks and also that of the endomycorhizals fungi spores occur in the rhizosphere of other species.

Lastly, it is significant to note the omnipresence of Cenococcum geophilum mycorrhiza in all the stations and the majority of the ectomycorrhizal trees.

Keywords: ectomycorrhizas, arbuscular mycorrhizas, forest species, Algerian North-east

Introduction

In the Algerian North-East, the forest ecosystems play a socio-economic, ecological and entertaining role of first order (Messaoudène et al., 1996). However, each year, the surface of these forests is reduced seriously because of many factors such as the long dry season, overgrazing, fires and overexploitation.

Today, the reconstitution of these forests proves to be of need consequently to increase the possibilities of trees to fight against the external agents proves more than necessary. In addition, it was established that the majority of the forest trees contract symbiotic associations with some fungi and bacteria of the soil which gives opportunity to the tree to resist the drastic effects of the climate, the lack of nutrients provided from the soil and the parasitic attacks (Dommergues et al., 1999; Smith and Read, 2008).

In this way, we foresee experiments of controlled mycorrhization in nurseries. But before, we think that the knowledge of the symbiotic status of the various species is an essential step. It is the subject of this present article. Our study proceeded in the El Tarf province (the extreme algerian North-east) and related to the trees or the shrubs of the forest ecosystems of plain, dune and mountain as well as the ripicolous ecosystems.

Materials and methods

-Presentation of the study zone and stations

The study zone is the area of Algeria limited by the Mediterranean Sea to north, the hills of the Tellian Atlas in the south and the west and by the Tunisian border in the east (Fig.1). It is characterized by an average rain fall of 910 mm/year and an average maximum temperature around 18°C. The coldest months are January and February whereas July and August are hottest. The dry season lasts nearly 4 months and the atmospheric humidity goes between 69 and 74%. According to the Emberger climagramm (1955), the area of El Tarf extends from the sub wet to wet bioclimatic stage of vegetation (de Belair, 1990) and stands on deposits and alluvia, numidians siliceous flyshs and dunes. In this area, altitude varies sea level up to 1202m.

The geological constitution of the basement gather only nummulitic grounds dating primarily from the tertiary sector and quaternary (Joleau, 1936).The most advanced soils are under the oaks and the pines, they are forest brown soils. The hills are characterized by sandstones and Numidian clays, the depressions by alluvia and colluviums (Marre, 1992). The localization and the description of the study stations are presented in figure1 and table 1.

Fig. 1: Localization of sampling stations (scale : 1 /1000000)

Table 1: Localization and characteristics of the various sampling stations

Stations	Brief description of the station
S1	Maquis of kermes oak on littoral dune. Ben Mhidi county, 2 km after oued Mafragh, altitude: 20m
S2	Plantation of maritime pine, Righia, Berrihane county, alt.: 50m
S3	Forest of cork oak and ripisylvaie, Righia, Berrihane county, 18 km after the Righia village, in direction of El-Kala, alt.: 50m
S4	Forest of cork oak. El-Koursi county, in the West of the Mellah lake, alt.: 100m
S5	Degraded forest of cork oak. El Kala county, natural reserve of Braptia, full southern with Mellah lake, alt.: 87m
S6	Plantation of Eucalyptus and Acacia. El Kala county, alt.: 50m
S7	Mix introduced species Souarak county, arboretum of Tonga, alder grove, alt.: 50m
S8	Mixed forest of cork oak-zeen oak. Bougous county, 500m after the Bougous village, alt.: 260 m
S9	Forest of zeen oak, jebel Ghorra, Bougous county, 2 km after the Bougous village towards the Tunisian border, alt.: 850 m

-Estimate of the mycorrhizal colonization

For each station, we took root samples of ten individuals of each tree species present in the settlement. Part of the fine roots was observed directly with the dissecting microscope in order to seek the ectomycorrhizas (ECM), which made it possible to distinguish different morphotypes according Agerer (1987-1996) description. On the other part, the frequency of the arbuscular mycorrhizal (AM) colonization was evaluated by the method of Trouvelot et al. (1986) after staining with the acid fuschine or Chlorazol black according to the technique of Kormanik et al (1980). Lastly, the Rhizobium or Frankia infection was detected by the presence of nodules.

- Extraction of Glomalean fungi spores

This research was carried out on soil samples taken of from Acacia decurrens rhizosphere in mixture with Eucalyptus camaldulensis in the El kala station (S6). The arbuscular mycorrhizal fungi (AMF) spores or sporocarpes were extracted according to the wet sieving technique (Gerdeman, 1963).

Their identification was tried by means of Schenck & Perez (1986) key.

Results and discussion

The results show the existence of mutualist symbiosis in all the prospected species. Whatever were the species either main one (cork oak, zeen oak and maritime pine), the secondary species (alder , chestnut, merisier, laurel…) or the introduced species (eucalyptus, acacia, cypress...), they carry all either ECM or AM or both at the same time. We thus share the suggestion formulated by Trappe (1977) and then by Selosse and Le Tacon (1999) according to which the mycorrhizal state is a general state in the plant world.

Among the observed ectomycorrhizal morphotypes, Cenococcum geophilum mycorhiza (Fig. 2), easily recognizable, is in the majority and omnipresent as well at the oaks and the pines or other trees (chestnut, eucalyptus). Cenococcum geophilum is a fungus which has a great capacity to infect trees of different species and under varied ecological conditions (Le Tacon, 1997). When the water stress established (in summer), much of mycorrhizas is destroyed, those of Cenococcum geophilum are however more resistant (Garbaye & Guehl, 1997).

Its omnipresence at the majority of the studied forest species reveals difficult environmental conditions. Indeed, the Mediterranean forest constitutes an ecosystem submitted to strong edaphic, climatic and economic constraints which stimulates Cenococcum geophilum to be proliferating in this medium type.

According to Selosse and Le Tacon (1999), this species which is met in all the planet natural ecosystems with ectomycorrhizas, would contribute probably universally, to the survival of the forest trees with ectomycorrhizas during the water stress periods. Secondary species of the oak forest, spontaneous ones (wild cherry tree, bay-tree, alder, poplar…) or are introduced (hazel-tree, eucalyptus…) present an AM frequency infection ranging between 25 and 60% in the majority of the cases.

Acacia and Casuarina, although introduced species in Algeria present an additional infection respectively by Rhizobium and Frankia. The research of the Glomalean spores in the rhizosphere of Acacia mearnsii and Eucalyptus camaldulensis revealed a very significant morphotypic diversity (Fig. 3). The Glomus genus seems prevalent.

Table 2: Mycorrhizal status of main studied forest species (ECM: ectomycorrhiza, AM: arbuscular mycorrhiza, R: Rhizobium nodules, Fr.: Frankia actinorhizas)

Family	**Plant Species and sampling stations (S)**	**Type of symbiosis and % of colonisation**	**Number of ECM morphotype**
Pinaceae	Pinus maritima Lam S2	ECM (82,12)	10
	Pinus pinea L., S8	ECM (64,22)	4
	Pinus radiata L., S8	ECM (33,35)	2
Cupressaceae	Juniperus oxycedrus L., S6	MA (19,22)	-
	Cupressus sempervirens L., S6	ECM (58,64), MA (29,2)	3
Taxodiacea	Taxodium disticum L., S 8	MA (26,22)	-
Casuarinaceae	Casuarina equisetifolia Forst., S1	MA (58,02), F	-
	C. cunningamiana Miq.	MA (50,66), F	-
	C. obesa Miq.	MA (44,35), F	-
Fagaceae	Quercus suber L., S3, S4, S5, S6.	ECM (68,71), MA (09,00)	14
	Quercus faginea L., S4, S7,	ECM (62,32)	9
	Quercus coccifera L., S1	ECM (49,13)	2
	Castanea sativa L., S7	ECM (50,42), MA (41,15)	7
Betulaceae	Alnus glutinosa L.Gaertn, S2, S8	ECM (61,43), MA (25,52)	8
Salicaceae	Populus alba L., S5	ECM (28,40), MA (31,86)	4
	Salix pedicellata L., S5	MA (25,03)	-
	Salix babylonica L, S2, S8	MA (23,62)	-
Corylaceae	Corylus avellana L., S7	MA (29,24)	8
Juglandaceae	Juglans regia L., S8	MA (33,15)	-
Rosaceae	Cerasus avium L., S7	MA (44,09)	-
	Crataegus monogyna Jacq., S5	MA (38,64)	-
	Rubus ulmifolius L., S5,	MA (58,37)	-

Lauraceae	Laurus nobilis L., S5	MA(63,05)	-
Oleaceae	Fraxinus oxyphylla L., S8	MA (40,42)	-
	Olea europaea L., S1, S5	MA (51,56)	-
	Olea oleaster Link., S1, S5	MA (44,32)	-
	Phillyrea media L., S1, S5, ,S4	MA (65,62)	-
Anacardiaceae	Pistacia lentiscus L., S1, S5	MA (35,39)	-
Myrtaceae	Myrtus communis L., S3, S5	MA (63,54)	-
	Eucalyptus globulus Labill., S6, S8	ECM (36,80), MA (12,96)	3
	Eucalyptus camaldulensis Dehnh, S6	ECM (30,72), MA (15,06)	3
Fabaceae	Ceratonia siliqua L., S7	MA(35,44)	-
	Calycotome villosa Link. S5,	MA (60,00)	-
	Genista ferox L., S6	MA (30,39)	-
	Genista numidica L., S6	MA (29,35)	-
	Cytisus triflorus L'Herit., S6	MA (29,12)	-
	Acacia cyanophylla Benth., S8	MA (68,20), R	-
	Acacia mearnsii De Wild., S8	MA (72,75), R	-
	Acacia melanoxylon R., S8	MA (61,23), R	-
	Acacia retinoides Willd., S8	MA (42,26), R	-
	Retama monosperma subsp bovei Spach (Maire) S1	MA (08,77), R	-
Cistaceae	Cistus monspelliensis L.S2,S3,S5	ECM (09, 75), MA (18,77)	1
	Halimium halimifolium (L) Wilk	MA (42,42)	-

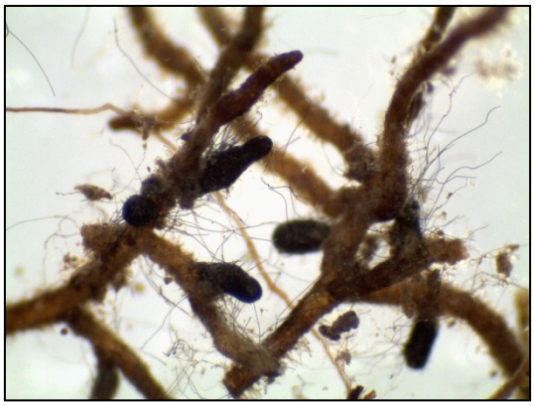

Figure 2: Cenococcum geophylum mycorrhiza colonizing the roots of Quercus suber

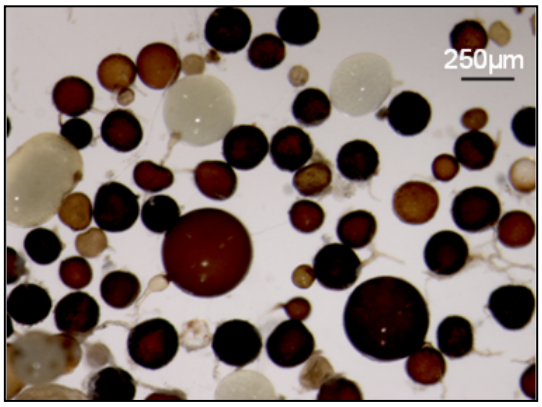

Figure 3 : Various morphotypes of spores in the Acacia mearnsii rhizosphere

Conclusion

The results of this study allow us to give the following conclusions:

All the prospected trees present either an ECM or an AM colonization or both. Alder and filao carry actinorhizas, all Fabaceae are nodulated.

It is advisable to reinforce this study by identifying and by isolating the micro-organisms implicated in various symbiosis observed. These symbiotic microorganisms play certainly a significant role in the trees nutrition. But, do they act in an optimal way?

To make them profitable, intensifying the programs of biodiversity inventory of the whole knowledge is a requisite to any reliable biological or applied research, in order to select the most powerful strains by comparing them with known introduced strains. In this manner, the most performed strains will be selected. The exploitation of Cenococcum geophilum fungus would be also a significant way to explore.

To conclude, let us say simply that Algeria suffers from two flails, desertification and deforestation which dangerously accelerated after climatic changes and also under the effect of the intensive methods of exploitation and irrigation. Among the likely approaches susceptible to act against these two flails, one of most promising is that of to master the controlled mycorrhization in order to produce seedlings of good quality and to realize the successful afforestations.

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Optimization of a Centrifugal Pump by Using CFD Tools

Muaz Kemerli[1], Zekeriya Parlak[1], Tahsin Engin[1], Sercan Çam[1], Yusuf Koç[2]

[1]Sakarya University, Mechanical Engineering Department, Turkey

[2]Arçelik A.Ş,Turkey

E-mail: zparlak@sakarya.edu.tr

Abstract: The state-of-the-art method to solve complex fluid flow problems is Computational Fluid Dynamics (CFD) and one of the complex fluid flow problems in turbomachinery is centrifugal pumps. Numerical analysis of a double exit centrifugal pump has been solved by using the Commercial CFD package FLUENT. The flow rates and the power consumption of the pump according to parameters has been investigated. By using the optimization tools in the package program with 9 different parameters, the optimum design point has been searched and the optimal geometry has been created in order to provide an efficient flow within the desired values. A better performance for double exit centrifugal pump is verified with an optimum geometry by using numerical analysis. The effect of the geometry parameters on power consumption and volumetric flow rate have been plotted and interpreted.

Key words: Centrifugal Pump, CFD, flow analysis, optimization, numerical simulation, MRF, frozen rotor, response surface optimization

Introduction

Centrifugal pumps are rotodynamic turbomachines which use rotating blades to increase the pressure of a fluid. To design a pump and realize this operation, the behavior of the fluid in the whole body has to be determined before the pump is manufactured. To understand the flow behavior by experiment takes a lot of time, money and needs effort. The CFD tools can overcome this problem, and in recent years, most of the industries are using CFD as numerical simulation tool for flow analysis of centrifugal pumps (S. R. Shah et al. 2010). In this study, the optimization tools will be used to reach an optimum geometry for a double exit centrifugal pump which is rotating in both ways, with the best power consumption and flow rates and an effective geometry will be searched to pump the water to the desired outlet conditions.

For simulation of a centrifugal pump there are various type of methods available (S. R. Shah et al 2012) and choosing the correct method for a specific problem was another important question. As the flow characteristic of a new designed pump is considered, it was obvious that, just to simulating the blades would not be enough since the pump has a special body. Also the blades are not so efficient because of they are designed to rotate in both ways, thus the efficiency of the pump has to be explored. So that the full flow domain needs to be meshed and simulated in order to sustain a proper result. But while simulating the full domain it is a long period to analyze a transient solution by using sliding mesh method as it is performed in studies by M. Asuaje et al. (2004) and K. W. Cheah et al (2008) or using dynamic meshes which is studied by H. Si et al (2013). In our early studies it is explored that for this specific

geometry, a steady state solution did not have such a big difference with a transient one. Also, to optimize a transient solution is not so easy since the results are changing periodically and the optimization algorithms need robust results and a short simulation time. So it is decided to apply the MRF method, which is well known and used in many studies with different software such as the study by J. J. Damor et al.(2013) for a commercial CFD software or the study by O. Petit et al.(2009) for open source CFD software.

The study is a contribution to the CFD studies and in particular the studies which are focused on optimization by exploring the effect of the pump geometry on flow rates through the different outlets. However the concept of a double exit centrifugal pump is still an unstudied issue and needs more researchers to interest in this area.

Geometry

The geometry of the pump has been designed to provide different flows through different outlets while the impeller was rotating in different ways. As the impeller rotates in clockwise the flow is directed to one outlet, Outlet 1 and while it works in other direction the flow is directed to the other outlet, Outlet 2. To achieve that there are two reflectors has been placed in the entrance of the outlet pipes as shown in Figure 1. While the pump starts up, the first reflector prevents the first outlet to discharge the flow and the second reflector keeps the flow out. And when the impeller works in reverse way, the effect of the reflectors has been reversed and the flow is directed to the other outlet. So that to prevent the flow in one outlet and to keep the flow out in the other outlet is the desired conditions. There are 10 geometry parameters has been chosen to achieve this design point. The full flow domain also can be seen from Figure 2. The parameters will be given in further pages in Table 1.

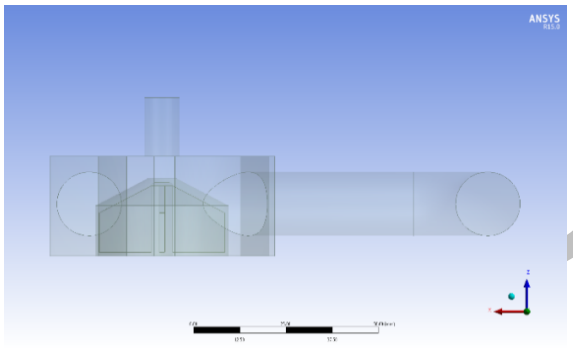


Figure 1: Geometry of the pump body

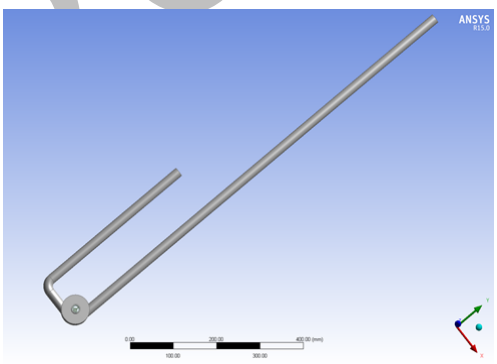


Figure 2: Geometry of the solution domain

The impeller has four blades and the blades have an angle of 0° to provide an efficient performance while the impeller rotates in both ways. The geometry of the blade is simple since those kinds of pumps are used for small flow rates and has to be cost-free. To provide a volute effect, the geometry has been enhanced with a volute height.

Grid Generation

The geometry is divided to fine meshes by using the meshing interface with ANSYS Workbench and the average of mesh number for all geometries was around 300.000 cells. Since the geometry was changing regarding the parameters and design points it was not possible to use a specific meshing method. The pipes have inflation layers and the long pipes have been modelled with a sweep mesh to shorten the solution time. The sweep mesh and the inflation layers at the boundary are shown in the Figure 3 and Figure 4

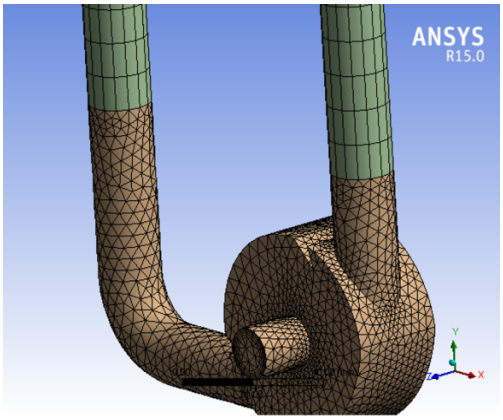


Figure 3: Grid structure of the domain

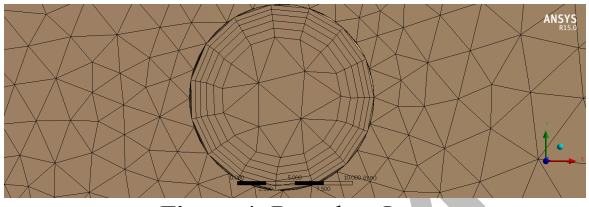


Figure 4: Boundary Layers

The MRF method which is also known as frozen rotor method used to simulate the impeller motion which assumes that the rotating domain is frozen but the mesh cells are moving or rotating at a given rotational speed, and the domain interacts with other domain(s) thereby the solution converges to a point as if the impeller froze while rotating in a specific point of time. The method and the MRF zone can be seen in the Figure 5 and Figure 6 below.

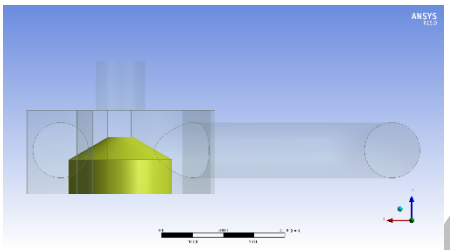


Figure 5: MRF zone

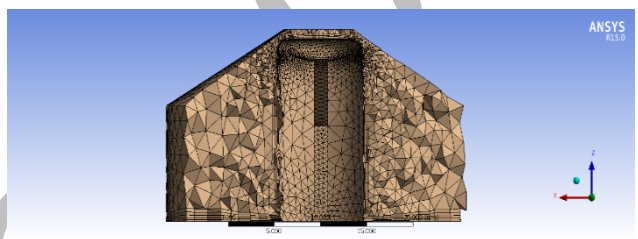


Figure 6: Inside of the MRF zone and the mesh structure

Solution Method

The boundary conditions are chosen to see the flow streamlines to understand the effect of the reflectors and to see the flow rate limits. The head pressure at the inlet and at the both outlet pressures were 0 Pa. The k-ε turbulence model has been used for a steady-state solution. Rest of the body has been considered as walls. The revolution speed was 3000 rpm.

Optimization

To reach an optimum geometry, ANSYS Response Surface Optimization is used. There are 10 parameters are chosen as seen from the Table 1. Four of the parameters are for the blades and three of the parameters are for the reflector. Rest of the parameters are for the pump body. The bounds for the geometry parameters are also given in the table. The optimization tool searched for a flow rate of 15 lt/m for the desired outlet, 0 lt/m for the other outlet and the power consumption is minimized. Outlet diameter is wanted to be at a value around 23 mm and the chamfer angle is limited to 25 ° after realizing a bunch of unphysical answers.

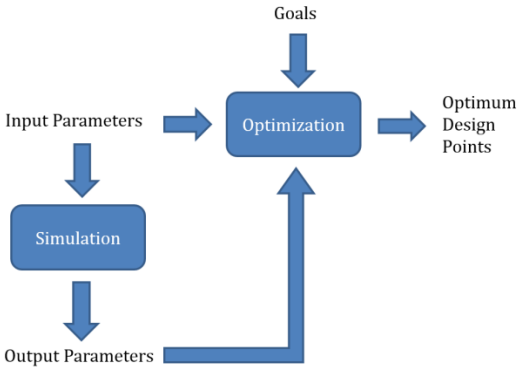


Figure 7: Optimization diagram

Vacuum Effect

While monitoring the results at the outlet, sometimes the flow goes in reverse way, which is known as reverse flow. This is an unphysical situation for the geometry since there is no flow supply in an outlet for the real conditions. The reason is that the model is considered as a single phase model and in the reality there is a multi-phase situation. To understand that problem, a multi-phase model has been generated as shown in Figure 8 and the vacuum values are interpreted.

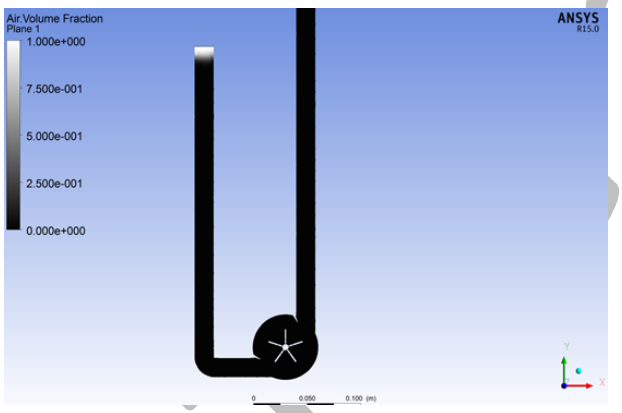


Figure 8: Air fraction contours for the multi-phase solution

After the evaluation of multi-phase solutions it is understood that for the small values of reverse flow around 0-1 lt/m the situation can be considered as an equilibrium and the air doesn't effect the domain body. But for the bigger values the vacuum might let more air inside the pump domain and this might cause some problems. Also for a single phase numerical solution the reverse flow leads into error. So that it is not desired to see a discharge from the Outlet 1, but it is not desired to see negative flow rate values either.

Another exploration is that the reverse flow in the outlet can be interpreted that the flow cannot rise at the outlet and the level of the water at that outlet is less than the modelled level as much as the kinetic energy of the reverse flow. By using this idea further improvements and different computer codes can be used simultaneously to model the situation more clearly.

Results

After the design points has been solved, for a 4 blade geometry there are 147 design point with input and output data has been evaluated by using the Response Surface Optimization tool. The optimum

points which are listed below in Table 1 has been determined by considering the goals. The optimization goals can be seen from the Table 2 below. Also the effect of the parameters and the correlations between values can be seen from the figures below.

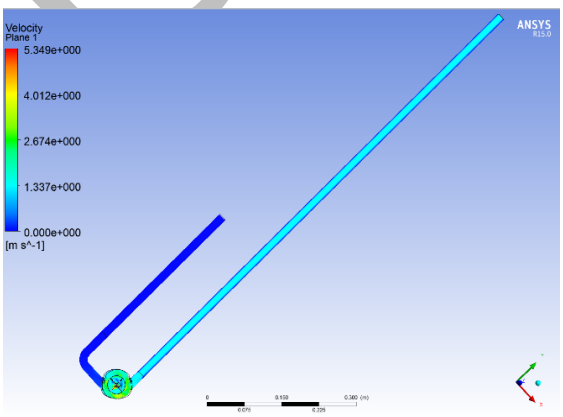
Table 1: Parameter bounds

Parameters	**Bounds**	**Optimum Points**
Reflector Width	3-8 mm	> 6 mm
Reflector Gap between the impeller	1-6 mm	< 3,5 mm
Throwing Angle	20-60 °	> 40 °
Volute Radius	30-50 mm	> 40 mm
Blade Radius	15-23 mm	< 20 mm
Blade Width	15-24 mm	< 19 mm
Blade Chamfer Angle	0.001-60 °	> 30 °
Inlet Diameter	8-50 mm	< 25 mm
Outlet Diameter	10-28 mm	> 21 mm
Number of Blades	4	4

Table 2: Optimization goals

Output Parameters	**Target Values**
Outlet 1	15 lt/m
Outlet 2	0 lt/m
Power	Minimum
Outlet Diameter	23
Blade Chamfer Angle	25

The results for the best design point was 17 lt/m and -0,3 lt/m at the Outlet 1 and Outlet 2 respectively. The power consumption was less than 15 Watts. A negative flow rate at an outlet can be interpreted as a vacuum situation as seen from Figure 8, but as we have modelled such small values before, that doesn't make a big difference if it is compared with a multi-phase solution.



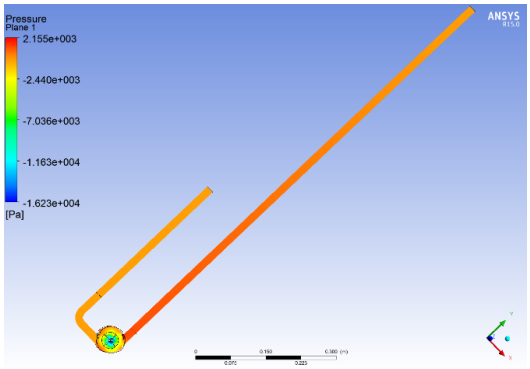


Figure 9: Velocity contours

Figure 10: Pressure contours

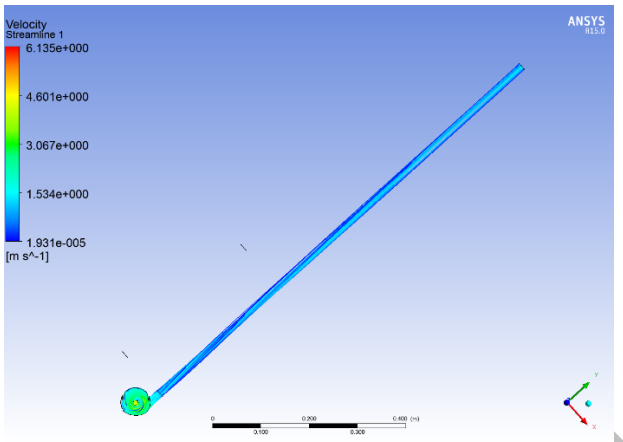


Figure 11: Streamlines rendered by velocity

The correlation between power and blade width shows the expected values for this special geometry. As the blade width grows the volume of the fluid transferred also increases as expected. When the results have been evaluated for the Outlet 2, the bigger blade width, it increases the flow rate through the undesired outlet, Outlet 2. As it is understood clearly, there need to be an optimization tool to determine the optimum design point since all those inlet parameters effect the output results.

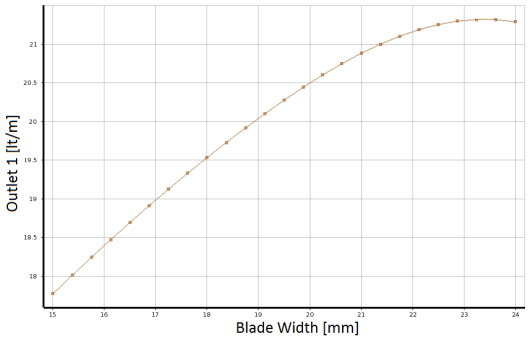


Figure 12: Blade Width vs. Outlet 1

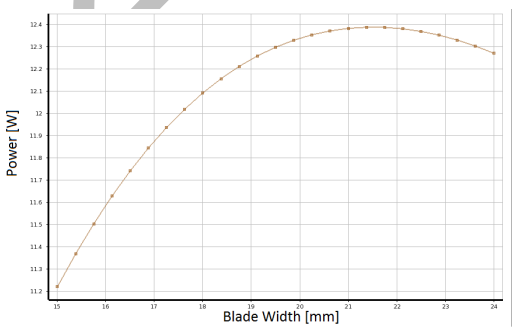


Figure 13: Blade width vs. power

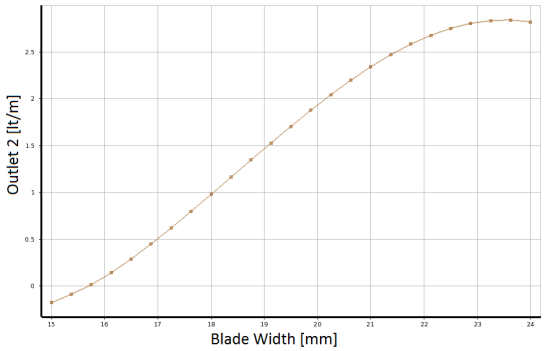


Figure 14: Blade Width vs. Outlet 2

There is another simulation has been done by using different blade numbers as well. But it was not possible to use that parameter with all the other parameters since blade number is a discrete parameter and

the design points was 735 if it is used with whole parameters. Even though all design points would have been simulated, it was still not possible to converge all those points, and only one non-converging design point could have blocked the whole optimization. So to understand the effect of blade number, some of the parameters, which are mentioned below in Table 3, have been excluded

Table 3: Constant parameters for blade number optimization

Parameters	Value
Volute Radius	40 mm
Blade Chamfer Angle	30 °
Outlet Diameter	22
Inlet Diameter	20

Different blade numbers has an excepted relation with the power. As the blade number grows, the power and the flow rate are increasing. But when the relation between blade number and Outlet 2 is examined, it is an unexpected result to see that as the blade number grows, the flow rate for Outlet 2 is decreasing and the reason behind that might be the effect of the blades which are preventing the flow when there are more blades interacting with the fluid.

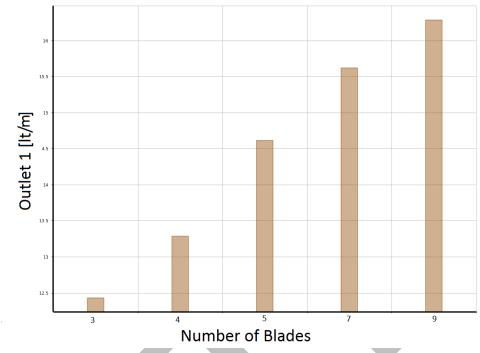


Figure 15: Number of blades vs. Outlet 1

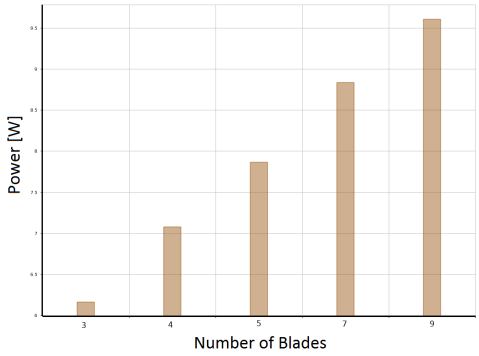


Figure 16: Number of blades vs. power

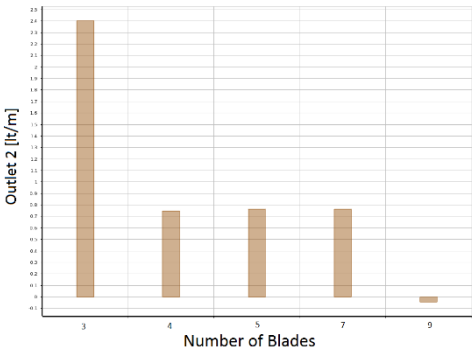


Figure 17: Number of blades vs. Outlet 2

Conclusions

As it is understood from the results, the optimization tools are very effective and time saving processes while designing turbomachines, but the users should be aware of the unphysical answers, and the bounds for the parameters has to be chosen very carefully. Avoiding big numbers of parameters also can be a relative solution since the technology still doesn't offer a solution for an optimization with very big amount of parameters.

The solution method which is used in this study can offer a physical answer for a double exit centrifugal pump. The vacuum effect and the reverse flow can also be interpreted as the static pressure at the outlet is less than the outlet pressure as the kinetic energy of the reverse flow. Different mathematical algorithms can be used and work simultaneously with the CFD solution to model this situation. It can also be modelled by using a multi-phase model by considering the gravity effects.

It is also important to note that using MRF method has limitations if the geometry is not uniform, and the optimization algorithm has significant errors as well. The solution needs more clear results for a correct optimization, but using a transient solution for an optimization to find the correct results is time consuming. It is clear that the CFD methods needs better improvement to shorten the analysis time and set better steady-state methods for such special turbomachine geometries.

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Özet Sağkalım Verilerinin Meta-Analizi

Nilgün YILDIZ

Marmara Üniversitesi, Matematik Bölümü, Istanbul,Turkey.
ncelebi@marmara.edu.tr.

Abstract Meta analizi aynı konuda yapılmış çalışmaların sonucunda uyumsuzluk olduğunda, örneklem genişliği bir etkiyi ortaya çıkarmada yetersiz olduğunda veya bir araştırmacının yapması için çok geniş olduğundan çok pahalı ve zaman alıcı olduğunda gerçekleştirilen niceliksel bir yeniden inceleme çalışmasıdır. Sağ kalım analizi, tanımlanan herhangi bir olayın ortaya çıkmasına kadar geçen sürelerin incelenmesinde kullanılan istatistiksel yöntemlerin bütünüdür. Bu çalışmada yaşam verilerinden elde edilen sonuçları birleştiren farklı yaklaşımlar incelenmiş ve ülserle ilgili yapılan makalelerden elde edilen verilere meta-analizi uygulanmış ve özet bir sonuca ulaşılmıştır.

Key words: Meta-analizi, hazard oranı, Sabit Etkiler Modeli, Rasgele Etkiler Modeli

Giriş

Bilim dünyasında yaşanan hızlı gelişmelerden dolayı, her yıl çok fazla sayıda bilimsel yayın üretilmektedir. Üretilen bilimsel çalışmaların kalitesini ve önemli olup olmadığını tanımlamak oldukça zordur. Aynı konu ile ilgili yapılmış farklı çalışmalar birbiriyle uyumsuz olan sonuçlar, okuyan kişilerin kafasını karıştırmaktadır. Konuyu açıklığa kavuşturmak için alanında uzman birinin yardımına ve farklı çalışmaların sonuçlarının kesin bir sentezini sağlamasına ihtiyaç vardır. Meta-analiz ile çalışmalardaki bilgiler birleştirilebilmekte ve çelişkili veya belirsiz sonuçlara neden olabilecek farklı çıkarsamalar tek bir sonuç haline dönüştürülebilmesine yardımcı olmaktadır. Aynı zamanda iyi tasarlanmış ve uygun yapıldığında, verilerin sentezlenmesinde güçlü bir istatistiksel araçtır. Bağımsız ve farklı çalışmaların elde edilen istatistikler yardımıyla tek bir sonuca ulaşmayı sağlayan analitik bir yöntemdir. Ayrıca ayrı yapılmış olan çalışmalarla ile karşılaştırıldığında kişisel görüşlerden daha az etkilenmesi ve tarafsız sonuçlar elde edilmesi özelliğinden dolayı büyük bir avantaja sahip bir yöntemdir (Whitehead,2002, Yıldız, 2002).

Materyal ve Yöntemler

Meta analizi; belirli bir konuda yapılmış bağımsız birden çok çalışmaların sonuçlarının birleştirme ve elde edilen bulguların istatistiksel analizi yapma yöntemi olarak tanımlanmaktadır. Farklı çalışmaların sonuçlarının birleştirilme gerekliliği ilk olarak Light ve Smith adlı akademisyenler tarafından önerilmiştir. Glass 1976'da bu türdeki araştırmalara ilk olarak "Meta Analizi" adını vermiştir. Meta analizi orijinaliyle ilişkisini bozmadan daha etraflı ve ayrıntılı olarak düzenlenen yeni bir çalışma disiplinidir (Hedges,1985).

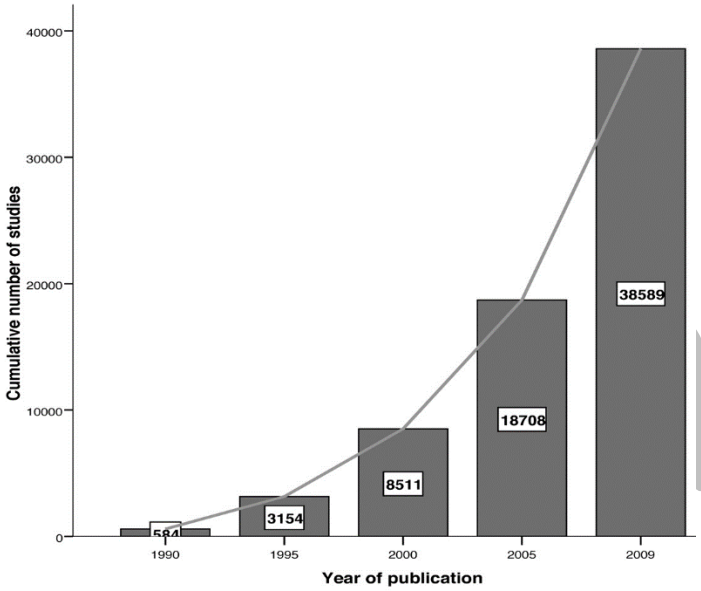
Neden Meta-Analiz

Her yıl gerek ulusal gerekse uluslararası dergilerde çok fazla sayıda bilimsel çalışma yayınlanmakta olduğu için takip etmek oldukça güçtür.

- Her konuda birbiriyle çelişen çok sayıda çalışma ile karşılaşılmaktadır.
- Yapılan küçük çalışmaların istatistiksel gücü düşük.

- İstatistiksel açıdan güçlü çalışmaları yapmak zaman ve maliyet gerektirir.
- Karşıt görüşlere sahip olan çalışmaların bilinmesi özetlenmesi gerekir.
- Bu ihtiyaçlara cevap veren bir istatistiksel yöntem olan meta-analiz'in her geçen gün önem ve popülaritesi artmaktadır.
- Özellikle sağlık, eğitim ve psikoloji alanında yapılan çalışmalar araştırmacıların bilimsel çalışmalarını çok iyi yerlerde yayınlanmasını sağlayan bir istatistiksel araç haline gelmiştir.

Şekil 1'de yıllara göre yapılan meta-analiz yapılan çalışmaların sayısını göstermektedir. 90'lı yılların başında çalışma sayısı 584 iken 2000'li yıllarda bu sayı 3154 ulaştığı kanıta dayalı tıp'ın etkisiyle 2009 yılında ise yapılan çalışmaların sayısı 38589 ulaştığı görülmektedir.



Şekil 1: Yıllara göre yapılmış olan meta-analiz ile ilgili çalışma sayısı

Meta Analizinin Avantajları

- Karşılaştırmanın istatistiksel gücünü artırır.
- Bir tedavinin etkisinin tahmin edilmesini geliştirir;
- Zıt çalışmaların sonuçlarını birleştirir;
- Yeni sorulara cevap verir;
- Farklı çalışmalarda seçilen konuların alt gruplarını analizleri yapılmasını sağlar;
- Analizlerin trendlerini belirler**.**
- İleride yapılacak olan çalışmalara ihtiyaç olduğu alanları tanımlar;
- Önceki çalışmalarda belirli bir konu üzerinde modifiye edilen bilgi varsa ve bunun nasıl yapıldığını sağlar;

Kullanıldığı Alanlar

Meta-analiz yöntemi ilk olarak sosyal bilimlerde kullanılmasına karşın özellikle sağlık araştırmalarında çok yaygın olarak kullanılmaktadır. Sağlık alanında yapılan çalışmalara bakıldığında ise baş ağrısı, kanser, alerji türleri, kardivasküler hastalıklar, ağrı azaltma ve depresyon ilgili çalışmalarda kullanılmaktadır.

BMJ dergilerinden biri olan Evidence Based Medicine sistematik reviewların sonuçlarına üzerine kurulu bir dergidir. İlaç sanayisinde genellikle bir ilacın etkinliğinin değerlendirilmesi için yapılan bir dizi çalışmayı değerlendirmekte kullanılmaktadır.

Eğitim alanında ise çok geniş bir kullanıma sahiptir. Uzaktan eğitim ile geleneksel sınıftaki yapılan eğitim çalışmalarını karşılaştırmakta, gelişen ekonomilerde öğretmenin sahip olduğu deneyimle, öğrenci başarısı üzerinde bir etkiye sahip olup olmadığının değerlendirilmesinde kullanılmaktadır.

Psikolojide kanıta dayalı pratiği desteklemek amacıyla kullanılmaktadır. Yaşam süresi üzerinde kişilik değişiminin değerlendirilmesinde, medyanın şiddetinin agresif kişiliğe sahip olan bireyler üzerindeki etkilerinin değerlendirilmesinde, cinsiyet farklılığının matematiksel yetenekler, liderlik ve sözsüz iletişimin cinsiyet farklılığını test etmekte kullanılır.

Ekoloji alanında rüzgar çiftliklerinin çevresel etkilerini belirlemede, yabancı bitkilere maruz kalındığında biyotik direnç, denizdeki besin zincirindeki değişiklerin etkileri, küresel iklim değişikliklerinde bitki reaksiyonlarını koruma çabalarının değerlendirilmesinde kullanılır (Borenstein,2009).

Meta-Analizin Aşamaları

Meta-analiz yönteminin uygulanması için belirli bir çalışma düzenin oluşturulması gerekmektedir. Bununla ilgili olarak uzmanlar farklı önerilerde bulunmaktadır. Çalışma düzeninin işleyiş basamakları sırasıyla aşağıdaki gibi olabilmektedir:

Araştırma Sorusunun Belirlenmesi: Araştırmanın sorusu önceden ayrıntılı bir şekilde tespit edilmeli, bağımlı ve bağımsız değişkenler tanımlanmalıdır (Rosenthal ve DiMatteo, 2001; Petitti, 1994). Araştırma sorusu belirlenirken oldukça dikkatli olunmalıdır. Araştırma sorusunun çok genel olması altından kalkılamayacak kadar fazla veri, çok sınırlandırılmış olması da meta-analiz yapmaya yetmeyecek kadar az veri toplamak ile sonuçlanabilir.

Yazın Tarama: Araştırma sorusu ile ilgili yazın taraması yapılarak yayınlanmış ve yayınlanmamış verilerin hepsi ortak bir havuzda toplanır. Ancak ulaşılan çalışmaların tamamının meta-analize dâhil edilmesi hatalı sonuçların oluşmasına neden olabilir. Bu nedenle çalışmalar, araştırmacının belirlediği dâhil edilme kriterleri temel alınarak seçilmelidir.

Çalışmaların Kodlanması: Seçilen çalışmalar araştırmacı tarafından özenle kodlanır. Kodlamadaki farklılıklar bazı detaylar hakkındaki belirsizliklerden kaynaklanabileceği için kodlama sistemi özenle geliştirilmelidir.

Etki Büyüklüğünün Hesaplanması: Kodlanan çalışmalarda kullanılan ölçekler ve ölçüm sonuçları farklılık göstereceğinden standart bir değere ihtiyaç vardır. Bu kavram daha ileride detaylı olarak açıklanmıştır.

İstatistiksel Analiz: Kodlanmış veriler için uygun etki büyüklüğü belirlendikten sonra, %95 güven aralığı, etki büyüklüğünün homojenlik testi ve heterojenliğin göstergesi olan parametrelerin yer aldığı istatistiksel analiz kısmı ile ilgili istatistiksel değerlerin hesaplanması, uygun model seçiminin belirlenmesine geçilir.

Sonuçlar ve Yorumlar: Bütün bilimsel çalışmalarda olduğu gibi kullanılan yöntemlerin, hesaplamaların açık ve net şekilde ifade edilmesi gerekir. Meta-analize dahil edilen çalışmaların kim tarafından ne zaman yapıldığının, kullanılan parametrelerle ilgili istatistiki sonuçların yer aldığı bir özet tablonun da sunulması beklenir. Nihayet, meta-analiz sonucu elde edilen sonuçlar yorumlanmasına geçilir. İçinde bulunulan durumun potansiyel sorunları belirtilir ve yapılacak araştırmaların iyileştirilmesi için önerilerde bulunulur (Şahin, 2005, Yıldız, 2014).

Önceden belirlenen kabul ve ret kriterlerine göre hangi çalışmaların kabul edilip edilemeyeceğine karar verilmesinin ardından istatistiksel olarak birleştirmesine geçilir. Ancak sonuçlardan çıkarımlar yapılması için, sabit etkiler veya rasgele etkiler modeli olmak üzere iki istatistiksel modelden yararlanılır (Yıldız, 2002). Bahse konu modeller aşağıda özetlenmiştir:

Sabit Etkiler Modeli (Fixed Effects Model): Bu modelde her bir çalışmanın tamamen aynı etkiyi tahmin ettiği varsayılır.

$$Y_i = \mu + \varepsilon_i$$

Farklı örneklemler ve yöntemler düşünüldüğünde, ölçümler doğru olsa bile her bir çalışmanın aynı sonucu verdiği konusu tartışmalıdır. Bu varsayım; yapılan çalışmaların aynı etki büyüklüğünü paylaşıp paylaşmadığının belirlenmesi için kullanılan ve ayrıca etki büyüklüklerinin bir çalışmadan diğer çalışmaya göre farklılık gösterip göstermediğinin belirlenmesini sağlayan bir istatistiki yöntem ile yani homojenlik testi ile test edilmektedir (Yıldız, 2002).

Rasgele Etkiler Modeli (Random Effects Model): Sabit etki varsayımı uygun olmadığı durumda kullanılması uygun olan bir modeldir. Bu modelde hem çalışmalar arası hem de çalışmaların kendi içerisindeki değişimler dahil edilmektedir.

$$Y_i = \mu + \beta_i + \varepsilon_i$$
$$\beta_i \sim N(0, \tau^2)$$
$$\epsilon_i \sim N(0, \sigma_i^2)$$

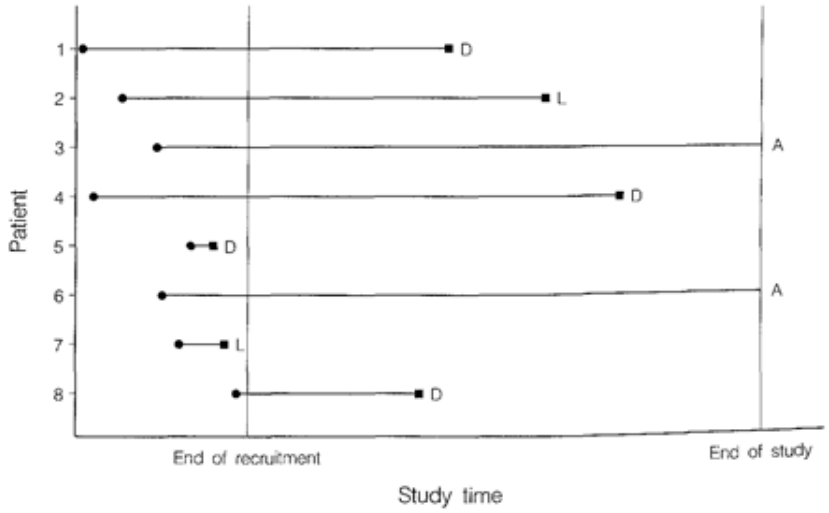
β_i çalışmalar arasındaki heterojenliğe karşılık gelmektedir. Çalışmalar arası varyans beklenen varyanstan büyük ya da küçük olabilmektedir. Ancak varyans beklenenden küçük ise sabit etkiler modelindeki sonuçlarla rasgele etkiler modelindeki sonuçlar birbirine oldukça yakın olabilmektedir (Yıldız, 2002)

Sağkalım Analizi: Mühendislik alanında güvenirlilik (reliability), iktisat ve sosyoloji alanında süre (duration**),** Sağlık çalışmalarında sağkalım analizleri, sonuç değişkenin belirli bir ilgilenilen olayın gerçekleşmesine kadar geçen süre olduğu durumda kullanılan analiz yöntemlerinin tamamıdır. bu yöntemin üç temel amacı vardır .
Sağkalım ve/ya hazard fonksiyonlarını tahmin etmek, Sağkalım ve/ya hazard fonksiyonlarını karşılaştırmak ve Açıklayıcı değişkenlerin ilişkisinin sağkalım süresi üzerine etkilerini incelemektir (Kleinbaum&Klein, 2005).

Sansür: Klinik çalışmalarda her hasta için yaşam süresine ulaşılması mümkün değildir. Bazı hastalar çalışmanın sonlanma zamanında halen hayatta olabilirken, bazıları ise çalışmadan kendi istekleri ile çekilebilirler ya da başka nedenlerden dolayı (başka bir hastalık dolayısıyla ölüm,tedaviden memnuniyetsizlik, alternatif yeni bir tedavinin varlığı, taşınma… vb) çalışmadan çıkabilirler. Bu durumda hastalar hakkında bazı bilgilere sahip olmamıza karşın hayatta kalma sürelerini tam olarak bilmemiz mümkün değildir. Dolayısıyla bu gözlemlenmeyen olaya sansürlü(censored) gözlemler olarak adlandırılırlar (Kul,2009). Sansürlü gözlem türleri aşağıdaki gibidir.

1. Çalışmanın bitiş noktasına kadar olgu gözlenmemesi (administrative censoring)
2. Çalışma bitmeden denekle ilgili bilgi alınamaması (lost to follow-up)
3. Başka bir olgu (başka nedenden ölüm, ilaç reaksiyonu vb.) nedeni ile çekilme (withdrawing)

Şekil 2'de bir klinik çalışmada karşılaşılabilecek veri tiplerine ilişkin sekiz hastanın yer aldığı örnekte gösterilmiştir.



Şekil 2: Farklı zamanlarda analize dahil edilen hastaların çalışmaya giriş sürelerini gösteren grafik

1,4,5 ve 8 nolu hastaların belirlenmiş olan süre içerisinde öldüğünü, 2 ve 7. hastalardan herhangi bir bilgi alınamadığı (lost to follow-up), 3 ve 6. numaralı hastaların hala yaşadığını göstermektedir (Collet**,** D.**,** 2003).

Sağkalım Analizinde Kullanılan Fonksiyonlar

Sağkalım analizinin temelini oluşturan sağkalım fonksiyonu, belirli bir t zamanına kadar ya da t zamanından daha fazla yaşayan bireylerin olasılığı olarak tanımlanır. Aşağıda gibi ifade edilir.

$$S(t) = 1 - F(t) = P(T > t), \ 0 \leq t < \infty$$

Dağılım fonksiyonu yardımıyla, olasılık yoğunluk fonksiyonu sürekli değişkenlerde türevi yardımıyla bulunabilir.

$$f(t) = \frac{dF(t)}{dt} = -\frac{dS(t)}{dt}$$

Sağkalım fonksiyonları ve hazard fonksiyonu sağkalım zamanlarının en önemli iki fonksiyondur. Sağkalım Fonksiyonu;

$$S(t) = P(T \geq t) = 1 - F(t)$$

ise, Başlangıçta sağ olan bireyin belirli bir sure içerisinde (Δt) ölmesi olasılığına hazard (tehlike oranı) fonksiyonu denir hazard fonksiyonu,

$$h(t) = \lim_{\Delta t \to 0} \left[\frac{P[t \leq T < t + \Delta t / T \geq t]}{\Delta t} \right] = \frac{f(t)}{S(t)}$$

şeklinde tanımlanır. Zamana göre değişim gösterdiğinden dolayı Bu fonksiyon olasılık fonksiyonu değildir (Kleinbaum&Klein, 2005).

Uygulama

Aralık sansürlü verilerde meta-analizini açıklamak için ülser datası ele alınmıştır. Çift körleme yöntemiyle, Endoskopili ile ülser olduğu kesinleşmiş olan hastalarda, temel tedavi yöntemi yapıldıktan sonra hastalığın nüksetmesini engellemek amacıyla tasarlanmış olan yeni ilaçın etkinliği araştırılmak istenmektedir. Toplamda 337 hasta yeni ilaç (tedavi) ve kontrol olmak üzere randomize olarak belirlenmiştir. Bütün hastalar için ameliyat olduktan sonra 6. ve 12. aylarda düzenli olarak endoskopi çekilmesi planlanmıştır. Planlanan zamanların dışında hastalığın nüksetmesi durumunda doktor ziyareti yapılması ve endoskopi ile teşhis edildiği zaman bu veri sansürlü olarak değerlendirilmektedir. beş ülkede yapılan çalışmada, her ülkeden elde edilen veriler ayrı bir çalışmanın parçası olarak kabul edilen metodoloji ile meta-analizi yapılarak açıklanmıştır. Ülser hastaları ile ilgili tedavi ve kontrol grubunda bulunan hastaların sayısı Tablo 1'de verilmiştir (Whitehead,2002).

.

Tablo 1: Ülser hastaları ile ilgili tedavi ve kontrol grubunda bulunan hasta sayısı

Ülke	Aralık (ay)	Tedavi Grubu			Kontrol Grubu		
		Nükseten	İyileşen	Geri çekilen	Nükseten	İyileşen	Geri çekilen
Avusturya	(0,6]	40	12	3	38	15	6
	(6,12]	34	3	3	27	4	7
Belçika	(0,6]	22	2	5	16	3	4
	(6,12]	17	5	0	12	1	3
Fransa	(0,6]	15	4	3	15	5	5
	(6,12]	10	1	4	12	1	2
Hollanda	(0,6]	55	0	7	46	6	3
	(6,12]	47	5	3	38	3	5
Norveç	(0,6]	3	0	0	4	0	0
	(6,12]	3	0	0	3	0	1

Ölçek olarak log hazard oranı kullanılacaktır.

$$\theta = \log\left\{\frac{h_T(t)}{h_C(t)}\right\}$$

%95 Güven aralığı değerleri aşağıdaki formül yardımıyla hesaplanır.

$$\hat{\theta} \pm Z_{1-\alpha/2}\sqrt{Var(\hat{\theta}}$$

Ülser datası ile ilgili log hazard oranının tahmini, standart hatası ve %95'lik güven aralığına ilişkin sonuçlar Tablo 2'de verilmiştir.

Tablo2: Ülser datasi ile ilgili log hazard oraninin tahmini, standart hatasi ve %95'lik güven araliğina ilişkin değerler

Ülke	$\widehat{\theta_i}$	$se\widehat{\theta_i}$	%95 G. A
Avusturya	-0,29	0,347	(-0.970,0.389)
Belçika	0,195	0,628	(-1.035,1.426)
Fransa	-0,129	0,607	(-1.319,1.062)
Hollanda	-0,748	0,558	(-1.842,0.346)
Norveç	-0,748	0,558	(-1.842,0.346)

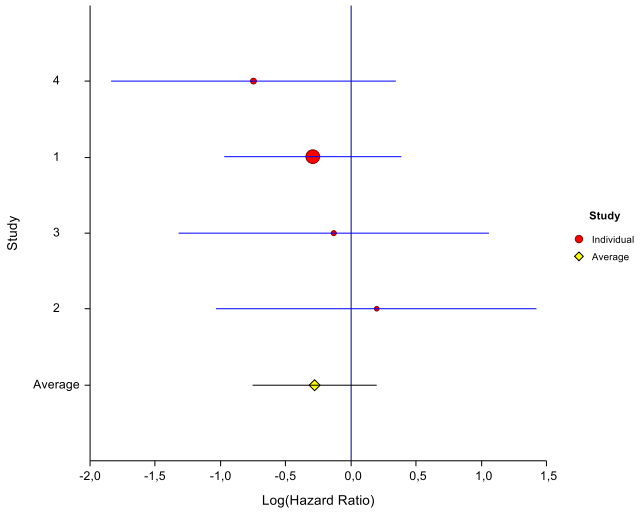
Sabit etkiler model için heterojenlik değeri, birleştirilmiş log hazard oranı, standart hata ve %95'lik güven aralığına ilişkin değerler Tablo 3'te yer verilmiştir.

Tablo 3: Sabit etkili model için yapılmış olan analiz sonuçları

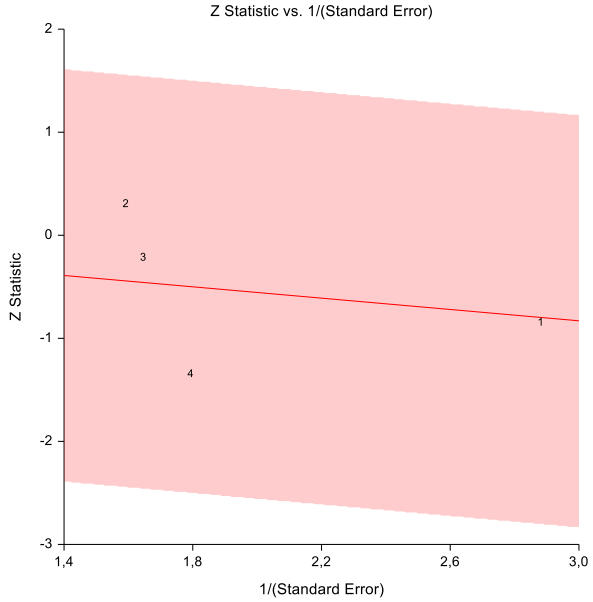
Çalışmalar arasındaki fark testinin değeri: $\chi^2 = 1{,}35; 1\ s.d; p = 0.24$
Heterojenlik değeri χ^2 =1.338; 3(s.d) $p = 0.72$
$(\hat{\theta}) = 0.279$

$se(\hat{\theta}) = 0.241$
$\%95\ G.A = (-0.757, 0.244)$

Sabit etkiler modeline göre yapılmış olan analizde birleştirilmiş log hazard oranı değeri 0.279, Standart hata değeri 0.241 güven aralığın alt değeri -.0.757, üst değeri ise 0.244 olarak bulunmuştur. Çalışmalar arasındaki farklılık değerinin p değeri istatistiksel olarak önemli bulunmamıştır.
Ülser datası için log hazard oranın sabit etkiler modele göre hem bireysel hemde birleştirilmiş tahmin değerleri Şekil 3'deki gibidir.



Şekil 3: Ülser datası için sabit etkiler modeline göre log hazard oranın tahmin değerleri



Şekil 4: Ülser verisi için Radial (Galbraith) grafiği

Ülser datası ile ilgili rasgele etkili modele göre log hazard oranının tahmini, standart hatası ve %95'lik güven aralığına ilişkin sonuçlar ve birleştirilmiş log hazard oranı, standart hatası ve %95'lik güven aralığının alt ve üst sınır değerleri Tablo 4'te verilmiştir.

Tablo 4: Ülser datası ile ilgili rasgele etkili modele göre log hazard oranının tahmini, standart hatası ve %95'lik güven aralığına ilişkin değerler

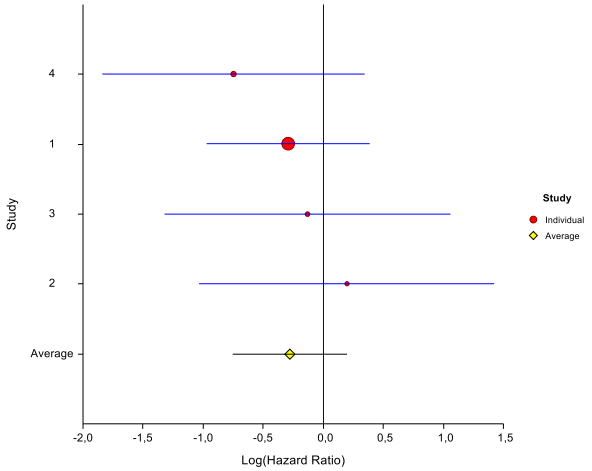
			%95 Alt	% 95 Üst	
	Log Hazard	Standart	Güven	Güven	Rasgele Etkiler
Ülke	Oranı	Hata	Sınırı	Sınırı	Ağırlık
Avusturya	-0,2900	0,3470	-0,9701	0,3901	49,5338
Belçika	0,1950	0,6280	-1,0359	1,4259	15,1231
Fransa	-0,1290	0,6070	-1,3187	1,0607	16,1876
Hollanda	-0,7480	0,5580	-1,8417	0,3457	19,1554
Norveç	-0,7480	0,5580	-1,8417	0,3457	19,1554
Birleştirilmiş					
	-0,2783	0,2442	-0,7570	0,2003	

Tablo 4'e göre çalışmanın yapıldığı her ülke için ayrı ayrı log hazard oran tahmin, standart hata, güven aralığının alt ve üst sınır değerleri ve ağırlık katsayıları bulunmuştur. Sonrasında 5 ülkede yapılan çalışma sonuçları rasgele etkili modele göre birleştirilerek özet log odds oranı değeri -0,2783, standart hata değeri 0.2442, Güven aralığın alt değeri -0.7570, üst değeri 0.2023 olarak bulunmuştur. Rasgele etkili model için heterojenlik değeri, birleştirilmiş log hazard oranı, standart hata ve %95'lik güven aralığına ilişkin değerler Tablo 5'te yer verilmiştir.

Tablo 5: Rasgele etkili model için yapılmış olan analiz sonuçları

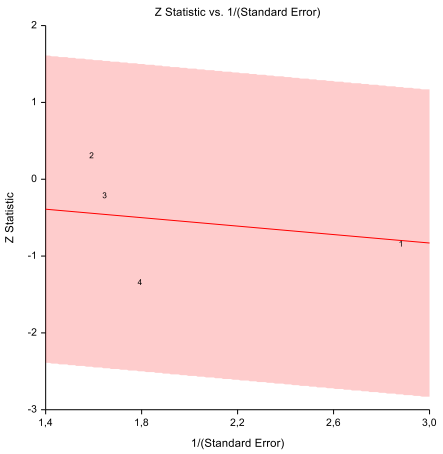
Çalışmalar arasındaki fark testinin değeri: $\chi^2 = 1.299; 1\ \text{s.d}; \text{p} = 0.25$
Heterojenlik değeri $\chi^2 = 1.338$; 3(s.d) $\text{p} = 0.72$
$(\hat{\theta}) = 0.278$
$\text{se}(\hat{\theta}) = 0.244$
$\%95\ \text{G.A} = (-0.757, 0.244)$

Rasgele etkili modele göre yapılmış olan analizde birleştirilmiş log hazard oranı değeri 0.278, Standart hata değeri 0.244 güven aralığın alt değeri -.0.757, üst değeri ise 0.244 olarak bulunmuştur. Çalışmalar arasındaki farklılık değerinin p değeri istatistiksel olarak önemli bulunmamıştır. Ülser verisi için log hazard oranın rasgele etkili modele göre hem bireysel hem de birleştirilmiş tahmin değerleri Şekil 5'deki gibidir.



Şekil 5: Ülser datası için rasgele etkili modele göre log hazard oranın tahmin değerleri

Radyal grafiğinde dikey eksende z-istatistiği ve yatay eksende ağırlık ölçüsü göstermektedir. Y eksenine yakın olan çalışmalar en büyük ağırlığa sahip çalışmalardır. Sınırlar içinde yer alan çalışmalar homojen olarak yorumlanır. Sınırların dışında yer alan çalışmalar aykırı olabilir.



Şekil 6: Ülser verisi için Radial (Galbraith) grafiği

Şekil 6'ya gore en büyük ağırlığa sahip olan çalışmaların 2. ve 3. çalışmalar en küçük ağırlığın ise 1. Numaralı çalışma yani Avusturya'da yapılmış olan çalışma olduğunu söyleyebiliriz.

Sonuç

Sağlık alanında yapılan çalışmalarda sansürlü veri tipi ile sıklıkla karşılaşılmaktadır.mBu verilerin alışılagelen yöntemler kullanılarak istatistiksel analiz yapılması mümkün olmadığından dolayı sağkalım verileri için geliştirilmiş yöntemlerin kullanılması gerekmektedir. Her yıl gerek ulusal gerekse uluslararası dergilerde çok fazla sayıda bilimsel çalışma yayınlanmakta olduğu için takip etmek oldukça güçtür. Her konuda birbiriyle çelişen çok sayıda çalışma ile karşılaşılmaktadır. Meta-analizi ile çalışmalardaki bilgiler verilerin türüne göre uygun bir yöntemle birleştirilebilmekte ve çelişkili veya belirsiz sonuçlara neden olabilecek farklı çıkarsamalar tek bir sonuç haline dönüştürülebilmektedir.
Literatüre bakıldığında veri tipi olarak, kategorik, sürekli ya da ilişkiler veriler için meta-analizi kullanılırken, pratik hayatta oldukça önemli bir veri türü olan sağkalım analizine ilişkin yapılmış meta-analiz çalışma sayısı çok kısıtlı olduğu görülmektedir. Bu çalışmada öncelikle olarak meta-analiz hakkında genel bilgi işleyiş prensipleri verildikten sonra sağkalım analizi ile ilgili temel kavramlardan bahsedilmiştir. Bu çalışmada öaralık parçalı ülser datası ele alınmış sabit ve rasgele etkiler model için hesaplamalar yapılarak veriler birleştirme yoluna girilmiştir. Bu analizlerin neticesinde her iki model için

birleştirilmiş log hazard oranı değeri oldukça yakın sonuçlar vermiştir. Bu sonuca göre yeni uygulanan ilaç tedavisi geleneksel yönteme göre daha iyi sonuç vermiştir. Ülser rahatsızlığın sahip olan bireylerin temel tedavi uygulandıktan sonra ilaç tedavisinin daha iyileştiriciye etkiye sahip olduğu gözlemlenmiştir.

Sonuç

Bu çalışmada rasgele etkili modelde çalışmalar arası varyansı tahmin etmek için momentler yöntemi (method of moments) kullanılmıştır. Sonraki çalışmalarda iteratif yöntemler kullanılarak tahmin ediciler ile hesaplamalar yapılarak yöntemlerin etkinliği karşılaştırılabilir**.**

Teşekkür

Bu çalışma FEN- A- 101013-0396 numaralı proje tarafından desteklenmektedir.

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Pakistan, Its Youth And Social Media

Muhammad Zain Islam

Social Media Officer (University of Management and Technology)

C 11 Johar Town Lahore, Pakistan

Email : zain.islam@umt.edu.pk

Abstract: Pakistan has faced some serious problems in recent years. It has a tarnished international image, but there is optimism in the country. The much needed bearers of new hope are the young guns of Pakistan who are vocal, active, and as informed as any. They like to express themselves on different social media platforms. The constantly evolving online youth of Pakistan has acted responsibly on critically important occasions such as the shooting of Malala Yousuf, Lawyer's Movement etc. The online community has shown its muscle on certain occasions but it remains to be seen, how will it face up to the challenge of coming elections, will it impact the outcome?

Keywords: Pakistan, Pakistani Youth, Impact of Social Media, Online Political Activisim, Social Media

Parametric Assessment on Diagonal Reinforcement Detailed RC Short Columns

Fatih ALTUN and Tamer DIRIKGIL

Erciyes Üniversitesi Mühendislik Fakültesi, Kayseri/TURKEY
Email: dirikgil@erciyes.edu.tr

Abstract: Non-linear behavior of reinforced concrete structures and structural elements can be calculated using the finite element method. The major advantage of the analytical studies to solve complex problems by the finite element method makes possible that obtaining analytical data consistent with experimental data with less labor, cheaper and shorter time.

In this study, some parameters influencing the shear dominant behavior of RC short columns with diagonal reinforcement details are discussed. The reinforced concrete short columns, which are the subject of the study, consist of 800mm (series of SC800) and 1000mm (series of SC1000) length of two series. Each set consist of four columns. Series contain four separate columns which are reference column, confinement spaces with 150mm, 200mm and 300mm. The confinement space in reference column is 100mm. There have been diagonal reinforcements having the same characteristic and dimension with confinement bar “excluding reference columns“ at the columns. Depending on the columns which have the confinement spaces with 150mm,200mm and 300mm, these diagonal reinforcements have approximately 26.5Â°, 33.7Â° and 45Â° dimensions respectively. SAP2000 and ANSYS softwares were used to determine lateral load-displacement relationship of these columns by creating finite element models. Affecting variables on the behavior of RC short columns such as concrete strength, axial load index and shear reinforcement diameter were evaluated using the analytical models as a parametrically. In the parametric study, columns which have 35MPa, 45MPa, 60MPa concrete strength, columns which have 0.3, 0.4 0.5 axial load index and columns which have 10mm, 12mm shear reinforcement diameter were discussed.

When evaluated the analytical data, the lateral load capacity of the short columns while increasing significantly, lateral displacement reduces with increase in concrete strength. Increase of the axial load level increases the shear strength. However, this increase was not as effective as the increase in concrete strength. Because of increasing axial load level, lateral displacement response of columns decrease by enforcing the columns more rigid behavior. Increasing the diameter of the shear reinforcement increases both shear strength and ductility of the RC short columns.

Keywords:RC short column, ANSYS, SAP2000, parametric study

Performance Study of an Oil Palm Fresh Fruit Bunch Three Wheeler Evacuation Machine

Azali Awaludin, Syed Salim Syed Salim, Abdul Halim Zainal Abidin and Mohd Rosdi Ngah

Felda Global Venture Research and Development, Applied Technology Division

Floor 7th, Balai Felda, Jalan Gurney 1, 54000 Kuala Lumpur.
azali.a@feldaglobal.com

Abstract: A case study to determine performance of Three Wheeler evacuation machine was done at Felda Plantation. Using 20kg (average) of fresh fruit bunch (FFB), A machine was tested at different topography where the area are 0.7 hectares (terrace), 1.5 hectare flat area, 1.5 hectare mild undulating and 1.5 hectare heavy undulating. Method of optimum was used to determine performance three wheeler where the performance between 73% to 77% efficiency measured. From experiment also shows three wheeler can access all train in oil palm plantation.

Keyword: Oil Palm Fresh Fruit Bunch, evacuation, topography, three wheeler

Introduction

Oil palm area production of oil palm fresh fruit bunch (FFB) for last 5 year was increased to 5.05 million MT, as FFB improved to 19.59 MT per hectare (ha) from 19.12 MT per ha in 2012(Media released) . This data showed a good tool must have to harvest and evacuate oil palm FFB and loose fruit (LF). Tool in oil palm plantation was used to do a job for harvesting and evacuating include cutting and loading a FFB. Starting with the use of the sickle/chisel, cut the bunch will be identified after ripening. Sickle and chisel is a sharp instrument made of steel. Normally sickle and chisel will be affixed on the end of bamboo, round timber, steel and aluminium are also called pole. The length of the pole and timber depends on tree height and tree age. After FFB cut using the equipment will be transported by wheelbarrow or any powered machinery. In mechanization term, applied of machine or any tool in assist of work in field collection of oil palm plantation with indicator of production in tonne/day. In history of harvesting oil palm FFB, FFB and loose fruit will be loaded in wheelbarrow the number 2-4 of FFB, will be wheeled through the path of tree harvesting in the number of 10-15 trees up to the platform. From the platform of FFB will be sent to the factory for processing. Wheelbarrow that were originally made of wood and mounted of end a chassis with wheel. Wheel barrow is the easy way to evacuate the FFB because the maintenance is free and very cheap to buy but need a lot of labour to do work and low production of FFB. Ahmad Hitam (1999) study a system approach to mechanization in oil palm plantation. Figure 1 show a schematic diagram and connection from harvesting and mill. It show a related to FFB harvesting, pruning, evacuation and transportation of FFB to the mill. As for the evacuation of FFB and also mainline transport to mills, there have been tremendous improvements. Three wheeler is an important interface machine between harvester and in field collection to evacuate FFB to platform. This activity also to ensure FFB can send to mill in 24 hour to process and produce highly quality of crude palm oil.

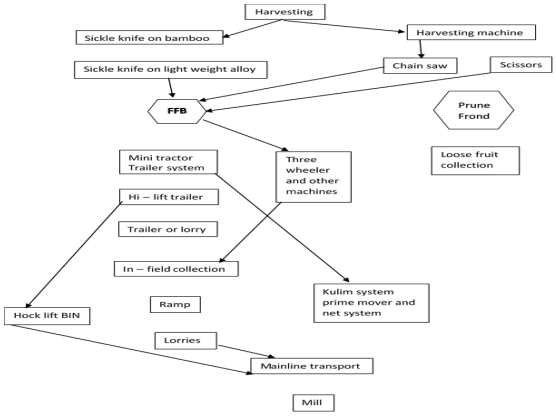


Figure 1: System approach to mechanization

In Malaysia, the demand for labour is a major issue, and now includes the use of mechanized equipment. If the matter is not resolved, FFB production will drop drastically and will give impact on the country's export commodities. Harvesting of FFB is presently an operation not amenable to mechanization, but infield fresh fruit bunch (FFB) collection especially on flat to undulating terrain has been mechanized with varying degree of success(Kamarudzaman Ali 1994), (Mohd Ali 1995) and (Cunnigham 1969). To overcome this problem, Azali Awaludin (2011) study the machinery used for the production of FFB were compared in terms of machinery, land use, the amount of labour used, the total production of FFB (MT) and the costs involved. Below in table 1 shows

Machine	First Capital (RM)	Maintenance (Monthly)(RM)	Usage of worker	Productivity (ton/hour)	Area Coverage (hectare)
Wheelbarrow	60 - 150	none	3	6t	6 -8h
Mini Tractor	60,000 -70,000	300 -500	3	30 -40t	10 -15h
Eco Rider	26,000	200	2	10 - 12 t	8 -10h
Buffalo	2,000	100	2	6t	6 -8h
Grabber	75,000	500 -1000	1	30 -40t	

Table 1: Mechanization comparison

This study focus to all machinery currently used in FELDA plantation, machinery application or farm mechanization in the production of FFB can accelerate when the harvesting work is done. Besides reducing of foreign labour, mechanization also reduce damage on FBB during transportation to the mill. FFB delivery to the mill will increase double if managed properly. Mechanization requires a large amount of capital, yet effective mechanization of returns to factors of work efficiency, quality of FFB produced, labour utilization and management of an effective oil palm plantations. While a recent study has been done on the three-wheeler to get information related to the same information such as test equipment before. This testing purpose machinery to minimize costs, reduce labour and higher FFB productivity.

Problem statement of Oil Palm Fresh Fruit Bunch Evacuation

1. Requirements labour intensive to harvest. The ratio of workers to the acre is between 1:16 to 1: 18
2. Individual Task - harvester workers divided according to individual tasks ranging from 8-10 rows harvested per harvester. This causes the day to harvest a large area and difficult job of quality control that works with supervision.
3. Load BTS - Evacuate FFB from the base of the tree requires people or wheelbarrow. This work can reduce production of FFB because energy is used manually to evacuating FFB.

4. Loose collection -. To collect loose fruit for energy focusing to transport FFB bunches must be brought to the factory within 24 hours after harvest, resulting in a loose net seeds are not collected.
5. Acquisition costs - to bear the burden of additional costs of unskilled workers.

Material and Method

The methodology of evaluation includes 3 items are background of topography, the system works and test procedure. In Malaysia, Felda Global Ventures have 258,000 hectare of plantation area. Yong (2013), presented a data topography for Felda Global Venture Plantation Malaysia, there is 26% of area is Flat to gentle undulating (below 4° slope), moderately hilly is 49% (slope 5° -12°) and hilly is 25% (slope over 12°). Below in figure 2 shows a distribution of topography.

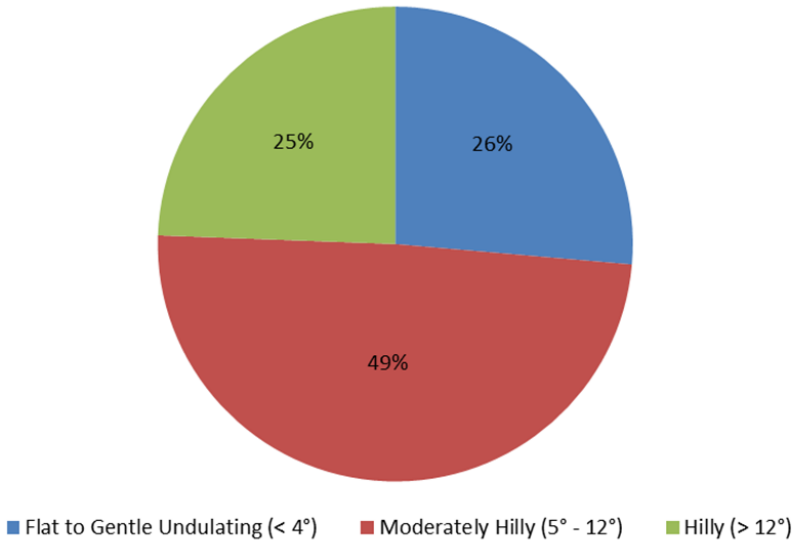


Figure 2: A distribution of topography for FGVPM

Based on above information, three wheeler evacuation machine evaluation will be focused to different train as mention in table 1.

Type of topography	Harvesting row	Area (hectare)	Slope (°)
Flat	7	1.5	0°
Undulating (mild)	7	1.5	5° - 8°
Undulating (heavy)	11	1.5	6° - 11°
Terrace	7	7	0°

Table 2: Information area of testing

In oil palm plantation, system of work implement to worker based on area coverage and job description. Works was divided based on area and total of labour. Ramesh Veloo (2010) proposed ratio 1 labour to 7

hectare for activities in plantation. To get same situation activities between actual working in plantation and this evaluation, 3 labour divided to do works as:-

1. Driver
2. Bunches loader
3. Loose fruit collector

Information of Three Wheeler

Figure 3: Three Wheeler Evacuation

Three wheeler was designed to suit with harvesting work. Equip with large bucket can contain 33 FFB at one time. Three wheeler evacuation machine also design with basic mechanical equipment and easy to drive and manoeuvre in harvesting path. Below in table 2 shows a specification of three wheeler evacuation machine.

Description	Three wheeler machine
BODY AND CHASSIS	
Body Length (mm)	2510
Body width (mm)	1125
Body Width – tire to tire (mm)	1330
Carrier Type	Manual Tip - Off
Carrier Width (mm)	1120
Carrier Length (mm)	1295
Ground Clearance (mm)	Front – 290mm,Rear-325mm
Vehicle weight (kg)	415
ENGINE	
Engine	Yanmar Air – Cooled Engine
Hp	10hp
Model	L100N6 - MTMR
Fuel	Diesel
Fuel Consumption/Hour (estimated)	0.25lt/hour – 0.44lt/hour

Fuel Consumption / Day (estimated)	2.0lt – 3.5lt/day
Clutch Type	Tension Pulley

Table 2: Information of Three wheeler evacuation machine

The evaluation was based on time recorded where time was recorded during FFB evacuation. A total of 200 bunches arrange at base of palm for topography of flat, mild undulating and heavy undulating. While the terrace area of 99 bunches are required. The three wheeler evacuation machine, will entered the harvesting path and 2 labour collecting FFB and loose fruit as normal/daily operation into the bucket of three wheeler. Time will recorded for this activity based on 2 repeated evacuation for each topography. Below in figure 4 shows a flow of three wheeler movement during evacuation and table 4 shows information area of testing.

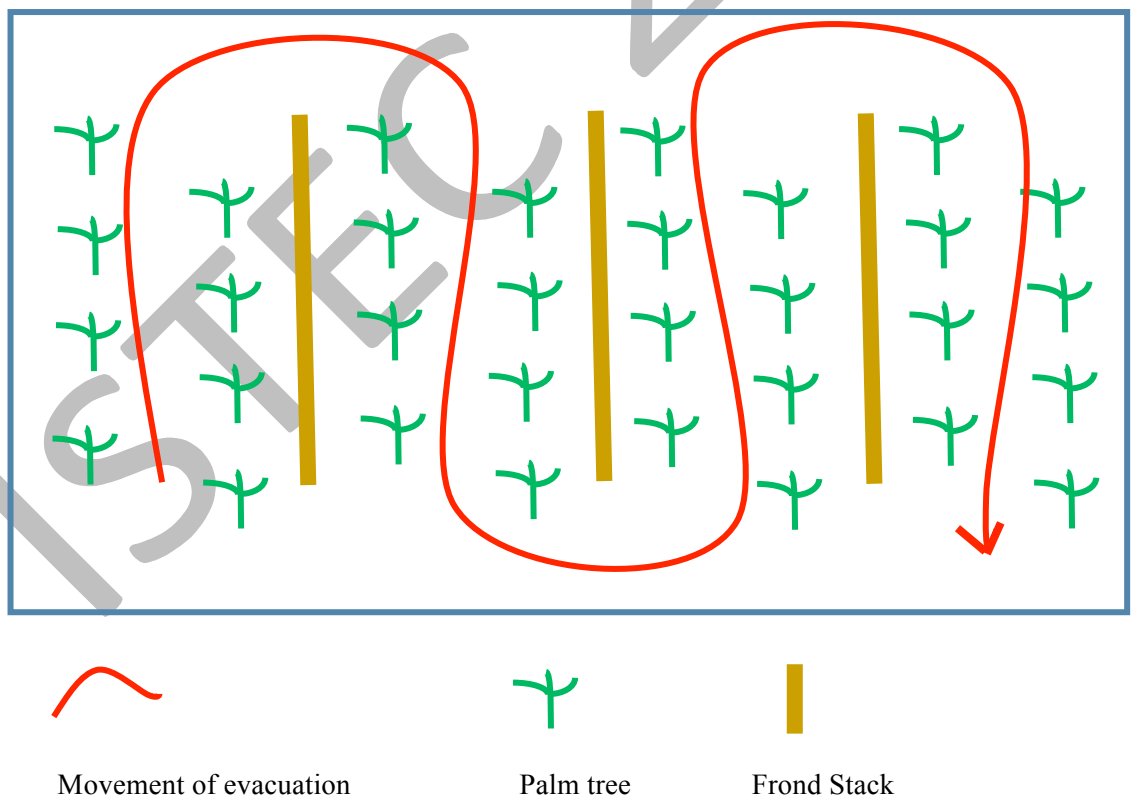


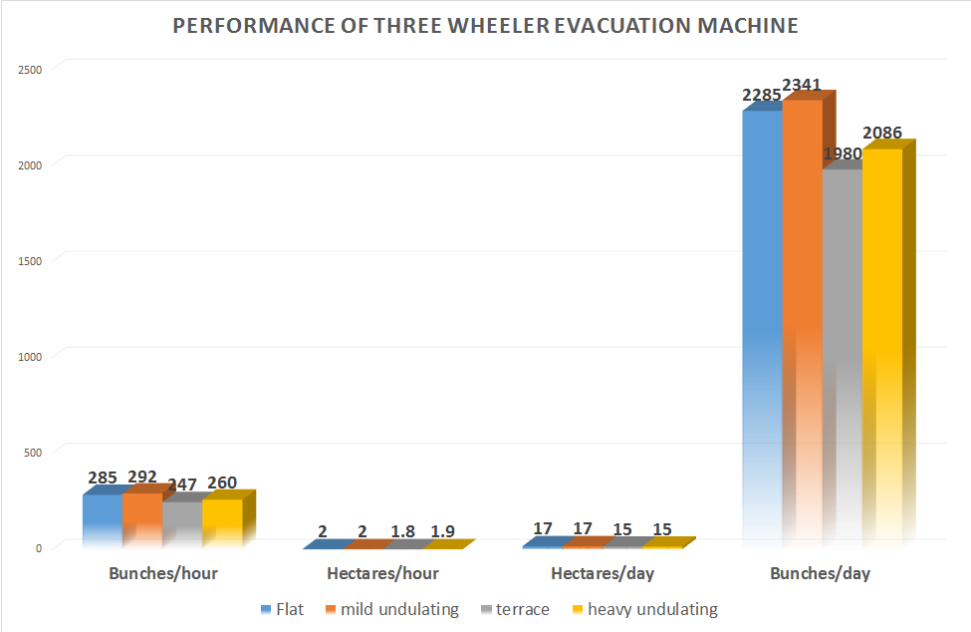
Figure 4: Movement of evacuation

Topography	Area (Ha)	No of FFB
Flat	1.5	200
Mild Undulating	1.5	200
Heavy Undulating	1.5	200
Terrace	0.7	99

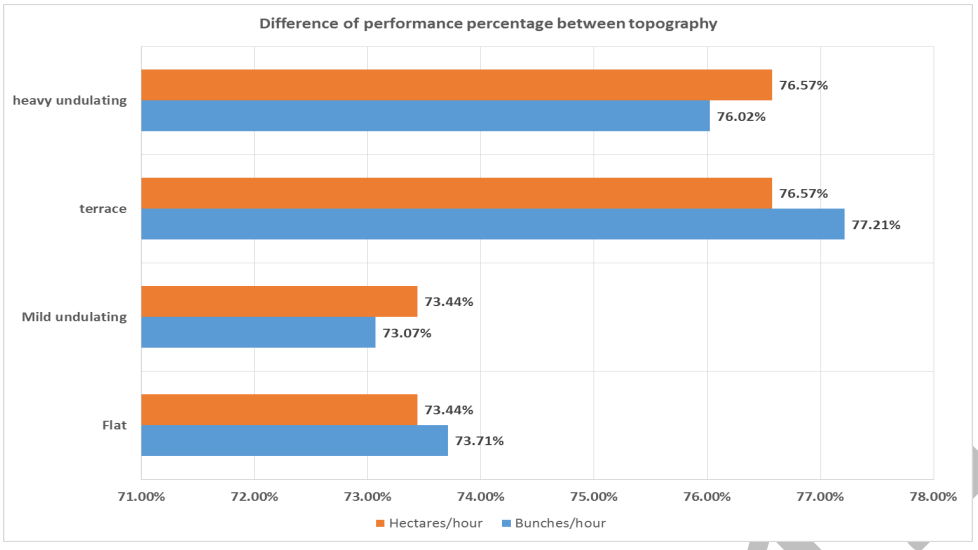
Table 4: Information of topography, area and number of FFB

Result

From results, this machine can evacuating 1980 to 2341 bunches of FFB per day or the equivalent of 39.6 tons to 46.8 tons per day with the use of 0.5 liter of diesel to 1 liter. The average number of tons per worker per day was 14.4 tonnes per hectare while the employee is 5.42 hectares per day. This machine also can operating in all topography testing. Below in graph 1 and graph 2 shows the performance result of three wheeler during the experiment.



Graph 1: Performance of three wheeler evacuation machine



Graph 2: Different of performance between topography

Discussion

Abdul Rahim Shuib (2010) claimed their FFB collection and evacuation machine productivity was found between 2.4 tonnes to 3.6 tonnes per hour. This FFB production are same (three wheeler) but this machine have no traction problem on shallow peat. Using Halftrack, this machine can carried weight about 500kg of FFB and using 18 hp diesel engine. Compared to three wheeler FFB evacuation machine, this three wheeler can carried load about 750 kg and using 10 hp engine more than 50% performance with halftrack machine. Abdul Rahim Shuib (2010) also promote evacuation machine named 'Grabbie' which specially designed grapple attached to chassis. The machine requires a team of eight FFB harvester and one machine operator. With production of FFB 18 -25 tonne per day and coverage an area of 25 hectare but not same with three wheeler because three wheeler can produce more FFB with same labour uses. Below in figures 3 shows halftrack and 'Grabbies'.

Figure 3 and figure 4: Halftrack and Grabbies

From topography testing, three wheeler can enter all the topography with evacuating include terraced areas. Three wheeler has a chassis width is 1330 mm. With a minimum capacity of 33 bunches FFB, three wheeler can easily move between harvesting path. Below shows factor influencing during experiment:-

- **Labour**

  FFB evacuating job and collect loose fruits into the bucket machinery using manpower, total use of labour energy will increased and lead to worker fatigue.
- **Weather**

During the experiment period, the rain dampened the ground in the harvesting path. This will cause the surface to become slippery and affect the amount of time recorded.

- **The degree of slope**

  Degree slope measured is in the range of 5 ° to 11 ° resistance to evacuation equipment in the FFB issue of harvesting path. Three wheeler evacuation have a special specification for climbing hills called 'differential gear lock "which can grip the surface better.

- **Loose fruit**

  Loose fruit collecting will influencing a lot of time recorded. This is because the FFB dropped at ground trash loose fruit because of the impact. It takes 1 minute to 2.5 minutes to collect loose fruit.

Conclusion

The factor of time is the most frequently used operations in the optimization method to obtain the efficiency of a machine. This method is based on time parameter changes, while keeping the others parameter at a constant level. Experiment show, three wheeler evacuation machine perform FFB evacuate work better than mini tractor because an efficiency show machine 70% and above. From topographic testing result, three wheeler evacuation machine can access all terrain of topography where this machine easily manoeuvre between harvesting path and terrace area. All result shows, three wheeler evacuation machine can help yield FFB increase and increase an oil extraction rate at mill.

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Preconcentration of heavy trace metals by cloud point extraction and determination by ICP OES

Mustafa S. Dundar[1], Umut Kahya[2], Ferhat Kaptan[2], H. Altundag[1]

[1] Sakarya University, Department of Chemistry, Esentepe Campus,

54187 Serdivan-Sakarya, Turkey

[2] Sakarya University, Institute of Science, Division of Chemistry,

54187 Serdivan-Sakarya, Turkey

E-mail: dundar@sakarya.edu.tr

Abstract: In recent years, determination of trace metals had very important place in environment, food, agriculture, etc. Inductively coupled plasma optical emission spectrometry (ICPOES) has gained very good recognition due to multi-elemental analysis capability, large dynamic linear range, high accuracy and precision and high productivity. Trace metal determination is performed in association with Cloud Point Extraction preconcentration technique, basically aiming at the enrichment of metallic species and/or matrix separation with the advantages of achieving high concentration factor, simple operation in systems free from contamination and rapid phase separation. Trace metals reacts with a complex which is entrapped in the surfactant-rich phase, whereas trace metals remains in the aqueous phase. Ultrasonic nebulization (USN) is usually employed to enhance the detection limits of ICPOES measurements. A sensitive and selective method has been developed for the determination of trace metals based on cloud point extraction (CPE) and ultrasonic nebulisation inductively coupled plasma optical emission spectrometry (USN-ICPOES). The proposed method was applied to the determination of trace metals. Thus, separation of trace metals can be realized and experimental results will be presented.

Keywords: Heavy metal, Preconcentration, ICP OES, Cloud Point Extraction

Introduction

Determination of trace metal ions in natural water samples is interesting and important for analytical chemistry. To detect them, we can use several methods such as atomic absorption spectroscopy, inductively coupled plasma atomic emission spectrometry, and so on. However, it is difficult to determine trace metals in their samples directly, because of their low concentration and coexistence of matrix species. Therefore, pre-concentration and separation of analyte are needed before measuring. The most common procedures for the pre-concentration of analytes interested are the use of either liquid–liquid or solid sorbents extraction. Recently, a cloud point extraction of organic and inorganic compounds using non ionic surfactants have been concerned in analytical chemistry (Watanabe, 1984; Silva, 1997; Stalikas, 2002). Cloud point extraction (CPE) is a separation and preconcentration method (Shen, 1997). This method has been some advantages such as low cost, rapidly procedure and widely application field. Cloud point extraction has been applied to determination of trace metal ions from different matrices recently years. A cloud point extraction preconcentration technique is still being developed nowadays. If this technique was vested in the basic structure, which simply described as follows. Firstly, ligand solution is added into the solution of dissolved heavy metal atoms. Thus, metal-ligand complex is created then the surfactant is added to this solution. Thereafter, the resulting solution is heated. Thereby, the cloud point temperature is reached. Solution was heated at this temperature for a certain period of time. Micelle formation is provided. The micelle solution was centrifuged to collect together. After centrifugation, the solution and rich phase appropriately separated from each other. Finally, rich phase is dissolved back some of the solvents. Dissolved in a suitable concentration of metal atoms is analyzed using the spectrophotometric method. In these studies, optimized parameters; pH, metal concentration, the quantity the ligand, the cloud point temperature (Watanabe, 1978; Cordero, 1993), clouding time and duration of centrifugation (Bezerra, 2008; Lemos, 2007; Yamini, 2008; Sang, 2008).

Experimental Work

In this study, Copper (Cu) was selected as the metal atom. Model solutions of 1000 mg/l concentration were prepared from AR grade reagent. 2.5 µg metal and 5,7-diiodo-8-hydroxyquinoline as a ligand were chosen of all experimental works. NaH_2PO_4/K_2HPO_4 solution was used as the buffer solution. 5 ml of buffer solution and 16 mg of ligand were used in the model solutions. IGEPAL CO 520 purchased from Sigma Aldrich was used as a surfactant. This surface active agent was chosen because it does not absorb the ligand without metal atoms. Surfactant was used 0.33% (v/v) for all model solutions. Cloud point temperature was set at 76 °C. Cloud point time was determined as 45 minutes. Centrifugation time was chosen 10 minutes. Spin speed of centrifugation was chosen as 6000 rpm. 1.5 mol / L HNO_3 was used for recovery.

The model solutions were analyzed using inductively coupled plasma optical emission spectrometer (ICP-OES). Spectra Arcos model ICP-OES instrument was used in all experiments. All preconcentration operations were performed in the volume of 15 ml polypropylene centrifuge tubes.

Methods

Table 1: Operating conditions of ICP-OES instrument

RF generator power plasma	1,5 kW
Auxiliary gas flow rate	1 L/min
Coolant gas flow rate	14,5 L/min
Nebulizer gas flow rate	0,89 L/min

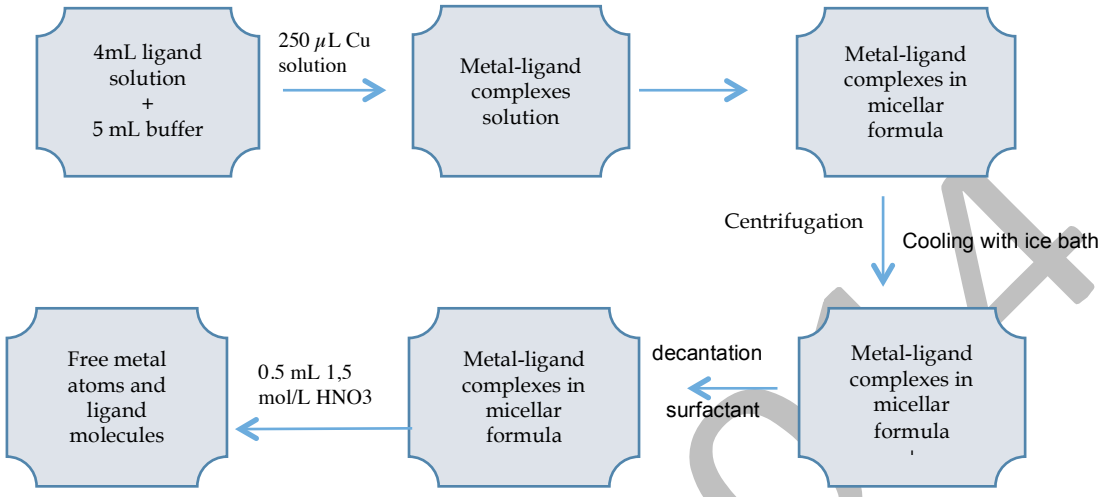

Figure 1: Experimental methods applied in experiment

Results and Discussion

At the end of the experimental work, optimum pH, temperature, the quantity of metal atoms and the quantity of ligand molecules were analyzed. According to results, the copper atoms of the best conditions for recovery are at pH 8, the temperature at 75 °C, and 3 mL of 0.25 volume of the metal was analyzed in the volume of the ligand.

These important factors, such as clouding time, centrifugation time, is planned to optimize factors such as speed of centrifugation.

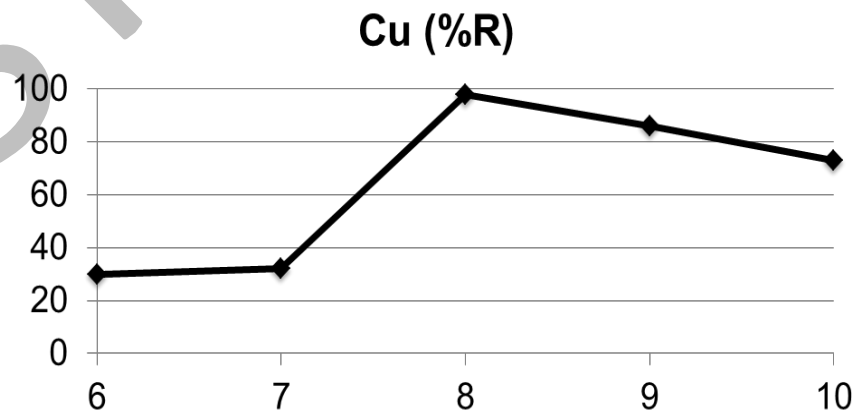

Figure 2: Effect of pH recovery of copper atoms

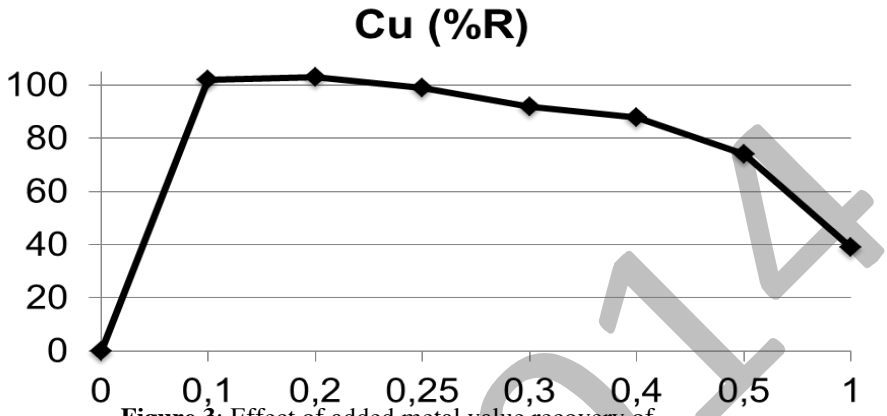

Figure 3: Effect of added metal value recovery of

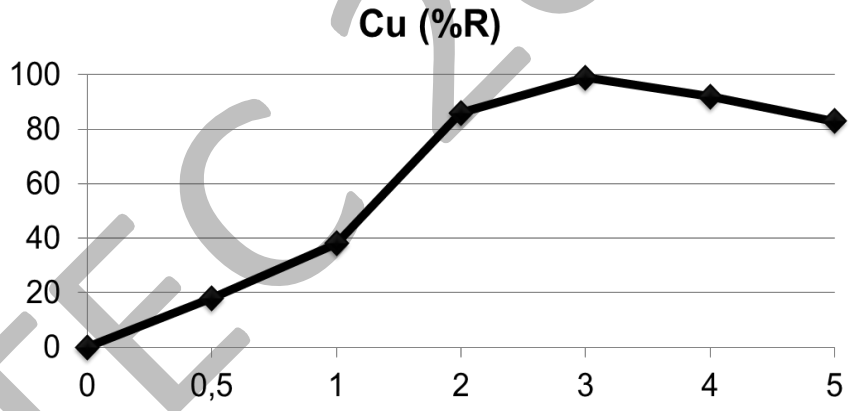

Figure 4: Effect of added ligand value to recovery of copper atoms

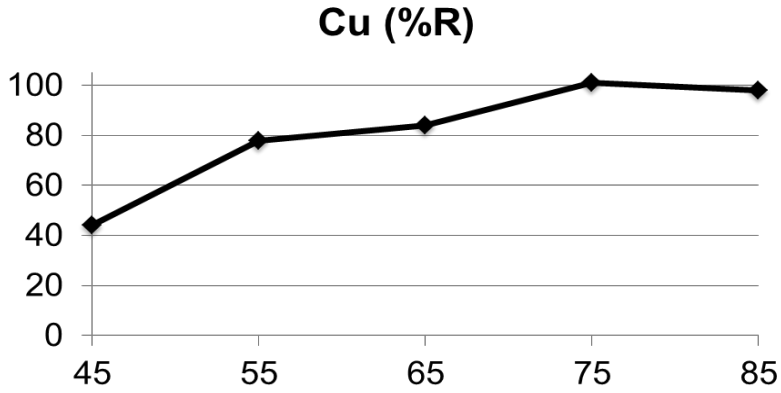

Figure 5: Effect of cloud point temperature to recovery of copper atoms

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Probability density function estimation using Multi-layer perceptron

Touba Mostefa Mohamed*, Abdenacer Titaouine*, Touba Sonia*, Ouafae Bennis**

* Biskra University, B.P 145 RP, 07000 Biskra, Algeria
mm.touba@gmail.com, titaouin@yahoo.fr, sonia11_dz@yahoo.fr

** PRISME Institute, University of Orléans, 21 rue Loigny La Bataille, 28000 Chartres, France
ouafae.bennis@univ-orleans.fr

Abstract : The problem of estimating a probability density function (pdf) can easily be encountered in many areas of experimental physics (high energy, spectroscopy, etc.) and other fields. The standard procedure is to bin the space and approximate the pdf by the ratio between the number of events falling inside each bin over the total and normalized to the bin volume. In this paper we estimate the univariate pdf using an MLP (Multi-Layer Perceptron) where the inputs are based on the exponential model. The proposed method is very effective and estimated densities are too close to some theoretical pdfs. Our method has been integrated in the famous steepest descent algorithm for marginal score functions estimation where two linearly mixed sources were successfully separated.

Key words: Probability density estimation, Neural networks, Multilayer perceptron, BSS, Score function.

Introduction

The probability density function (pdf) is a central concept in statistical data analysis, and the most popular instruments for pdf estimation are: histograms and kernel density estimation. More information about pdf estimation can be found in (Silverman, 1986). The reader can also be referred to (Vogt, 2007) for some basic analysis techniques.
In the following we give a short introduction to some density estimation methods.

Histograms:

It is the oldest and most widely used density estimator. The data range is divided into a set of successive and non-overlapping intervals (bins). The bins of the histogram are defined as the intervals $[x_0 + mh\,, x_0 + (m+1)h\,]$ for m positive and negative integers, x_0 is the origin and h is the bin width. For a set of n observed data points supposed to be a sample of an unknown density function p_X, The histogram is defined by:

$$\hat{p}_X(x) = \frac{\text{number of observations in the same bin as } x}{nh} \qquad (1)$$

The histogram can be generalized by allowing the bin widths to vary. Then the estimate becomes:

$$\hat{p}_X(x) = \frac{\text{number of observations in the same bin as x}}{n(\text{widh of bin containing x})} \quad (2)$$

However, there are some drawbacks in using histograms:

-The histogram is not continuous so trouble arises when derivatives are required (score functions in blind source separation)

-Choice of origin may have an effect in the interpretation

-Representing multivariate data by histogram is difficult

The naive estimator:

The pdf can be defined as a probability density as:

$$p_X(x) = \lim_{h\to 0} P(x - h \le X \le x + h) \quad (3)$$

Thus,

$$\hat{p}_X(x) = \frac{\text{number of observations falling into}[x-h,x+h]}{2hn} \quad (4)$$

By this way, $\hat{p}_X(x)$ does no longer depend on the origin of the chosen data range discretisation. The naïve estimator can be defined clearly by a weight function as follows:

$$\hat{p}_X(x) = \frac{1}{nh}\sum_{i=1}^{n} \omega\left(\frac{x-x_i}{h}\right) \quad (5)$$

Where

$$\omega(x) = \begin{cases} \frac{1}{2} & \text{if } -1 < x < 1 \\ 0 & \text{if otherwise} \end{cases} \quad (6)$$

This means that rectangular boxes of width 2h and height $\frac{1}{2hn}$ are placed around each datum and then summed up to get the estimate $\hat{p}_X(x)$.

But this estimator also has got some drawbacks:

$\hat{p}_X$ is not continuous but has jumps at the points $x_i \pm h$ and has zero derivative everywhere else

The kernel estimator:

This estimator is obtained by replacing the weight function in the expression of the naïve estimator by a kernel function $K(x)$ which satisfies:

$$\int_{-\infty}^{+\infty} K(x)\,dx = 1$$

Then the kernel estimator is given by

$$\hat{p}_X(x) = \frac{1}{nh}\sum_{i=1}^{n} K\left(\frac{x-x_i}{h}\right) \quad (7)$$

Here h is the smoothing parameter. It controls the trade-off between the statistical significance of the pdf estimate and its effective resolution.

Traditionally and statistically, the pdf is constructed by locating a Gaussian kernel at each observed datum, e.g., the fixed-width kernel density estimator (FKDE) and the adaptive kernel density estimator (AKDE). Although the FKDE, which constructs a density by placing fixed width kernels at all of the observed data, is widely used for nonparametric density estimation, this method normally suffers from several practical drawbacks (Silverman, 1986).

Neural networks for pdf estimation

To overcome the problem of high cost in computation and memory storage of the kernel estimator, a clustered radial basis function (RBF) based kernel density estimator, named RBF network, can be used (Hwang, Lay and Lippman,1993, Popat and Picard, 1993; Popat and Picard, 1994). The RBF network uses a reduced number of radial basis kernels, with each kernel being representative of a cluster of training data, to approximate the unknown density function. This method is often referred as mixture (Gaussian) modeling (Rabiner, 1989). These networks are also widely used in regression and classification applications (Moody & Darken, 1989).

The use of feedforward neural networks (Svozil, Kvasnicka & Pospichal, 1997) with sigmoid hidden units called multilayer percceptrons (MLPs) for pdf estimation was proposed in (Modha & Fainman, 1994), where the training approach based on the minimization of the negative log-likelihood is described. However, the pdf approximation capabilities of general multilayer feedforward neural networks have been established by White (1992).

It is well known that the gaussian mixture approach encounters difficulties in approximating the uniform distribution. This is not the case for the MLP model. Likas (2001) have presented an approach of pdf estimation based on the use of feedforward multilayer neural networks with sigmoid hidden units. The method is based on numerical integration technique.

In this paper we estimate the univariate pdf using an MLP (Multi-Layer Perceptron) where the inputs are based on the exponential model. The proposed method is very effective compared to some theoretical pdfs.

Problem formulation

For problems defined in $\mathcal{R}^{\mathrm{p}}$, the network architecture (Fig.1) consisted of p input units, one hidden layer with H hidden units having the logistic activation function and of one output unit with exponential activation function (Modha & Fainman, 1994) :

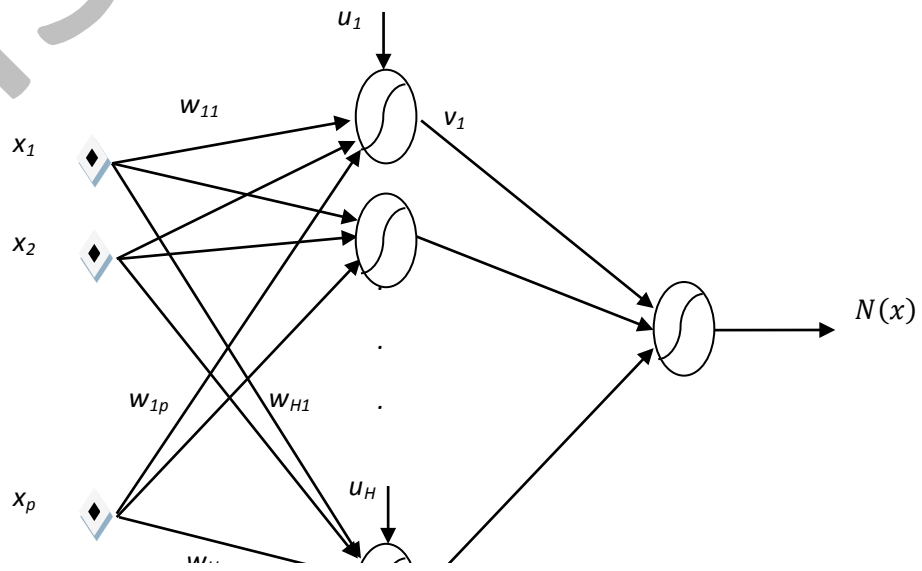


Figure 1: Basic MLP approach to pdf estimation

Let $x(k) \in \mathcal{R}^p$, $(k = 1, \dots, n)$ be a set of n data points drawn independently according to an unknown density f(x) that we want to approximate, and let's define the model of pdf with parameter $\boldsymbol{\theta}$ by the function

$$p_N(\mathbf{x}, \boldsymbol{\theta}) = \frac{N(x,\boldsymbol{\theta})}{\int_{\mathcal{R}^p} N(\mathbf{y},\boldsymbol{\theta})d\mathbf{y}} \tag{8}$$

In the paper of Modha & Fainman (1994), the parameter vector $\boldsymbol{\theta}$ is adjusted by minimizing the function:

$$\mathcal{L}(\boldsymbol{\theta}) = -\sum_{k=1}^{n} \ln\{p_N(\mathbf{x}(k), \boldsymbol{\theta})\} \tag{9}$$

Replacing $p_N(\mathbf{x}, \boldsymbol{\theta})$ in (9) by its expression (8) we obtain:

$$\mathcal{L}(\boldsymbol{\theta}) = -\sum_{k=1}^{n} \ln\{N(\mathbf{x}(k), \boldsymbol{\theta})\} + n \ln\left\{\int_{\mathcal{R}^p} N(\mathbf{x}, \boldsymbol{\theta})d\mathbf{x}\right\}$$

$$= -\sum_{k=1}^{n} \ln\{N(\mathbf{x}(k), \boldsymbol{\theta})\} + n \ln(I_{\boldsymbol{\theta}}) \tag{10}$$

With

$$I_{\boldsymbol{\theta}} = \int_{\mathcal{R}^p} N(\mathbf{x}, \boldsymbol{\theta})d\mathbf{x} \tag{11}$$

The key idea in the algorithm of . Likas (2001), is the numerical integration technique used to compute (11).

Our work consists of estimating the monovariate pdf modeled by an exponential law. Hence, the equation (8) becomes:

$$p_d(x, \boldsymbol{\delta}) = \frac{N_e(x, \boldsymbol{\delta})}{\int_a^b N_e(y, \boldsymbol{\delta})dy}$$

$$= \frac{\exp(\delta_1 x + \cdots + \delta_d x^d)}{\int_a^b \exp(\delta_1 y + \cdots + \delta_d y^d)dy} \tag{12}$$

Where

$[a, b] = [\min x, \max x]$, d is the model order $(d = 1, 2, \dots)$

$(\delta_i, i = 1, \dots, d)$ are the model parameters.

This model has the following advantage:

- Most common densities (normal, uniform, exponential …etc.) are well fitted by the exponential densities (Ould Mohamed, 2012, p.54)

In Fig. 2, inputs in Fig. 1 are changed according to the model order so that the MLP architecture becomes:

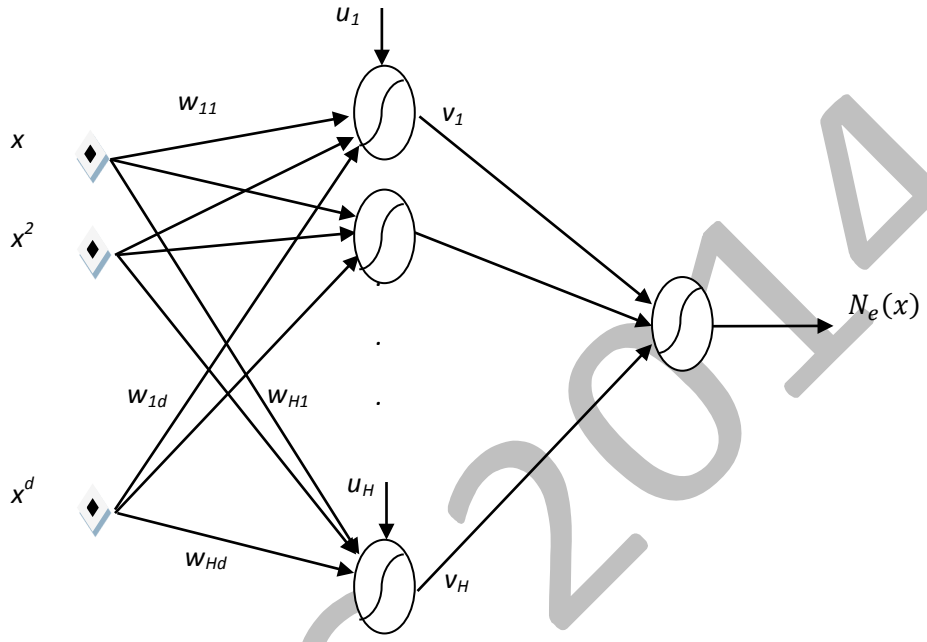


Figure 2: MLP architecture for exponential pdf modeling and estimation

A supervised training of the MLP is performed by constructing a training set using some non-parametric technique for pdf estimation. This means that, for the training set x_k , we have selected the histogram estimation method.

Application to blind source separation

Blind signal separation (BSS) and independent component analysis (ICA) are emerging techniques of array processing and data analysis that aim to recover unobserved signals or "sources" from observed mixtures (typically, the output of an array of sensors), exploiting only the assumption of mutual independence between the signals, more details can be found in (Hyvärinen, Karhunen and Oja, 2001; Jutten and Comon, 2007).

In instantaneous case, BSS becomes the problem of identifying the probability distribution of a vector $\mathbf{x} = \mathbf{As}$, given a sample distribution. In this perspective, the statistical model has two components: the mixing matrix **A** and the probability distribution of the source vector. the main idea is to find a matrix **B** (separating matrix) such that the components of the vector $\mathbf{y} = \mathbf{Bx}$ are mutually statistically independent.
Mutual information, $I(.)$, is a measuring criterion for designing a system which generates independent outputs.

If, $\mathbf{x} = \mathbf{As}$, where

$\mathbf{s} = (s_1, s_2, \dots, s_p)^T$, source signals , $\mathbf{x} = (x_1, x_2, \dots, x_p)^T$, observed signals

and

$\mathbf{A} = [a_{ij}]$, mixing matrix

Then

$\mathbf{B}$ is estimated by minimizing the mutual information $I(\mathbf{y})$ of $\mathbf{y} = \mathbf{Bx}$

$$I(\mathbf{y}) = \int_{\mathbf{y}} p_{\mathbf{y}}(\mathbf{y}) \ln \left\{ \frac{p_{\mathbf{y}}(\mathbf{y})}{\prod_{i=1}^{p} p_{y_i}(y_i)} \right\} d\mathbf{y} \quad (13)$$

Where,

$p_{\mathbf{y}}(\mathbf{y})$ is the joint pdf of vector $\mathbf{y}$, $p_{y_i}(y_i)$ is the marginal pdf of y_i

It is well-known that $I(y)$ is always non-negative and vanishes if and only if the y_i's are independent. Consequently, the parameters of the separating system can be calculated based on minimization of the mutual information of the outputs. It is very helpful to know an expression for the gradient of the mutual information. However, the gradient of the mutual information, $\frac{\partial I(\mathbf{y})}{\partial \mathbf{B}}$, can be expressed (Taleb and Jutten, 1999) by the following expression:

$$\frac{\partial I(\mathbf{y})}{\partial \mathbf{B}} = E\{\psi_{\mathbf{y}}(\mathbf{y})\mathbf{x}^T\} - \mathbf{B}^{-T} \quad (14)$$

where

$\psi_{\mathbf{y}}(\mathbf{y}) = \left(\psi_{y_1}(y_1), \dots, \psi_{y_p}(y_p)\right)^T$ is the marginal score functions vector

and

$$\psi_{x_i}(x_i) \triangleq -\frac{d \ln\left(p_{x_i}(x_i)\right)}{d\, x_i} = -\frac{\acute{p}_{x_i}(x_i)}{p_{x_i}(x_i)} \quad (15)$$

Then the steepest descent algorithm is applied on the parameter vector to search the minimum of $I(\mathbf{y})$:

$$\mathbf{B} \leftarrow \mathbf{B} - \mu \frac{\partial I(\mathbf{y})}{\partial \mathbf{B}} \quad (16)$$

μ is the step-size (positive constant)

We can see that in calculating $\frac{\partial I(y)}{\partial B}$, the pdf's of the components of $\mathbf{y}$ must be estimated, and the algorithm can be summarized in Fig. 3, where $\mathbf{I}_p$ denotes the identity matrix

Simulation results

In this step we have conducted experiments with data drawn independently from known distributions, which in turn we tried to approximate with the proposed approach. MLP training in the likelihood minimization was performed using gradient descent algorithm.

In all problems we have considered a training set with n = 2000 data points drawn independently from the corresponding pdf to be approximated.

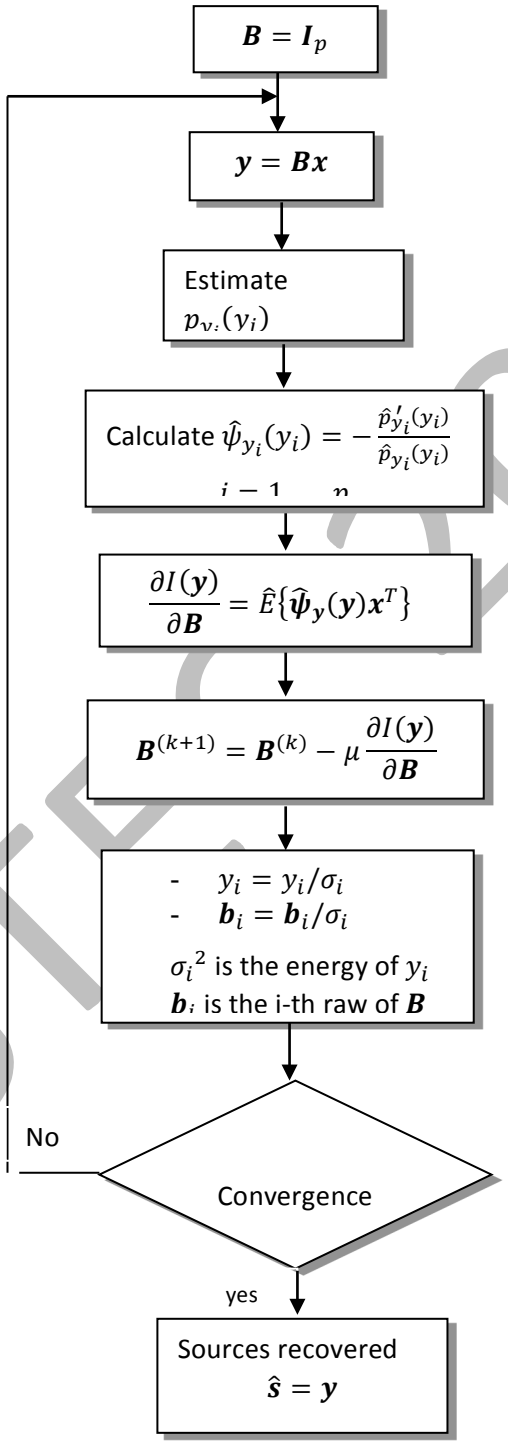
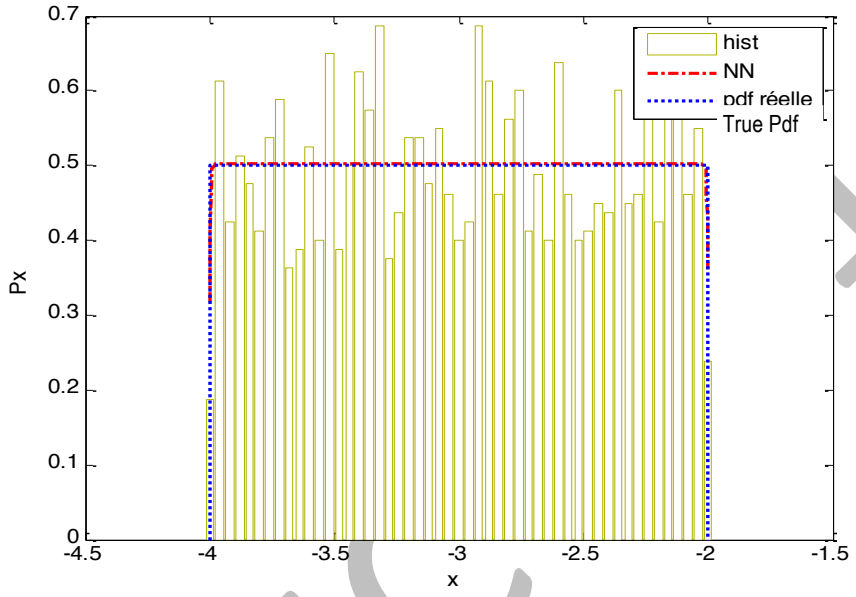


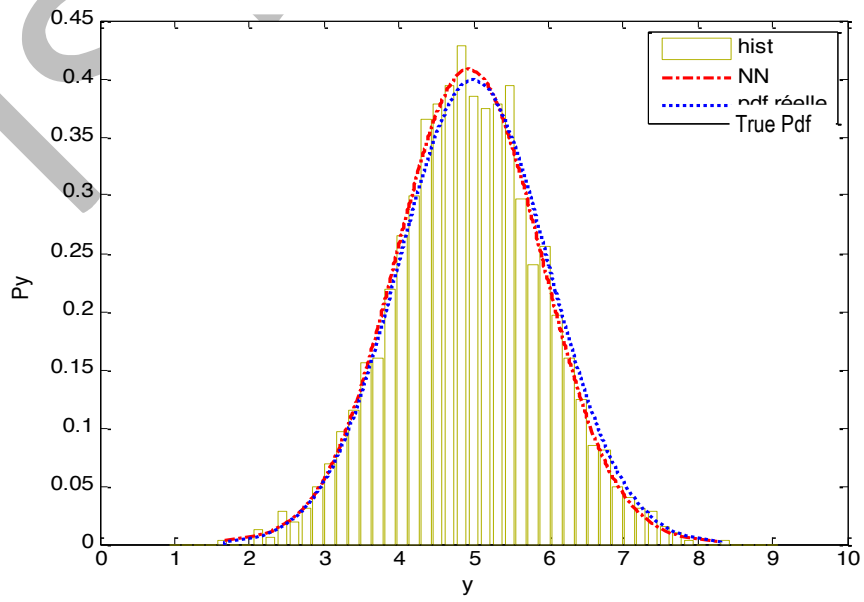
Figure 3: Steepest descent and neural pdf estimation for blind source estimation - linear instantaneous mixtures

Example 1

In this example we have generated samples using two simple distributions: Gaussian (N(5,1)) and uniform in the interval [-4,-2] (U[-4,-2]).
Fig. 4 illustrates the process of fitting the histograms of the two pdfs, and we can easily observe that the estimated pdfs coincide with the true ones.



(a)



(b)

Figure 4: Estimated Pdfs, (a) uniform pdf , (b) Gaussian pdf – (d=2 and H=2)

Example 2

In this example, the unknown pdf, g(x), was a mixture of the two pdfs used in the last example:

$$g(x) = 0.25\ U[-2,-1] + 0.25\ N(-7,0.25) + 0.25\ U[1,2] + 0.25\ N(7,0.25) \qquad (17)$$

Fig. 5 is another illustration of the effectiveness of our method. It is also clear that the estimated pdf is very close to the true pdf and is a smooth function unlike the histogram estimator.

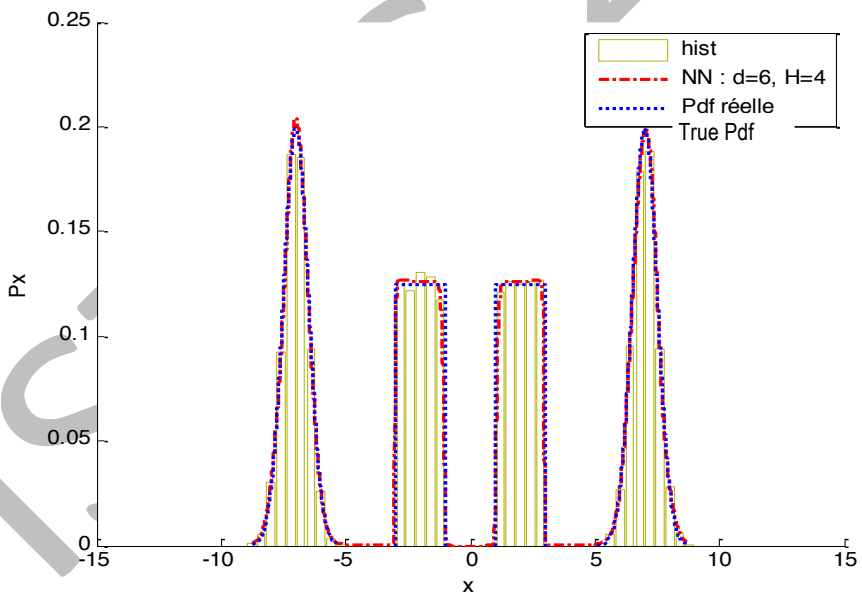


Figure 5: Estimated pdf (mixture of two pdfs) for two architectures of the MLP: (d=2,H=2) and (d=1,H=4)

Example 3

As sited in section (2.2), estimating pdf's in blind source separation is an essential step, and in some cases without this step, separation of the sources is impossible.

In this example, we apply our neural pdf estimation method to separate two linearly mixed independent sources.

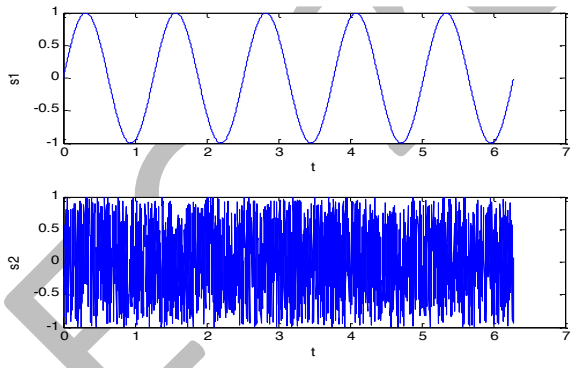
The independent sources are sine wave and uniformly distributed white noise in the interval [-1, 1]. These signals are linearly mixed with the mixture matrix

$$\mathbf{A} = \begin{bmatrix} -2.29 & 0.49 \\ 1.84 & 0.41 \end{bmatrix}$$

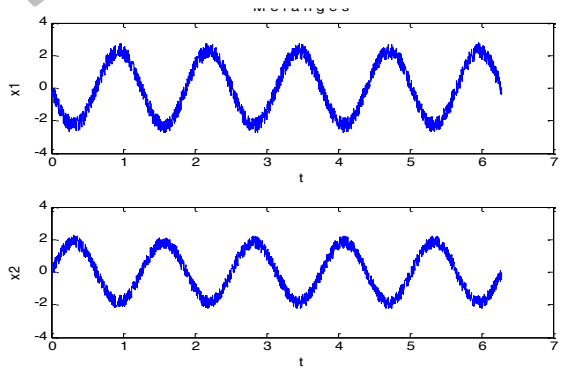
Fig. 6 shows the two sources and their mixtures.

Algorithm of Fig. 3 is used to separate the sources where marginal score functions are calculated from the estimated marginal pdf's and an MLP of two elements in the hidden layer (H=2, d=2) was used.

Outputs of the algorithm are shown in Fig. 7 and are good estimations of the source signals.



(a)



(b)

Figure 6: (a) Sources , (b) Mixture Signals

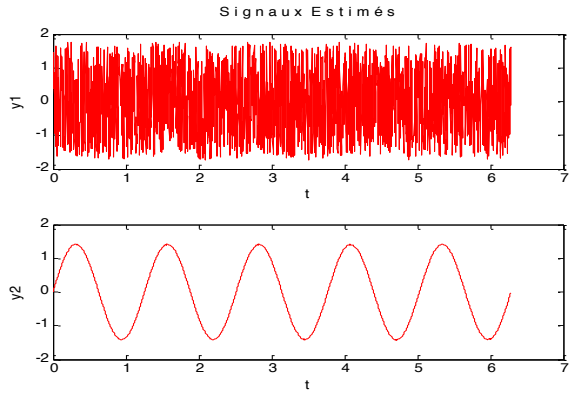


Figure 7: Estimated Sources (d=2, H=2, for pdf estimation)

Conclusions

As we mentioned before, this is a very important result about evaluation of the effectiveness of MLP in estimating probability density functions. We have modeled the data by exponential density law because most common densities (normal, uniform, exponential …etc.) are well fitted by the exponential densities (Ould Mohamed, 2012, p.54). We found that this method for one-dimensional problems has superior estimation capability compared to the widely used histogram approach. Our method has been integrated in the famous steepest descent algorithm for marginal score functions estimation where two linearly mixed sources were successfully separated.

Future research may focus on using our method to estimate the pdf for higher dimensions, and its application in separating nonlinear mixtures.

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Puanlayıcılar Arası Güvenirliğin Klasik Test Kuramı ve Genellenebilirlik Kuramına Göre Karşılaştırılması*

Serap Büyükkıdık

Gazi University, Educational Measurment and Evaluation Department, Turkey
sbuyukkidik@gmail.com

Duygu Anıl

Hacettepe University, Educational Measurment and Evaluation Department, Turkey
aduygu@hacettepe.edu.tr

Öz: Bu araştırmada, iki adet performans görevinin, analitik ve bütünsel dereceli puanlama anahtarıyla, dört puanlayıcı tarafından puanlanmasından elde edilen puanlara klasik test kuramı ve genellenebilirlik kuramı ile puanlayıcılar arası güvenirlik sınanması yapılmıştır. İki kuramın uygulanması sonucunda elde edilen katsayılar arası farklılaşma olup olmadığı ve hangi kuramın, hangi yönlerden daha avantajlı olduğu incelenmeye çalışılmıştır. Araştırma verileri 2011- 2012 Bahar döneminde Kütahya ilinde bir ortaokulda eğitim gören 132 6-7-8. sınıf öğrencisinin rutin olmayan problem çözümüne yönelik sergiledikleri performansların dört puanlayıcı tarafından, göreve özgü analitik ve bütünsel dereceli puanlama anahtarı kullanarak puanlanmasından elde edilmiştir. Klasik test kuramında puanlayıcılar arası güvenirlik analizi sınıf içi ilişki katsayısı ve puanlayıcılar arası ilişki katsayısı ile araştırılmıştır. Genellenebilirlik kuramında ise her iki puanlama anahtarı için b x g x p deseninde genellenebilirlik ve phi katsayıları incelenmiştir. Araştırma sonucunda genellenebilirlik kuramından elde edilen katsayıların klasik test kuramından elde edilen katsayılara göre göreceli olarak daha yüksek olduğu, genellenebilirlik kuramının uygulamasının klasik test kuramına göre daha detaylı bilgi sağladığı ve her iki kuramdan da elde edilen bulguların ölçümlerin güvenirliğinin yüksek olduğunu desteklediği görülmüştür

Anahtar kelimeler: Klasik test kuramı, genellenebilirlik kuramı, puanlayıcılar arası güvenirlik, performansa dayalı durum belirleme

Comparison Of Interrater Reliability Based On The Classical Test Theory And Generalizability Theory

Abstract: In this research, interrater reliability analyses with classical test theory and generalizability theory have been made to the scores of two performance tasks obtained from the scoring of analytical and holistic rubrics by four raters. Wheather are there differences among the coefficients obtained from consequence of applying of two theory or not and which theory is more advantageous than the other from which aspects have been examined. Research's data obtained from 132 students at a primary school in Kütahya in 2011-2012 spring term by the way of scoring two performance task which measure non-rutin mathematical problem solving skills, with analytical and holistic rubrics. Interrater reliability analysis has been examined with person correlation coefficient and intra-class correlation

coefficient in classical test theory. In Generalizability theory, reliability analysis have been made for both rubrics by using fully crossed design b x g x p. Results show that coefficients obtained from generalizability theory are relatively higher than the ones obtained from classical test theory. The application of generalizability theory provides more detailed information than classical test theory and findings of both theories support that reliability of data is high.

Key words: Classical test theory, generalizability theory, interrater reliability, performance assessment

* Bu çalışma "Büyükkıdık, S. (2012). Problem Çözme Becerisinin Değerlendirilmesinde Puanlayıcılar Arası Güvenirliğin Klasik T Kuramı ve Genellenebilirlik Kuramına Göre Karşılaştırılması." başlıklı yüksek lisans tezinin bir kısmından oluşturulmuştur.

Giriş

Bir ölçme aracında istenilen geçerli sonuçlar vermesidir. Güvenirlik geçerlik için bir önkoşuldur. Güvenirliğin sınanmasında çeşitli kuramlar bulunmaktadır. Bu araştırmada bu kuramlardan ikisi olan klasik test kuramı (KTK) ve genellenebilirlik kuramından (G kuramı) elde edilen puanlayıcılar arası güvenirlikler hesaplanmış ve elde edilen bulgular karşılaştırarak, hangi kuramın bu uygulama için uygun olabileceği tartışılmıştır. Spearman 1907-1913 yılları arasında klasik test kuramının (KTK) temelini atmış, ardından birçok bilim insanı; özellikle Guilford (1936), Gulliksen (1950), Magnusson (1967), Lord ve Novick (1968) kuramı yeniden ifade etmiş ve detaylandırmıştır (Crocker & Algina, 1986: s. 107). Ölçmede amaç gözlenen bir özelliğin gerçek değerini elde etmektir. Klasik test kuramı ölçme alanındaki ilk kuram olarak; ölçmeye karışan çeşitli hatalar yüzünden bu gerçek değerin, ölçme yoluyla doğrudan elde edilemeyeceğini, gözlenen puanlar yardımıyla kestirilmeye çalışılacağını belirtir (Baykul, 2000: 97). Kuramın temel denklemi (1):

$X_{gözlenen}=X_{gerçek}+X_{hata}$……(1) olarak tanımlanır (Crocker & Algina, 1986, s. 107; Baykul, 2003, s. 113).

Rastgele (seçkisiz) hataların yönü ve miktarı bilinmemediğinden dolayı, alanyazınında "sayıltı" olarak nitelendirilen, Crocker ve Algina (1986, s.111)'nın ve Baykul (2000, s.114)'un ispatı yapılabildiğinden dolayı "özellik" ya da "prensip" diye nitelendirdiği KTK'nin temel özellikleri şunlardır:
1. Tekrarlı ölçmelerde, rastgele (seçkisiz) hata puanları negatif ve/veya pozitif yönde değişeceğinden, hataların evrendeki dağılımının ortalaması sıfıra eşit olur.
2. Gerçek puanlar ile hata puanlarının korelasyonu sıfırdır.
3. Ayrı hata puanları arasındaki korelasyon sıfırdır.

KTK'nin yukarıdaki özelliklerinden kaynaklanan sınırlılıkları incelendiğinde aşağıdaki kavramlardan söz edilmektedir (Hambleton & Swaminathan, 1985, s. 2-3):
Birinci sınırlılık, madde güçlük ve madde ayırıcılık indekslerinin değerinin, testin uygulandığı cevaplayıcı grubunun yeteneğine bağlı olmasıdır.
İkinci sınırlılık, güvenirlik kavramının paralel formlarla tanımlanmış olması, güvenirlik hesaplamalarında, kaynağı belli olmayan tesadüfî hatalardan dolayı, güvenirliliğin alt sınırı elde edilir.
Üçüncü sınırlılık, ölçme hatalarının varyansı tüm cevaplayıcılar için aynı kalmaktadır.
Dördüncü sınırlılık, test maddeleriyle uğraşırken sınava girenlerin nasıl performans gösterdiklerinin KTK ile karşılaştırılamamasıdır.
Beşinci sınırlılık, KTK'de ölçme hatalarının bütün yetenek düzeylerindeki bireyler için aynı olduğu varsayılmaktadır.
Yukarıda değinilen bütün bu sınırlılıklara ek olarak, KTK, test geliştirme, yanlı maddelerin belirlenmesi, test puanlarının eşitlenmesi, maddelerin maksimum ayırıcılık gücü ve ayırdıkları yetenek ranjı hakkında bilgi vermekte yetersiz kalmaktadır.

Farklı bir çok isimle de nitelendirilen puanlayıcılar arası güvenirlik iki ya da daha fazla puanlayıcı

arasındaki uyum ve tutarlılığın derecesidir (Crocker & Algina, 1986; Cohen et al., 1996).

Araştırma kapsamında klasik tast kuramında temeli varyans analizine dayalı sınıf içi ilişki katsayısı ile puanlayıcılar arası güvenirliğin incelenmesi yapılmıştır. Çoklu değerlendirici ve sürekli ölçek olması durumunda Krippendorff'un alfası ve sınıf içi korelasyonun benzer sonuçlar verdiği yapılan çalışmalarda (Kılıç, 2009) da görüldüğünden, bu çalışmada verilerin sürekli, ve çoklu puanlayıcı olmasından ve alanyazında da tek facetli desenlerde elde edilen genellenebilirlik katsayısının puanlayıcılar arası güvenirlik belirlemede kullanılan sınıf içi ilişki katsayısıyla aynı sonuçları verdiği görüşünden (Shrout & Fleiss, 1979; Shavelson & Webb, 1991; McGraw & Wong, 1996; Brennan, 2001; Mushquash & O'Connor, 2006) dolayı, sınıf içi korelasyon daha kullanışlı olduğu düşünülerek kullanılmıştır.

Çalışmamızda sınıf içi ilişki katsayısında durum 2 kullanıldığından bu durum açıklanmaya çalışılacaktır. Durum 2 de iki yönlü rastgele etkiler modeli uygulanmaktadır. Burada sadece birimler değil değerlendiricilerde rastgele etki olarak varsayılmaktadır. Bu; değerlendiricilerin daha geniş değerlendiriciler popülasyonundan rastgele seçildiği varsayımına dayanmaktadır. Durum 2 için sınıf içi korelasyon katsayısı (ICC) aşağıdaki gibi hesaplanmaktadır (Shrout & Fleiss, 1979, s. 423).

GAKO = Gruplar arası kare ortalaması

DAKO = Değerlendiriciler arası kare ortalaması

HKO = Hata kare ortalaması

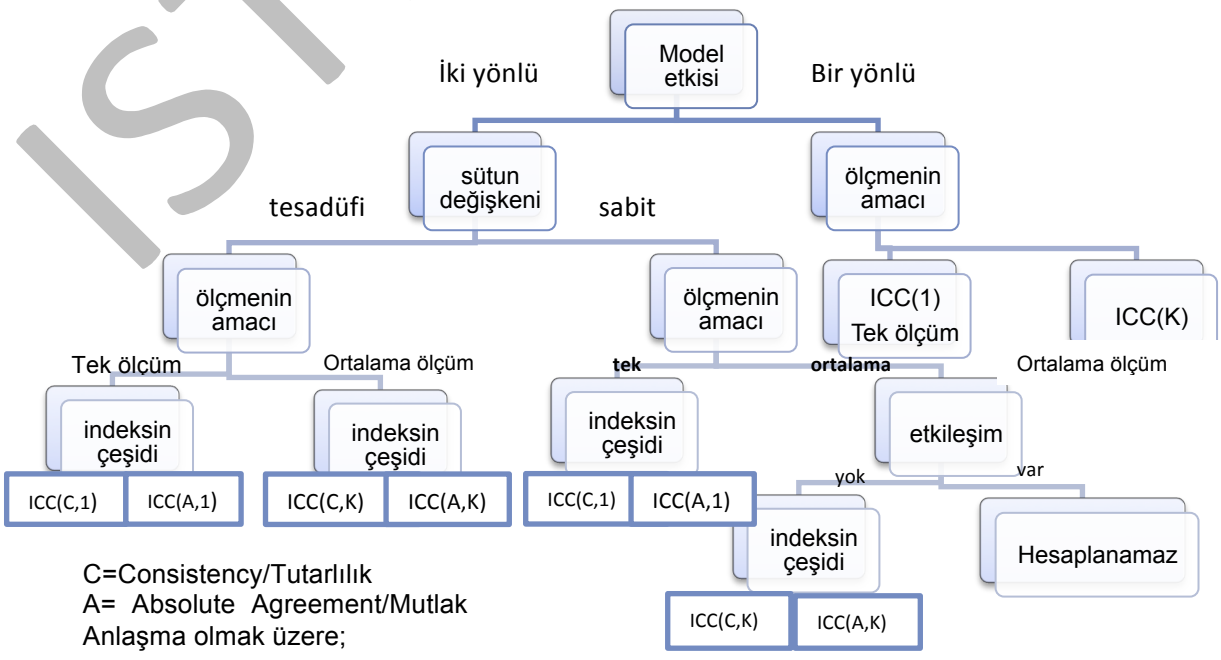
k= Değerlendirici sayısı

n = birey sayısı

olmak üzere;

$$ICC(2,1) = \frac{GAKO - HKO}{((GAKO) + ((k-1)HKA) + (k(DAKO - HKO))/n))}$$ eşitliği ile hesaplanır.

Sınıf İçi İlişki Katsayısı Seçerken



C=Consistency/Tutarlılık
A= Absolute Agreement/Mutlak Anlaşma olmak üzere;

Şekil 1. Sınıf içi ilişki (ICC) katsayısı seçiminde akış şeması (McGraw & Wong, 1996, s. 40)

Genellenebilirlik kuramı, klasik test kuramının günümüzde hala yaygın kullanılan gerçek puan modelinin sınırlılıklarına olan tepkiler içinde Cronbach, Gleser, Nanda ve Rajaratnam tarafından (1963-1972) ortaya atılmış, Shavelson and Webb (1991), Brennan (1992) ve son olarak Brennan (2001a)'nın çalışmaları doğrultusunda geliştirilmiş, davranış ölçümlerinde güvenirliğin değerlendirilmesini, güvenilir gözlemlerin genellenebilirlik (G) ve karar (K) çalışmalarıyla tasarlanmasını, araştırılmasını ve gözlenen puanlardaki tutarsızlık kaynaklarının miktarının tek bir katsayı ile belirlenmesini sağlayan, temelinde varyans analizine (ANOVA) dayalı olan istatistiksel bir kuramdır (Shavelson & Webb, 1991; Brennan, 2001a, 2001b).

Shavelson ve Webb'e (1991) göre, genellenebilirlik kuramı dört farklı açıdan klasik test kuramının daha genişletilmiş bir halidir:

1. Genellenebilirlik Kuramı, çoklu varyans kaynaklarını tek bir analizde ele alır.
2. Her bir varyans kaynağının büyüklüğünün belirlenmesini sağlar.
3. Hem bireylerin performanslarına dayalı bağıl kararlar hem de bireylerin performanslarıyla ilgili mutlak kararlar alınmasına ilişkin iki farklı güvenirlik katsayısının (sırasıyla; G Katsayısı ve Phi Katsayısı) hesaplanmasına olanak tanır.
4. Belirli bir amaca bağlı olarak, ölçme hatasının en aza indirgenebileceği ölçmelerin düzenlenmesine (Karar "K" çalışmaları) imkân tanır.

Genellenebilirlik Kuramı Klasik Test Kuramı ve ANOVA'nın bir uzantısı olarak görülse de, G kuramını anlamak için KTK ve ANOVA'dan fazlasını anlamak gerekir Örneğin; KTK'nın Feldt ve Brennan (1989) tarafından açıklanan bütün yönleri G Kuramının içinde yer almamaktadır. Aynı şekilde ANOVA'nın da hepsi G kuramıyla ilgili değildir, aslında ANOVA'nın bazı yönleri G Kuramı ile ilgilidir. Ek olarak, ANOVA çalışmaları birçok deneysel desen ve ANOVA konusu ele alması bakımından G Kuramından ayrıldığını vurgular. G Kuramı özellikle varyans bileşenleri ve onların hesaplanmasına odaklanır (Brennnan, 2001a, s. 4).

G Kuramının, KTK ile farklılıkları aşağıda sıralanmıştır.

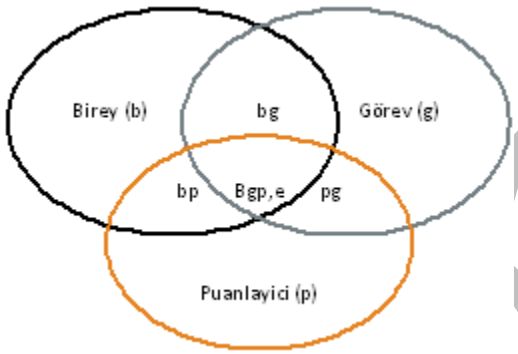
- G Kuramı bir ölçme durumunda yer alan bütün potansiyel hata kaynaklarını birlikte ve eş zamanlı olarak değerlendirerek, tek bir hata kaynağını bir defada değerlendiren KTK'ye göre daha kapsamlı bir güvenirlik kestirimi yapılmasına olanak sağlar.
- G Kuramı KTK'nin aksine güvenirlik çalışmalarında sadece ölçmedeki hatalara kaynaklık eden değişkenlik kaynağını değil, aynı zamanda bu değişkenlik kaynaklarının ortak etkilerini de dikkate alır.
- G Kuramı, çoklu hata kaynaklarının birleşimini ve test-tekrar test güvenirliği, iç tutarlılık ve puanlayıcılar arası güvenirliklerin birlikte değerlendirmektedir.
- G Kuramı ölçmenin güvenirliğin belirlenmesinde mutlak hem de bağıl değerlendirmeler için KTK'de ise sadece bağıl değerlendirme için güvenirlik hesaplanır.
-G Kuramında Karar Çalışmaları ile istenilen her değişkenlik kaynağının koşullarının sayısının değiştirildiği durumda güvenirliğin sınanmasına imkan tanır. KTK'de ise sadece bir değişkenlik kaynağının (madde/görev) sayısının değiştirilmesinin güvenirliği nasıl etkilediği Spearman-Brown formulü ile hesaplanabilir.
- G Kuramı geçerlik ve güvenirlik arasındaki geleneksel farklılığı da bir ölçüde ortadan kaldırmaktadır. Genellenebilirlik kuramında kabul edilebilir gözlemler evreninden alınan örneklemin evrene genellenebilirliği test edildiğinden, kapsam geçerliğinin de bir kanıtı olarak kabul edilebilmektedir (Shavelson & Webb, 1991; Brennan, 2001a).

Genellenebilirlik Kuramının çerçevesi iki analiz safhasını birleştirir. İlk durum genellenebilirlik (G) çalışması olarak adlandırılan kabul edilebilir gözlemleri evrenine genellenebilmesini analiz eder. İkinci durum karar (D/K) çalışması ölçme tutanağının değişkenlik kaynakları için diğer genellenebilirlik katsayılarını, K çalışmasındaki bilgileri kullanarak kararlaştırır. Diğer bir deyişle, bir G çalışması hata varyansının büyüklüğünü hesaplar ve K çalışması en etkili biçimde, en güvenilir ölçümleri elde etmek ve en iyi ölçme desenine karar vermek için bilgileri kullanır (Eason, 1989, s. 9).

Genellenebilirlik kuramında verilerin yapısı ve araştırmacının amacına göre kullanılan desenler bulunmaktadır. Bu araştırmada kullanılan desen aşağıda açıklanmıştır.

Genellenebilirlik Kuramında Kullanılan Desenin Açıklanması

Bu araştırmada kullanılan desen " birey x görev x puanlayıcı" olduğundan bu desen şimdi açıklanmaya çalışılacaktır. Araştırmada 132 bireyin tümünün iki performans görevine verdikleri yanıtlar dört puanlayıcının her biri tarafından puanlandığı için bu desen kullanılmıştır. Ölçmenin hedefi bu çalışmada bireyler olduğundan birey (b) genellikle "facet" yani "ölçme hatasının olası kaynağı" olarak adlandırılmaz ve bu yüzden biz de araştırmamızda bu desen için iki-facet desenini kullandık diyebiliriz. Bu desende bireylerin puanlarını etkileyen iki bağımsız değişken (tesadüfî faktör-facet) olduğu görülmektedir. G Kuramının b x g x p deseninde tanımlanmış geniş bir evrende yer alan bütün test maddeleri ve puanlayıcıların genellenmesinde, belli bir bireyin (b), belli bir görevden (g) ve puanlayıcıdan (p) elde edilen puanları Tablo 1'de açıklanmıştır (Brennan, 1992: 28, 2001a, s. 7).



Şekil 2: İki değişkenli (iki facet) bir desende ortak etkileşim alanı simgesel model

Bu değişkenlik kaynaklarının düzeyleri de (levels) koşullar (conditions) olarak adlandırılır. Örneğin; b x g x p desenimizde görev ve puanlayıcı "ölçme hatasının olası kaynakları (facets)" iken, görev ve puanlayıcı sayıları da bu değişkenlik kaynaklarının koşulu olarak adlandırılır.

Tablo 1: G kuramının b x g x p deseninden elde edilen puanlara ait eşitlikler

$X_{bgp} =$	
μ	Genel ortalama (1)
$+ \mu_b - \mu$	Birey etkisi
$+ \mu_g - \mu$	Görev etkisi
$+ \mu_p - \mu$	Puanlayıcı etkisi
$+ \mu_{bg} - \mu_b - \mu_g + \mu$	Birey x görev etkisi
$+ \mu_{bp} - \mu_b - \mu_p + \mu$	Birey x puanlayıcı etkisi
$+ \mu_{gp} - \mu_g - \mu_p + \mu$	Görev x puanlayıcı etkisi
$+ X_{bgp} - \mu_b - \mu_g - \mu_p + \mu_{bg} + \mu_{bp} + \mu_{gp} - \mu$	Ortak(artık) etki

Tablo 2: İki değişkenlik kaynaklı tesadüfi desen için varyans bileşenlerinin kestirilmesine ait eşitlikler

Varyans Kaynağı	Kareler Toplamı	Serbestlik derecesi	Kareler Ortalaması	Kestirilen Varyans Bileşenleri
Birey (b)	SS_b	n_b-1	$MS_b= SS_b/ n_b$-1	$\sigma^2_{(b)}$
Görev (g)	SS_g	n_g-1	$MS_g= SS_g/ n_g$-1	$\sigma^2_{(g)}$
Puanlayıcı (p)	SS_p	n_p-1	$MS_p= SS_p/ n_p$-1	$\sigma^2_{(p)}$
b x g	SS_{bg}	$(n_b$-1)(n_g-1)	$MS_{bg}= SS_{bg}/ n_{bg}$-1	$\sigma^2_{(bg)}$
b x p	SS_{bp}	$(n_b$-1)(n_p-1)	$MS_{bp}= SS_{bp}/ n_{bp}$-1	$\sigma^2_{(bp)}$
p x g	SS_{pg}	$(n_p$-1)(n_g-1)	$MS_{pg}= SS_{pg}/ n_{pg}$-1	$\sigma^2_{(gp)}$
b x g x p, e	$SS_{bpg,e}$	$(n_b$-1)(n_g-1)(n_p-1)	$MS_{bpg,e}= SS_{bpg,e}/ n_{bpg,e}$-1	$\sigma^2_{(bgp)}$

İki değişkenlik kaynaklı tamamıyla çaprazlanmış desende gözlenen varyans;

$$\boldsymbol{\sigma^2 X_{bgp} = \sigma^2_b + \sigma^2_g + \sigma^2_p + \sigma^2_{bg} + \sigma^2_{bp} + \sigma^2_{gp} + \sigma^2_{bgp,e}} \quad ...(4)$$

eşitliği ile tanımlanır. Eşitlik (4)'de belirtilen yedi varyans bileşenin her biri varyans analizi ile kestirilebilir. Tablo 2'deki değişkenlik kaynakları şunlardır:

1. Birey (b) $\boldsymbol{\sigma^2_b}$: Görevi yerine getirenlerin ölçülmek istenilen özelliklerindeki farklılıklardan kaynaklanan değişkenlik kaynağıdır.

2. Görev (g) $\boldsymbol{\sigma^2_g}$: Her bir görevin diğerlerine oranla kolaylığından ve zorluğundan kaynaklanan değişkenlik kaynağıdır.

3. Puanlayıcı (p) $\boldsymbol{\sigma^2_p}$: Puanlayıcıların bireylerin performansını değerlendirirken birbirlerine göre daha cömert (yumuşak) olup olmadığını göstermektedir. puanlayıcı etkisinden kaynaklanan değişkenlik kaynağıdır. Farklı puanlayıcıların nasıl değişkenlik yaratabileceğini açıklar.

4. Birey görev etkileşimi (bg) $\boldsymbol{\sigma^2_{bg}}$: Ölçülmek istenmeyen görev etkisinin, ölçülmek istenen birey etkisini etkilemesi sonucu ortaya çıkan değişkenlik kaynağıdır. Bireylerin bir görevden diğerine durumlarındaki değişikliği gösterir.

5. Birey puanlayıcı etkileşimi (bp) $\boldsymbol{\sigma^2_{bp}}$: Ölçülmek istenmeyen puanlayıcı etkisinin, ölçülmek istenen birey etkisini etkilemesi sonucu ortaya çıkan değişkenlik kaynağıdır. Bireylerin durumlarının bir puanlayıcıdan diğerine farklılık gösterip göstermediğini gösterir.

6. Görev puanlayıcı etkileşimi (gp) $\boldsymbol{\sigma^2_{gp}}$: Ölçülmek istenmeyen görev ve puanlayıcı etkileşiminden kaynaklanan değişkenlik kaynağıdır. Puanlayıcıların bir görevden diğerine kararlılıklarını gösterir.

7. Birey görev puanlayıcı etkileşimi (bgp) $\boldsymbol{\sigma^2_{bgp,e}}$: Ölçme hatasından kaynaklı artık değişkenlik kaynağıdır.

Yöntem

Araştırma Türü

Araştırma, psikometrik özelliklerin belirlenmesine ve durum saptamaya yönelik olup, genelleme amacı gütmemesi boyutuyla ise betimseldir.

Araştırma Grubu

Araştırmanın çalışma grubunu, 2011- 2012 eğitim-öğretim yılında Kütahya İline bağlı bir ilköğretim okulunda öğrenim göre 132 ilköğretim ikinci kademe 6.,7.,8. sınıf öğrencileri oluşturmaktadır. Bu öğrencilerin problem çözme becerileri iki görev doğrultusunda dört puanlayıcı tarafından

puanlanmıştır. Puanlayıcıları, farklı bölgelerde görev yapan, 0-5 yıl arasında deneyimleri değişen, gönüllü matematik öğretmenleri oluşturmuştur.

Verilerin Toplanması

Araştırmanın verileri, 2011- 2012 eğitim-öğretim yılında Kütahya iline bağlı merkez ilköğretim okulunda öğrenim gören 132 ilköğretim 6.,7.,8. sınıf öğrencisinin rutin olmayan problem çözme becerisine yönelik hazırlanan iki performans görevinde sergiledikleri performansların ilköğretim matematik öğretmeni dört puanlayıcı tarafından yanıt tanıma kodları ve analitik dereceli puanlama anahtarıyla ve ardından on gün arayla bütünsel dereceli puanlama anahtarıyla puanlanması ile toplanmıştır.

Bulgular

Performansa dayalı durum belirlemede, aynı kişinin performansını farklı puanlayıcıların aynı koşullar altında, analitik dereceli puanlama anahtarı ile puanlamasından elde edilen sonuçlar arasındaki tutarlılık derecesine intraclass korelasyon katsayısı ile bakılmış ve bulgular Tablo 3'de gösterilmiştir.

Tablo 3: Farklı puanlayıcıların analitik dereceli puanlama anahtarı ile aynı kişileri puanlamaları sonucu elde edilen tutarlılık katsayıları

Yöntem	df1	df2	değer	F	p
$\mathbf{ICC(2,1)_C}$	263	789	,938	61,995	0,00*
$\mathbf{ICC(2,1)_A}$	263	789	,930	61,995	0,00*

*p<0.01

Tablo 3 incelendiğinde farklı puanlayıcıların analitik dereceli puanlama anahtarıyla verdikleri puanlar arasında yüksek düzeyde anlamlı bir ilişki görülmektedir (F(1; 263,789)= 61.995; $ICC(2,1)_C$=0.938; $ICC(2,1)_A$=0.930; p=0.00). Bu analitik dereceli puanlama anahtarından elde edilen puanların klasik test kuramına göre; yüksek düzeyde puanlayıcılar arası tutarlılığa sahip olduğunun göstergesidir.

Bütünsel dereceli puanlama anahtarı kullanılarak yapılan puanlamalarda farklı puanlayıcıların verdikleri puanlar arasındaki tutarlılığın bir ölçütü kabul edilen sınıf içi korelasyon katsayısı sonuçları Tablo 4'de belirtilmiştir.

Tablo 4: Farklı puanlayıcıların bütünsel dereceli puanlama anahtarı ile aynı kişileri puanlamaları sonucu elde edilen tutarlılık katsayıları

Yöntem	df1	df2	değer	F	p
$\mathbf{ICC(2,1)_C}$	263	789	,893	34,247	0,00*
$\mathbf{ICC(2,1)_A}$	263	789	,874	34,247	0,00*

*p<0.01

Tablo 4 incelendiğinde farklı puanlayıcıların aynı bireylerin performanslarına analitik dereceli puanlama anahtarıyla verdikleri puanlar arasında yüksek ve 0.01 düzeyinde manidar bir ilişki görülmektedir (F(1; 263,789)= 34,247; $ICC(2,1)_C$=0.893; $ICC(2,1)_A$=0.874; p=0.00). Bu bütünsel dereceli puanlama anahtarından elde edilen puanların Klasik Test Kuramına göre; yüksek düzeyde puanlayıcılar arası tutarlılığa sahip olduğunun göstergesidir.

İlköğretim ikinci kademe 132 öğrencinin iki göreve gösterdikleri performansların analitik dereceli puanlama anahtarı ile dört puanlayıcı tarafından puanlanmasından elde edilen puanlara G kuramında b x g x p deseni ile genellenebilirlik çalışması yapılmıştır. Her bir değişkenlik kaynağının kestirilen varyans bileşenleri ve toplam varyansı açıklama yüzdeleri Tablo 5'de verilmiştir.

Tablo 5: Analitik dereceli puanlama anahtarı ile elde edilen puanların b x g x p desenine ait G çalışması sonucunda kestirilen varyans bileşenleri ve toplam varyansı açıklama yüzdeleri

Varyans Kaynağı	Sd	Kareler Toplamı (S.S)	Kareler Ortalaması (M.S)	Varyans	%
b	131	16931.88	129.251	15.423	80.6
g	1	61.094	61.094	0.107	0.6
p	3	89.731	29.910	0.078	0.4
bp	393	2296.018	5.842	2.344	12.2
bg	131	153.655	1.172	0.004	0.0
gp	3	13.625	4.541	0.025	0.1
bgp, e	393	453.625	1.154	1.154	6.0
Toplam	1055	19999.632			100

b: birey, g: görev, p: puanlayıcı

Tablo 5'de verilen b x g x p desenine ait G çalışması sonucunda kestirilen varyans ve toplam varyansı açıklama yüzdeleri incelendiğinde, en çok birey (b) ana etkisine ait varyans bileşeninin toplam varyansın % 80.6'sını açıkladığı, en az ise birey x görev ortak etkileşiminin % 0.0 değeri ile toplam varyansa katkı sağlamadığı görülmektedir.

Birey (b): Görevi yerine getirenlerin problem çözme becerilerinin farklılık gösterdiği $\boldsymbol{\sigma_b^2}$ (15.423) varyans oranı ve % 80.6 toplam varyansı açıklama yüzdesiyle görülmektedir. Bu performansa dayalı durum belirleme uygulamasında amaçlanan bireylerden kaynaklanan beceri farklılıklarının yansıtılabildiğinin ve problem çözme becerisi bakımından değerleme yapılan grubun heterojen özellikler gösterdiğinin göstergesi olabilir.

Görev (g): Her iki görevin benzer güçlükte olduğu $\boldsymbol{\sigma_g^2}$(0.107) varyans oranı ve % 0.6 toplam varyansı açıklama yüzdesiyle görülmektedir.

Puanlayıcı (p): Puanlayıcıların bireylerin performansını değerlendirirken birbirlerine göre daha cömert (yumuşak) olmadığını $\boldsymbol{\sigma_p^2}$(0.078) varyans oranı ve % 0.4 toplam varyansı açıklama yüzdesiyle görülmektedir. Farklı puanlayıcıların benzer puanlamalar yaptığı anlaşılmaktadır.

Birey puanlayıcı etkileşimi (bp): Ölçülmek istenmeyen puanlayıcı etkisinin, ölçülmek istenen birey etkisini etkilemesi sonucu ortaya çıkan değişkenlik kaynağıdır. Bireylerin durumlarının bir puanlayıcıdan diğerine kısmen farklılık gösterdiği $\boldsymbol{\sigma_{bp}^2}$(2.344) varyans yüzdesi ve % 12.2 toplam varyansı açıklama oranıyla görülmektedir. Ayrıca Tablo 15 incelendiğinde ölçmenin nesnesi kabul edilen birey değişkenlik kaynağından sonra en yüksek toplam varyansa katkı getirme oranıyla, birey puanlayıcı etkileşimi dikkate değer bir değişkenlik kaynağı olmuştur.

Birey görev etkileşimi (bg) : Ölçülmek istenmeyen görev etkisinin, ölçülmek istenen birey etkisini etkilemesi sonucu ortaya çıkan değişkenlik kaynağıdır. Bireylerin bir görevden diğerine durumlarının değişmediği $\boldsymbol{\sigma_{bg}^2}$(0.004) varyans oranı ve % 0.0 toplam varyansı açıklama yüzdesiyle görülmektedir. Bu sonuçta, görev değişkenlik kaynağının toplam varyansa getirisinin düşük olmasının etkisi yadsınamaz. Buradan her iki görevin benzer yapıyı ölçtüğü, bireylerin her iki göreve de gösterdikleri performansların benzer olduğu yorumu da yapılabilir. Bunun yanında görevlerin güçlük düzeylerinin farklı olmasından dolayı b x g etkileşimi toplam varyansı daha çok etkileyebileceği ve bu araştırmada iki performans görevinin uygulandığı göz önüne alınmalıdır.

Görev puanlayıcı etkileşimi (gp): Ölçülmek istenmeyen görev ve puanlayıcı etkileşiminden kaynaklanan değişkenlik kaynağıdır. Puanlayıcıların bir görevden diğerine kararlı oldukları $\boldsymbol{\sigma_{gp}^2}$(0.025) varyans oranı ve % 0.1 toplam varyansı açıklama yüzdesiyle görülmektedir. Her bir göreve verilen puanların bir puanlayıcıdan diğerine farklılaşmadığı bu değerlerle de görülmektedir.

Birey görev puanlayıcı etkileşimi (bgp) $\boldsymbol{\sigma_{bgp,e}^2}$: Ölçme hatasından kaynaklı artık değişkenlik kaynağıdır. Tablo 16 incelendiğinde; ölçmenin nesnesi birey ve b x p ortak etkileşiminden sonra en büyük değişkenlik kaynağı olduğu $\boldsymbol{\sigma_{bgp,e}^2}$(1.154) varyans oranı ve % 6.0 toplam varyansı açıklama yüzdesiyle

anlaşılmaktadır. Ancak tesadüfi hata olarak da adlandırılan bu değişkenlik kaynağının toplam varyansı açıklama yüzdesi önemli bir büyüklükte değildir.

İlköğretim ikinci kademe 132 öğrencinin iki göreve gösterdikleri performansların bütünsel dereceli puanlama anahtarı ile dört puanlayıcı tarafından puanlanmasından elde edilen puanlara G kuramında b x g x p deseni ile genellenebilirlik çalışması yapılmıştır. Her bir değişkenlik kaynağının kestirilen varyans bileşenleri ve toplam varyansı açıklama yüzdeleri Tablo 6'da verilmiştir.

Tablo 6: Bütünsel dereceli puanlama anahtarı ile elde edilen puanların b x g x p desenine ait G çalışması sonucunda kestirilen varyans bileşenleri ve toplam varyansı açıklama yüzdeleri

Varyans Kaynağı	Sd	Kareler Toplamı (S.S)	Kareler Ortalaması (M.S)	Varyans	%
b	131	16372.533	124.981	14.836	76.0
g	1	136.023	136.023	0.243	1.2
p	3	281.548	93.849	0.310	1.6
bp	393	2469.826	6.284	2.191	11.2
bg	131	249.601	1.905	0.000	0.0
gp	3	22.616	7.538	0.042	0.2
bgp, e	393	747.258	1.901	1.901	9.7
Toplam	1055	20279.408			100

b: birey, g: görev, p: puanlayıcı

Tablo 6'da verilen b x g x p desenine ait G çalışması sonucunda kestirilen varyans ve toplam varyansı açıklama yüzdeleri incelendiğinde, en çok birey (b) ana etkisine ait varyans bileşeninin toplam varyansın % 76.0 'sını açıkladığı, en az ise birey x görev ortak etkileşiminin % 0.0 değeri ile toplam varyansa katkı sağlamadığı görülmektedir.

Birey (b): Görevi yerine getirenlerin problem çözme becerilerinin farklılık gösterdiği $\boldsymbol{\sigma_b^2}$ (14.836) varyans oranı ve % 76.0 toplam varyansı açıklama yüzdesiyle görülmektedir. Bu aynı zamanda grubun ölçülen özellik bakımından heterojen olduğunun da göstergesidir.

Görev (g): Her iki görevin benzer güçlükte olduğu, $\boldsymbol{\sigma_g^2}$(0.243) varyans oranı ve % 1.2 toplam varyansı açıklama yüzdesiyle görülmektedir.

Puanlayıcı (p): Puanlayıcıların bireylerin performansını değerlendirirken birbirlerine göre daha cömert (yumuşak) olmadığını, $\boldsymbol{\sigma_p^2}$(0.310) varyans oranı ve % 1.6 toplam varyansı açıklama yüzdesiyle görülmektedir. Farklı puanlayıcıların benzer puanlamalar yaptığı anlaşılmaktadır.

Birey puanlayıcı etkileşimi (bp): Bireylerin durumlarının bir puanlayıcıdan diğerine az oranda farklılık gösterdiği, $\boldsymbol{\sigma_{bp}^2}$(2.191) varyans yüzdesi ve % 11.2 toplam varyansı açıklama oranıyla görülmektedir.

Birey görev etkileşimi (bg) : Bireylerin bir görevden diğerine durumlarındaki değişmediği, $\boldsymbol{\sigma_{bg}^2}$(0.000) varyans oranı ve % 0.00 toplam varyansı açıklama yüzdesiyle görülmektedir.

Görev puanlayıcı etkileşimi (gp): Puanlayıcıların bir görevden diğerine kararlı oldukları, $\boldsymbol{\sigma_{gp}^2}$(0.042) varyans oranı ve % 0.2 toplam varyansı açıklama yüzdesiyle görülmektedir.

Birey görev puanlayıcı etkileşimi (bgp): Ölçme hatasından kaynaklı artık değişkenlik kaynağıdır. Ölçmenin nesnesi birey ve b x p etkileşiminden sonra en büyük değişkenlik kaynağı olduğu, $\boldsymbol{\sigma_{bgp,e}^2}$(1.901) varyans oranı ve % 9.7 toplam varyansı açıklama yüzdesiyle anlaşılmaktadır. Ancak tesadüfi hata olarak da adlandırılan bu değişkenlik kaynağının toplam varyansı açıklama yüzdesi önemli bir büyüklükte değildir.

Araştırmada kullanılan her iki kuramdan analitik dereceli puanlama anahtarı için elde edilen bulgular Tablo 7'de özetlenmeye çalışılmıştır.

Tablo 7: Analitik dereceli puanlama anahtarıyla elde edilen puanların KTK ve G kuramı güvenirlik sonuçları

Klasik Test Kuramı	**Genellenebilirlik Kuramı** b x g x p deseni
Cr α= 0.839-0.873	G=0.954 Φ=0.950 Birey değişkenlik kaynağı varyansı: $\boldsymbol{\sigma_b^2}$(15.423) Toplam varyansı açıklama yüzdesi: % 80.6
$ICC(2,1)_C$=0.938 $ICC(2,1)_A$=0.930 _Puanlayıcılar arası ilişki katsayısı (r)=0.927-0.954	Puanlayıcı değişkenlik kaynağı varyansı: $\boldsymbol{\sigma_p^2}$(0.078) Toplam varyansı açıklama yüzdesi: % 0.4

Tablo 7 incelendiğinde; KTK'de her bir puanlayıcının analitik dereceli puanlama anahtarıyla vermiş oldukları puanların iç tutarlılığının Cr α= 0.839 ve Cr α= 0.873 arasında değiştiği, buna karşılık G Kuramında her bir ölçüm için bağıl ve mutlak hata kaynaklarını dikkate alarak bulunan tek bir güvenirlik katsayısının G=0.954, Φ=0.950 bulunduğu görülmüştür. Ayrıca farklı puanlayıcıların analitik dereceli puanlama anahtarıyla vermiş oldukları puanlarda puanlayıcılar arası tutarlılık $ICC(2,1)_C$=0.938, $ICC(2,1)_A$=0.930 gibi yüksek düzeyde bulunurken, G Kuramında puanlayıcı değişkenlik kaynağı varyansı $\boldsymbol{\sigma_p^2}$(0.078) ve toplam varyansı açıklama yüzdesi % 0.4 gibi önemsenmeyecek değerlerde bulunmuştur.

Araştırmada kullanılan her iki kuramdan bütünsel dereceli puanlama anahtarı için elde edilen bulgular Tablo 8'de özetlenmeye çalışılmıştır.

Tablo 8: Bütünsel dereceli puanlama anahtarıyla elde edilen puanların KTK ve G kuramı güvenirlik sonuçları

Klasik Test Kuramı	**Genellenebilirlik Kuramı** b x g x p deseni
Cr α= 0.834-0.863	G=0.949 Φ=0.937 Birey değişkenlik kaynağı varyansı: $\boldsymbol{\sigma_b^2}$(14.836) Toplam varyansı açıklama yüzdesi: % 76
$ICC(2,1)_C$=0.893 $ICC(2,1)_A$=0.874 Puanlayıcılar arası ilişki katsayısı (r)=0.878-0.927	Puanlayıcı değişkenlik kaynağı varyansı: $\boldsymbol{\sigma_p^2}$(0.310) Toplam varyansı açıklama yüzdesi: % 1.6

Tablo 8 incelendiğinde; KTK'de her bir puanlayıcının bütünsel dereceli puanlama anahtarıyla vermiş oldukları puanların iç tutarlılığının Cr α= 0.834 ve Cr α= 0.863 arasında değiştiği, buna karşılık G Kuramında her bir ölçüm için bağıl ve mutlak hata kaynaklarını dikkate alarak bulunan tek bir güvenirlik katsayısının G=0.949, Φ=0.937 bulunduğu görülmüştür. Ayrıca farklı puanlayıcıların analitik dereceli puanlama anahtarıyla vermiş oldukları puanlarda puanlayıcılar arası tutarlılık $ICC(2,1)_C$=0.893, $ICC(2,1)_A$=0.874 gibi yüksek düzeyde bulunurken, G Kuramında puanlayıcı değişkenlik kaynağı varyansı $\boldsymbol{\sigma_p^2}$(0.310) ve toplam varyansı açıklama yüzdesi % 1.6 gibi düşük değerlerde bulunmuştur.

Sonuçlar ve Tartışma

Analitik ve bütünsel dereceli puanlama anahtarından elde edilen puanlara ait G kuramı ve KTK sonuçları incelendiğinde her iki kuramdan elde edilen bulguların ölçümlerden elde edilen verilerin

güvenilir olduğuna işaret ettiği, ancak G kuramından elde edilen güvenirlik katsayılarının KTK'den daha yüksek sonuçlar doğurduğu benzer araştırmalarda (Yelboğa, 2007; Güler, 2008; Deliceoğlu, 2009) da olduğu gibi görülmüştür.

b x g x p tümüyle çaprazlanmış desen analitik dereceli puanlama anahtarı ile elde edilen puanlar üzerine G çalışması uygulandığında, bütünsel puanlama anahtarıyla elde edilen puanlara oranla daha güvenilir sonuçlara ulaşılmıştır. Tesadüfi hata olarak da adlandırılan artık etki analitik dereceli puanlama anahtarından elde edilen puanlarda daha düşük değerde çıkarken, ölçmenin amacı olan bireylerin problem çözme yeteneklerindeki farklılıktan kaynaklanan etki ise daha yüksek çıkmıştır.

Kullanılan desende (b x g x p) K çalışması yapıldığında ise yine analitik dereceli puanlama anahtarından elde edilen puanların, bütünsel dereceli puanlama anahtarından elde edilen puanlara oranla daha yüksek G ve phi katsayılarına sahip olduğu, her iki puanlamadan elde edilen Phi katsayılarının ise göreceli olarak G katsayısından daha düşük çıktığı görülmüştür. Problem çözme becerisinin değerlemesine yönelik hazırlanan analitik dereceli puanlama anahtarı ile yapılan puanlamanın bütünsel dereceli puanlama anahtarı ile yapılan puanlamaya oranla göreceli olarak daha güvenilir sonuçlar verdiği görülmüştür. Bu sonuçlar alanyazında analitik dereceli puanlama anahtarından elde edilen puanların, bütünsel dereceli puanlama anahtarından elde edilen puanlara göre KTK'de göreceli olarak daha yüksek güvenirlikler verdiği bir çok çalışmayla örtüşmekte (Follman & Anderson, 1967; Bauer, 1981; Jonsson & Svingby, 2007) ve analitik dereceli puanlama anahtarından elde edilen puanların, bütünsel dereceli puanlama anahtarından elde edilen puanlara göre önemli derecede güvenilir olduğu sonucuna ulaşan çalışmaların bulgularıyla (Klein et. al, 1998; Boring, 2002) kısmen örtüşmektedir.

Klasik test kuramı ve genellenebilirlik kuramı bulguları karşılaştırıldığında ise; her iki kuramdan elde edilen bulguların birbiriyle örtüştüğünü, ancak hata kaynaklarını birlikte ve tek başına ele alması boyutuyla genellenebilirlik kuramının daha ayrıntılı bilgi sunduğu görülmüştür. Günümüzde bilgisayar teknolojisindeki gelişmelerle kuramların uygulanması kolaylaşmaktadır. Bu yüzden güvenirlik incelenirken kapsamlı bilgi veren kullanılması önerilmektedir.

Bu araştırmada ölçümlerden elde edilen verilere yönelik güvenirlik çalışması yapılmıştır. Bu sonuçlar araştırmada kullanılan performans görevlerine belirtilen dereceli puanlama anahtarı ile verilecek puanların her daim güvenilir sonuçları getireceğinin göstergesi değildir. Bir grupta ya da uygulamada güvenilir sonuçlar elde edilebilirken, başka bir grupta ya da uygulamada aksi durum söz konusu olabilir. Bu yüzden performansa dayalı durum belirleme gerçekleştirilirken uygulama yapılacak grubun özellikleri de gözetilerek performans görevleri ve görevlere uygun puanlama anahtarları hazırlanmalıdır.

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Random Thresholds for Decentralized Fusion Problems

Hakan SOKU & Suat BAYRAM

Turgut Ozal University, Department of Electrical and Electronics Engineering, Turkey
hsoku@turgutozal.edu.tr & sbayram@turgutozal.edu.tr

Abstract: In this paper, we consider the decentralized fusion problem under Bayesian framework in the presence of uncertainty in observations of local sensors. All decisions made by local sensors are transmitted to the fusion center where the final decision is made. The conventional approach is to set all thresholds of local sensors and the fusion center as deterministic variables and to optimize those variables according to the given criterion. The aim of this study is to investigate effects of setting and accordingly optimizing thresholds as random variables instead of deterministic ones. First we reformulate the problem with taking the random thresholds into account, then solve the corresponding optimization problem by using Particle Swarm Optimization (PSO) algorithm. In the simulations, it is observed than employing random thresholds in place of deterministic ones can improves the performance by up to 60%.

Keywords: Decentralized fusion, random threshold, restricted Bayes.

Introduction

In the collaborative human decision making problem under a binary hypothesis testing framework (wimalajeewa & varshney, 2013), thresholds used by the individual human agents to decide on which hypothesis is true are modeled as random variables because of mainly unpredictability and cognitive limitations of humans. decentralized fusion schemes find extensive applications areas in defense systems; thereby it is important to develop novel schemes performing better than conventional ones. to that end, in this study, thresholds of local sensors and the fusion center are set as random variables to improve the performance over the conventional approach, in which thresholds are deterministic, according to restricted bayes criterion in a decentralized fusion problem under a binary hypothesis testing framework. ıt turns out that setting thresholds as random variable outperforms the conventional case in which thresholds are deterministic.

In this study, we consider the restricted Bayes criterion to handle the uncertainty in the observations of the local sensors. More specifically, the aim of this study is to investigate effects of setting and accordingly optimizing thresholds as random variables instead of deterministic variables under the restricted Bayes framework (Hodges, Lehmann, Jr. & E.L, 1952; Lehmann, 1986), whose aim is to minimize the global probability of error while keeping the worst-case global probability of error below the predefined level. We also consider the likelihood ratio as a test statistic for the fusion center, which is a common use in practice. Uncertainty in the transmission of decisions of local sensors to the fusion center is modeled by a binary asymmetric channel (BASC).

The paper is organized as follows. The problem formulation is given, and derivations for optimum random thresholds are provided. After that, a numerical example is studied to investigate the effectiveness of the proposed scheme. Finally, concluding remarks are presented at the end.

Problem Formulation

Consider the decentralized fusion problem, in which each of local sensors decides on which hypothesis is true then all decisions of the local sensors are transmitted to the fusion center where the final decision is made. We have N local sensors and the observation vector $\mathbf{x}_i \in \mathbf{R}^K$ at the local sensor i can be expressed under binary hypotheses as follows:

$$H_0 : \mathbf{x}_i = \mathbf{s}_{i0} + \mathbf{n}_i \quad , \qquad H_1 : \mathbf{x}_i = \mathbf{s}_{i1} + \mathbf{n}_i \tag{1}$$

Where $\mathbf{n}_i$ is the background noise with PDF p_{n_i} (2). The signals are modeled as random vectors $\mathbf{s}_0 = [\mathbf{s}_{10}^T \mathbf{s}_{20}^T ... \mathbf{s}_{N0}^T]^T$ with the estimated PDF p_{s_0} (∑ under the hypothesis H_0 and $\mathbf{s}_1 = [\mathbf{s}_{11}^T \mathbf{s}_{21}^T ... \mathbf{s}_{N1}^T]^T$ with the estimated PDF p_{s_1} (∑ under the hypothesis H_1 . In practice, true PDFs of the signals can be very different from the estimated ones due to estimation errors in obtaining p_{s_0} (∑ and p_{s_1} (∑ (Hodges, Lehmann, Jr. & E.L, 1952; Lehmann, 1986). In other words, there exists uncertainty in the PDFs of the signals. In the restricted Bayes criterion, the worst-case scenario is also considered to take this uncertainty into account (Hodges, Lehmann, Jr. & E.L, 1952; Lehmann, 1986). Therefore, in the restricted Bayes framework, the least-favorable PDFs of the signals corresponding to the worst-case scenario are also considered along with the estimated ones (Hodges, Lehmann, Jr. & E.L, 1952; Lehmann, 1986). Let us denote the least favorable PDFs of the signals under hypotheses H_1 and H_0

with $p^{ls}_{s_1}(\sum$ and $p^{ls}_{s_0}(\sum$, respectively. Observations of the local sensors are also assumed to be conditionally independent.

The fusion center and all local sensors employ fix test statistics. Let us denote the test statistic at the local sensor i with $T_i(\sum$ and at the fusion center with L ($\sum$. In the conventional approach, thresholds of the fusion center and local sensors are considered as deterministic variables, and optimized according to the given criterion (Papastavrou & Athans, 1995; Viswanathan & Varshney, 1997), which is the restricted Bayes criterion in this study.

Let us denote the threshold of the local sensor i with $\boldsymbol{h}_i$ and the threshold of the fusion center with t . In this study, random variables are denoted with bold font. We define the random vector $\boldsymbol{h}$ with the PDF $p_{\boldsymbol{h}}(\sum$ containing all thresholds of the local sensors: $\boldsymbol{h} @[\boldsymbol{h}_1 \boldsymbol{h}_2 \sum\sum\sum \boldsymbol{h}_N]^T$.

The decision rule at the local sensor i is denoted with ϕ_i , where $\phi_i(x_i) = 1$ if $T_i(x_i) \geq \eta_i$, otherwise $\phi_i(x_i) = 0$. The observation received at the fusion center from the local sensor i is denoted with $\mathbf{u}_i$, where $u_i \in \{0,1\}$ .Define the random vector **u** containing all observations received at the fusion center from the local sensors: $\mathbf{u} @[\mathbf{u}_1 \mathbf{u}_2 \sum\sum\sum \mathbf{u}_N]^T$. The fusion center makes a final decision based on the observation **u**, that is, $\phi(u) = 1$ if $L(u) \geq t$, otherwise $\phi(u) = 0$, where $\phi(\sum$ is the decision rule employed at the fusion center.

Binary asymmetric Channel (BASC) is assumed, and the crossover probabilities can be defined as $c_{0i} @p(\mathbf{u}_i = 1 \mid \phi_i(x_i) = 0)$ and $c_{1i} @p(\mathbf{u}_i = 0 \mid \phi_i(x_i) = 1)$ for i = 1,2…, N.

Observations ($\mathbf{u}_i$ for i = 1, 2..., N) at the fusion center are independent from each other when the signal and thresholds of local sensors are given:

$$p(u \mid \eta, s_k, \mathrm{H}_k) = \prod_{i=1}^{N} p(u_i \mid \eta_i, s_{ik}, \mathrm{H}_k) \quad . \tag{2}$$

The probability of local sensor i deciding on H_1 when the threshold and the signal are given is denoted with $\mathrm{F}_{ik}(\eta_i, s_{ik}) @p(\phi_i(\mathrm{x}_i) = 1 \mid \eta_i, s_{ik}, \mathrm{H}_k)$. Then, $p(u_i \mid \eta_i, s_{ik}, \mathrm{H}_k)$ can be expresses as follows:

$$p(\mathbf{u}_i = 1 \mid \eta_i, s_{ik}, \mathrm{H}_k) = (1 - c_{1i})\mathrm{F}_{ik}(\eta_i, s_{ik}) + c_{0i}(1 - \mathrm{F}_{ik}(\eta_i, s_{ik})) \tag{3}$$

$$p(\mathbf{u}_i = 0 \mid \eta_i, s_{ik}, \mathrm{H}_k) = (1 - c_{0i})(1 - \mathrm{F}_{ik}(\eta_i, s_{ik})) + c_{1i}\,\mathrm{F}_{ik}(\eta_i, s_{ik}) \tag{4}$$

The PDFs of the observations received at the fusion center for the expected and the worst-case scenarios can be calculated as follows:

$$p(u \mid \mathrm{H}_k) = \int_{\mathrm{R}^N} \int_{\mathrm{R}^K} p(u \mid \eta, s_k \mathrm{H}_k) p_{s_k}(s_k) p_{\boldsymbol{h}}(\eta)\, \mathrm{d}s_k \mathrm{d}\eta$$

$$p^{ls}(u \mid \mathrm{H}_k) = \int_{\mathrm{R}^N} \int_{\mathrm{R}^K} p(u \mid \eta, s_k \mathrm{H}_k) p^{ls}_{s_k}(s_k) p_{\boldsymbol{h}}(\eta)\, \mathrm{d}s_k \mathrm{d}\eta$$

It should be noted that the least-favorable PDFs of the signals may be dependent on thresholds, that is, when the thresholds of the local sensors and the fusion center change the least-favorable PDFs may also change in some cases.

In this study, the fusion center is assumed to use the likelihood ratio as a test statistic. When the thresholds of the local sensors are given, the likelihood ratio can be expressed as follows:

$$L(u) = \frac{\int_{\mathrm{R}^K} p(u \mid \eta, s_1 \mathrm{H}_1) p_{s_1}(s_1) \mathrm{d}s_1}{\int_{\mathrm{R}^K} p(u \mid \eta, s_0 \mathrm{H}_0) p_{s_0}(s_0) \mathrm{d}s_0} = \frac{\mathrm{G}_1(u,\eta)}{\mathrm{G}_0(u,\eta)} \tag{5}$$

Where $\mathrm{G}_k(u,\eta) @ \int_{\mathrm{R}^K} p(u \mid \eta, s_k \mathrm{H}_k) p_{s_k}(s_k)\, \mathrm{d}s_k$ for k = 0, 1. For convenience, let us also define $\mathrm{G}^{ls}_k(u,\eta) @ \int_{\mathrm{R}^K} p(u \mid \eta, s_k \mathrm{H}_k) p^{ls}_{s_k}(s_k)\, \mathrm{d}s_k$ for k = 0, 1.

Since $u_i \in \{0,1\}$, the size of the set of possible values of u is 2^N. Therefore, $L(u)$ can take 2^N different values corresponding to possible values of u. Let us arrange the values of $L(u)$ in ascending order as $l_1, l_2, \ldots, l_{2^N}$ with corresponding values of u denoted with u^1, u^2, …, u^{2^N}, that is, $l_i = L(u^i) = \frac{G_1(u^i, \boldsymbol{h})}{G_0(u^i, \boldsymbol{h})}$.

For convenience let us represent all thresholds with the random vector θ having the PDF $p_\theta(\Sigma$, which is defined as $\theta @ [\eta^T t]^T$. Then, probabilities of the fusion center deciding on H_1 given that the true hypothesis is H_1 (the global detection probability) for the expected and the worst-case scenarios can be expressed as follows:

$$\mathrm{P}_\mathrm{D}(\theta) = \sum_{i=0}^{2^N-1} \mathrm{P}_{\mathrm{D}i}(\theta) \tag{6}$$

$$P_D^{ls}(\theta) = \sum_{i=0}^{2^N-1} P_{Di}^{ls}(\theta) \tag{7}$$

Where $P_{D0}(\theta) = I(t \le l_1), P_{Di}(\theta) = I(l_i < t \le l_{i+1})\left(G_1(u^{i+1},\eta) + G_1(u^{i+2},\eta) + \cdots + G_1(u^{2^N},\eta)\right)$ similarly

$P_{D0}^{ls}(\theta) = I(t \le l_1),\ P_{Di}^{ls}(\theta) = I(l_i < t \le l_{i+1})\left(G_1^{ls}(u^{i+1},\eta) + G_1^{ls}(u^{i+2},\eta) + \cdots + G_1^{ls}(u^{2^N},\eta)\right)$ for i = 1, 2,…,(2^N-1) . Here, $I(\cdot)$ denotes an indicator function: If the event A is true then I(A) = 1, otherwise I(A) = 0.

The probabilities of the fusion center deciding on H_1 given that the true hypothesis is H_0 (the global false alarm probability) for the expected and the worst-case scenarios can be given as follows:

$$P_F(\theta) = \sum_{i=0}^{2^N-1} P_{Fi}(\theta) \tag{8}$$

$$P_F^{ls}(\theta) = \sum_{i=0}^{2^N-1} P_{Fi}^{ls}(\theta) \tag{9}$$

Where $P_{F0}(\theta) = I(t \le l_1), P_{Fi}(\theta) = I(l_i < t \le l_{i+1})\left(G_0(u^{i+1},\eta) + G_0(u^{i+2},\eta) + \cdots + G_0(u^{2^N},\eta)\right)$, similarly $P_{F0}^{ls}(\theta) = I(t \le l_1),\ P_{Fi}^{ls}(\theta) = I(l_i < t \le l_{i+1})\left(G_0^{ls}(u^{i+1},\eta) + G_0^{ls}(u^{i+2},\eta) + \cdots + G_0^{ls}(u^{2^N},\eta)\right)$ for i = 1, 2,…,(2^N-1).

The global error probabilities at the fusion center for the expected and the worst-case scenarios can be calculated as follows:

$$P_E(\theta) = \pi_1(1 - P_D(\theta)) + (1 - \pi_1)P_F(\theta) \tag{10}$$

$$P_E^{ls}(\theta) = \pi_1(1 - P_D^{ls}(\theta)) + (1 - \pi_1)P_F^{ls}(\theta) \tag{11}$$

Where $\pi 1$ is the prior probability of hypothesis H_1.

In the restricted Bayes criterion, the goal is to minimize the global probability of error corresponding to the expected scenario under the constraint on the global error probability corresponding to the worst-case scenario.

Therefore, in the conventional approach, the following optimization problem is solved to obtain optimum deterministic thresholds:

$$\min_{\theta} \quad P_E(\theta)$$

$$\text{Subject to} \quad P_E^{ls}(\theta) \le \beta, \tag{12}$$

where β is a predefined parameter, determined based on the level of uncertainty (Hodges, Lehmann, Jr. & E.L, 1952; Lehmann, 1986; Bayram & Gezici, 2011). Let us denote the optimal deterministic thresholds with θ^{opt}, then in the conventional approach the global error probabilities corresponding to the expected and the worst-case scenarios are $P_E(\theta^{opt})$ and $P_E^{ls}(\theta^{opt})$, respectively. The restricted Bayes criterion generalizes the minimax and the Bayes criteria, and includes them as special cases. In (12), as β increases the restricted Bayes criterion converges to the Bayes criterion, and after some value of β the restricted Bayes becomes equivalent to the Bayes criterion (Hodges, Lehmann, Jr. & E.L, 1952; Lehmann, 1986). Similarly, as β decreases the restricted Bayes criterion converges to the minimax criterion, and at the minimum value of β the restricted Bayes becomes equivalent to the minimax criterion (Hodges, Lehmann, Jr. & E.L, 1952; Lehmann, 1986). In fact, the minimum value of β is the probability of error when the minimax criterion is employed.

In the case of thresholds being random variables, the aim is to obtain optimum PDFs of the thresholds which minimize the average global probability of error corresponding to the expected scenario while keeping the average global error probability corresponding to the worst-case scenario below the predefined level:

$$\min_{p_\theta(\Sigma} \quad E_\theta\{P_E(\theta)\}$$

$$\text{Subject to} \quad E_\theta\{P_E^{ls}(\theta)\} \le \beta. \tag{13}$$

It should be noted that when the value of β is high enough so that the constraint on the average global error probability corresponding to the worst-case scenario becomes ineffective, then the optimization problem in (13) is reduced to the minimization of average global probability of error corresponding to the expected scenario, which is the optimization problem of the Bayes criterion. Under this case, replacing deterministic thresholds by random ones is useless since optimal PDFs of random thresholds which minimize the average global error probability corresponding to the expected scenario consist of only one point mass, which means that random thresholds are indeed deterministic ones.

The particle swarm optimization (PSO) algorithm is used to solve the problem in (13).

Numerical Results

Consider the decentralized fusion problem with two local sensors, and scalar observations at the local sensor i are given as follows:

$$\mathrm{H}_0 \quad : \quad \mathbf{x}_i = \mathbf{n} \qquad , \qquad \mathrm{H}_1 \quad : \quad \mathbf{x}_i = s + \mathbf{n} \tag{14}$$

where **s** is a random variable with the PDF in the form of $p_s(s) = 0.5\delta(s-A) + 0.5\delta(s+A)$ where $\delta(\cdot)$ is the Dirac delta function and the value of A is estimated based on previous experience. In this model, the signal under H_1 employs binary modulation, namely, binary phase shift keying (BPSK). The background noise **n** is symmetric Gaussian mixture with the PDF:

$$p_{\mathbf{n}}(n) = \sum_{i=1}^{\mathrm{M}} \omega_i y_i(n-\mu_i), \tag{15}$$

where M is the number of Gaussian components in the mixture noise PDF, μ_i is the mean values of the Gaussian components, $\sum_{i=1}^{\mathrm{M}} \omega_i = 1$, $\omega_i \geq 0$, $y_i(y) = (1/\sqrt{2\pi}\,\sigma_i)\exp\{-y^2/(2\sigma_i^2)\}$ for i = 1, . . . , M , with σ_i being the standard deviations of the Gaussian components. All parameters are adjusted to make the PDF symmetric around the origin.

The local sensors employ the following test statistics $T_1(x_1) = x_1^2$ and $T_2(x_2) = x_2^2$. For this example, we can present $\mathrm{F}_{ik}(h_i, s_{ik})$ in the closed form expression:

$$\mathrm{F}_{ik}(h_i, s_{ik}) = p\left((\mathrm{n}+\mathrm{s}_{ik})^2 \geq h_i \mid h_i, \mathrm{s}_{ik}, H_k\right) =$$

$$\sum_{m=1}^{\mathrm{M}} \omega_m \left(Q\left(\frac{\sqrt{h_i} - s_{ik} - \mu_m}{\sigma_m} \right) + Q\left(\frac{\sqrt{h_i} + s_{ik} - \mu_m}{\sigma_m} \right) \right),$$

where $s_{i0} = 0$ and $s_{i1} \in \{-A, A\}$, and Q-function is given as $\mathrm{Q(x)} = (1/\sqrt{2\pi})\int_x^\infty e^{-t^2/2} dt$.

Based on previous experience, A is assumed to be estimated as 5, but it is also assumed to be known for sure that $A \geq 3$. In this case, the estimated PDF for the signal is obtained by inserting 5 for A in $p_s(s)$ since A is estimated as 5, and the least-favorable PDF is obtained by inserting 3 for A in $p_s(s)$ since in the scenario studied in the remaining part of the section the maximum value of means of the gaussian components in the background noise is 2, to which 3 is the closest value A can take. In this example, the least-favorable PDF of the signal is independent from the thresholds for the scenario studied in the remaining part of the section.

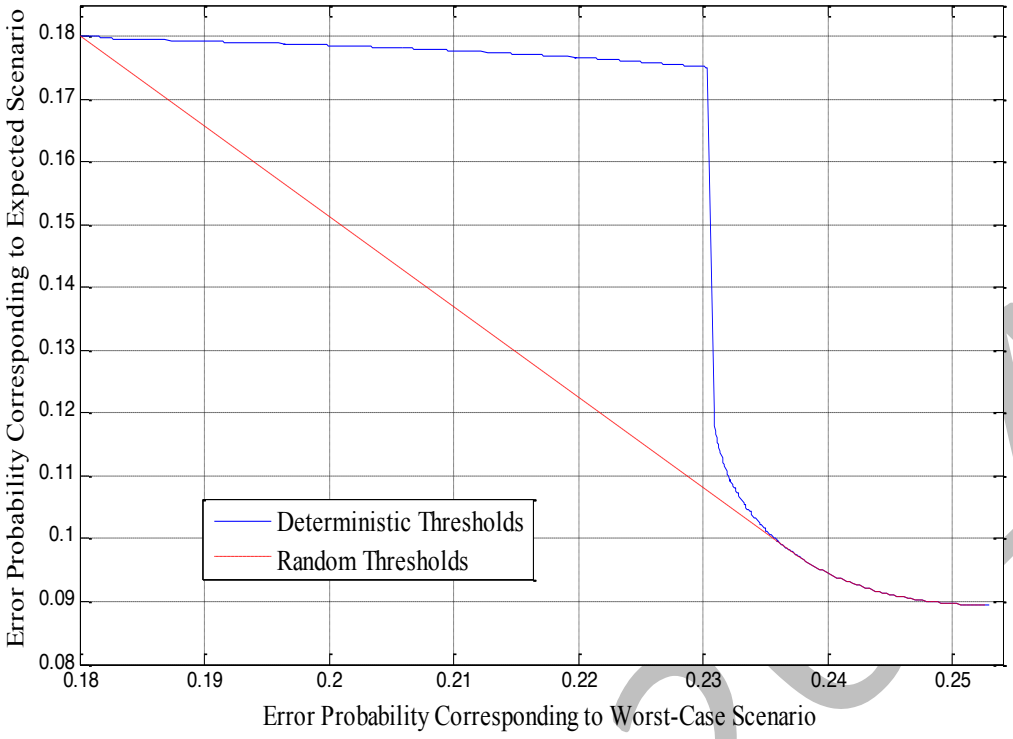

Figure : The curves of error probability corresponding to the expected scenario versus error probability corresponding to the worst-case scenario for the case of using optimal deterministic thresholds and the case of using optimal random thresholds, where $c_{0i} = c_{1i} = 0.01$ for i = 1,2, M = 2, $\mu_1 = -\mu_2 = 2$, $\omega_1 = \omega_2 = 0.5$, $\sigma_1 = \sigma_2 = 0.8$, $\pi_1 = 0.82$.

In the Figure, the curves of error probability corresponding to the expected scenario versus error probability corresponding to the worst-case scenario are plotted for the case of thresholds being optimal deterministic variables and the case of thresholds being optimal random variables, where $c_{0i} = c_{1i} = 0.01$ for i = 1, 2, M = 2, $\mu_1 = -\mu_2 = 2$, $\omega_1 = \omega_2 = 0.5$, $\sigma_1 = \sigma_2 = 0.8$, $\pi_1 = 0.82$. In the cases of $\beta = 0.18$ and $\beta = 0.0895$, the restricted Bayes criterion is equivalent to the minimax and Bayes criteria, respectively. And for these cases, using random thresholds does not provide any benefits over deterministic thresholds. It is also interesting to note that the curve corresponding to optimal random thresholds is convex.

Concluding Remarks

In this paper, the effects of replacing deterministic thresholds of local sensors and the fusion center by random ones have been investigated according to the restricted Bayes criterion. Through simulations, the effectiveness of the using the optimal random thresholds in place of the optimal deterministic ones has been shown.

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Reproductive gulls in Northeast Algeria Case legged Gull: "Larus michahellis"

A Baaloudj, B Samraoui.

Département de biologie, Université du 08 mai 1945 – Guelma, B.P 401 Guelma 24000
Email:bafef@yahoo.fr

Abstract:We have been studied thereproductive ecologyand dispersalofYellow-legged GullLarusmichahellisfor threeyears 2009-2011. The studyof thebreeding ecologyof the specieswas undertaken atthe Sriginaisland (Skikda). The mean clutch sizewas2.64±0.62, 2.49±0.72and2.37±0.77eggsin the threestudy years2009-2011respectively. Hatching successwassimilar forthe first two yearsof study(53% in 2009and 54% in 2010)butsignificantlylower inthe thirdyear(27% in 2011). The same trend was found forthefledgingsuccess, it was 33% and 32% in 2009and 2010respectivelyandonly 14% in 2011. Cannibalism andpredation bycats werethe twolikely causesoflow reproductive successinthe thirdyear. Regarding the species dispersal, we started a banding program of the yellow-legged gulls Larus michahellis michahellis in 2009, the first scheme of its kind in North Africa. Banding of chicks was initiated at Skikda and extended, a year later, to four other colonies located along the Algerian coast. Preliminary analysis of ringed yellow-legged gulls from Algerian colonies indicates that juveniles dispersed in a north-westerly direction to the Balearic Sea, the Bay of Biscay, the Alboran Sea and the western Atlantic coast from the Bay of Cadiz to the Galician shores. Preliminary data suggested two distinct routes: gulls from the eastern North African colonies moved N/NW to eastern Spain and overland to the Bay of Biscay, a pattern of dispersal previously reported for birds from Spanish and French western Mediterranean colonies. Juveniles from western colonies seemed also to move N/NW to the Alboran Sea and the Bay of Cadiz. In Spain, where most of the dispersal took place, data suggested that Algerian gulls occupied coastal areas which are used as aestivating refuges before returning to North Africa in late autumn and winter.

Key words: Breeding ecology, population dynamic, dispersal, Yellow-legged gull Larus michahellis, sea bird, banding scheme, Srigina, Algeria

Resistive Switching Mechanism through the oxygen vacancies using simple non-Si based Flexible ReRAM

Seung-Won Yeom, Sun-Gyu Jung, Byeong-Kwon Ju
E-mail:ysimon@korea.ac.kr

Abstract: We substantiate a flexible Resistive Switching Random Access Memory (ReRAM), which is a promising emerging memory. This method enables us to fabricate an Al/TiO2/Al structure on a polyimide substrate, which has extremely flexible and durable properties, rather than a Si-based substrate by a simple fabrication process. To understand the mechanism of the ReRAM device, devices were analyzed by X-ray Photoelectron Spectroscopy(XPS) and XPS depth profile analyses. Furthermore, harsh bending test of our devices did not affect the memory properties due to their short channel length and the high ductility of the aluminum electrode. This results here can open a new method to the fabrication of flexible non-volatile electronic devices.

Keywords: Flexible Memory, Emerging Memory, TiO2, XPS, Resistive Switching Memory, Non-volatile

Sample Field Study on the Obligations Imposed on the Companies by Occupational Safety: Kayseri

Z. Özlem Parlak Biçer

Erciyes University, Faculty of Architecture, Department of Architecture, 38039 Kayseri, Turkey
parlakoz@yahoo.com, parlako@erciyes.edu.tr

Hatice Özdemir

Erciyes University, Mustafa Çıkrıkçıoğlu Vocational Colage, 38039 Kayseri, Turkey
haticeozdemir@erciyes.edu.tr

Abstract: Today, developments in the industry of Kayseri almost determine the country economy. It is important that production is carried out in a safe manner in all areas of the city of Kayseri which is perceived as an industrial city. However, when the SSI (Social Security Institution) statistics for the year 2012 are examined, it is observed that the city is ranked 10. In the listing according to occupational accidents. The Occupational Health and Safety Law numbered January 1st, 2013. It has taken effect in 2014 for all organizations that have less than 50 employees excluding those with minor threats. Especially the small-medium-large scale organizations in the industrial region of Kayseri are bound to carry out their production activities in accordance with the legislation provisions of this law. In order to do this, they should either employ occupational health and safety professionals in their companies or get these services from a common health and safety unit. Starting from 2014, the obligation to carry out this law brings forth various managerial and economic enforcements to companies which include administrative fees, banning workers from working and shutting down of the workplace. Even though each enforcement is thought to bring forth various economic loads to the company, it is observed that the ratio is very high when compared with economic loads that will occur in case the companies face occupational hazards or occupational diseases. The objective of this study is to be a guide for Kayseri companies in two ways. It is expected that this study will be a pioneering study for similar studies that will be carried out in other cities.

Key words: Kayseri, Occupational Safety.

Introduction

According to the 2012 SGK (Social Security Institution) statistics, a total of 74.871 occupational accidents have occurred and 744 people have lost their lives while 2.209 people have become permanently disabled. The number of work days lost due to occupational accidents and occupational diseases is 1.650.250. Occupational accidents cause significant social and economic losses in all businesses. According to the ILO data, it is estimated that the economic losses in developing countries caused by occupational accidents and occupational diseases constitute about 4 % of the gross national local product (GSYİH) (Ministry of Labor and Social Security, 2009).

TUİK (Turkish Statistical Institute) carried out a study entitled, "Occupational Accidents and Occupational Health Problems" in 2013. Accordingly; 2.3 % of those who have been employed within the past 12 months have underwent an occupational accident. It has been determined that 2.1 % of those who are

employed or those who have worked in the past have suffered from a disease due to the past/present occupation (Turkish Statistical Institute, 2013).

When TUİK research results are compared with the occupational accidents and occupational disease statistics indicated by SGK, a significant difference can be observed. When the results are interpreted, it is expected based on the acceptance that the number of workers at the time of the survey is 26.319.000 according to TUİK data, the number of occupational accidents will be 605 thousand and the number of occupational diseases will be 552 thousand. This shows that our financial and spiritual losses due to occupational accidents and occupational diseases are much greater than what is estimated.

The increasing importance of occupational health and safety in recent years, the negative results that reflect on economic indicators and most importantly the obligation to bring our regulations up to par with EU norms have resulted in many legal regulations to be made. As a result of these developments, a need for a separate law has risen regarding this issue and the 6331 numbered Occupational Health and Safety Law has come into effect after being published in the Official Gazette dated June 30th, 2012 and numbered 28339. The law has started to be applied in less hazardous workplaces with a total number of employees less than 50 with the exclusion of items 6 and 7 and the date on which these items will come into effect for these workplaces has been determined as 01.07.2016. (Official Gazette, 2012)

The focus of this law is employees. The law is also valid for apprentices and interns. A general prevention approach has been brought about with the law by taking into consideration the factors determined during risk evaluation at the workplace. The steps that should be taken to prevent occupational accidents and occupational diseases will be the basis not the actions that should be taken after an occupational accident or occupational disease occurs. Within this scope the employer will continuously determine work related hazards for each stage of the process together with the employees and will take the necessary precautions against these possible threats.

The objective of this study is to attract attention to the fact that the criminal liabilities that will be brought about by occupational accidents and diagnosed occupational diseases in addition to the severe compensations as well as the costs related with incapacity to work and the administrative fines imposed by the government are much greater than the costs that are not spent to enhance the working environment.

Employer Liabilities

It is proposed that the management takes on a proactive approach in order to ensure that the workplace is healthy and safe for the employees and that the occupational hazards and occupational diseases are avoided. To this end, the law puts forth severe liabilities and sanctions for the employer while also emphasizing the responsibilities of the employees as well (Ministry of Labor and Social Security, 2012). “Providing the work related health and safety” of employees is the general liability of the employer. (Official Gazette, 2012).

With its item numbered 4, the law has encumbered the employers regarding the detection and prevention of work related risks and the provision of all required tools and instruments within this scope, the training of employees on the possible dangers at the workplace and the monitoring of recent scientific and technological developments in order to prevent the possible hazards that might occur in all stages of production from the machines, process steps, production line, transportation, storage etc., to continuously monitor the system established in order to prevent these possible hazards and to ensure the continuity as well as the permanence of these precautions while continuously bettering them.

The employer is liable to take the necessary precautions that will prevent occupational risks and protect the employees from hazards and to provide the necessary occupational health and safety services in order to do so. The employer can carry this out using one of the three methods: either by carrying this out by him/herself after taking the necessary documentations if he/she has the required qualifications keeping in mind the hazard class and number of employees of the workplace, by appointing an occupational safety specialist, workplace doctor and health personnel from among the staff or by outsourcing all or a portion of the work to either the common health units or the authorized public health centers (Official Gazette, 2012).

The risk evaluation liability of the employer is emphasized very clearly and without giving way to any doubt in the law numbered 6331 in contrast to the Occpational Law numbered 4857 (Official Gazette, 2012). The employer is liable to carry out a risk evaluation based on occupational health and safety. (Official Gazette, 2012) The hazards that might harm the employees are analyzed during this risk evaluation after which their importance and priorities are determined. The employer is liable to carry out the required environment measurements at the workplace keeping in mind the risk evaluation results (Ministry of Labor and Social Security, 2012).

The employer is liable to evaluate possible emergencies that might affect the employees and the workplace environment by taking into account the environment, substances used, work equipment and environmental conditions (Official Gazette, 2013c). The employer forms teams so that workplaces are prepared for possible emergencies, prepares emergency plans and purchases the required tools and equipment.

The employer keeps a record of the occupational hazards and occupational diseases that have occurred at the workplace and is obliged to inform SGK about occupational hazards within three working days after the incident and the occupational diseases within three working days after he/she is informed (Official Gazette, 2012). The employer is also obliged to give information about occupational hazards and occupational diseases according to the Social Security and General Health Insurance Law numbered 5510 (Official Gazette, 2006). The employer is obliged to have the health inspections of the employees made during start of employment, in case there is a change of work or during return to work following an occupational hazard or an occupational disease (Official Gazette, 2012).

The employer is responsible from preparing the required programs so that the employees take the necessary trainings regarding occupational health and safety as well as providing the required spot for the training and the tools and equipment; the employer is also responsible from ensuring that the employees participate in these trainings and that a participation certificate is issued to those who do so (Official Gazette, 2013a).

The employer is obliged to appoint or select an "employee representative" from among the employees who has the qualifications specified in the regulations and who will represent the employees in subjects such as participating work related with occupational health and safety, request precautions to eliminate hazard sources or to decrease risks due to any possible dangers (Official Gazette, 2013d).

At workplaces where there are fifty or more employees and that have continued operation for at least six months, the employer is obliged to establish a council that can carry out occupational health and safety work in an effective manner with the participation of all related parties as well as to execute the council decisions that have been included in the occupational health and safety regulation (Official Gazette, 2012). The employer should also responsible from the training required for council members and their substitutes, providing the required equipment to carry out meetings and to ensure that all kinds of reports and records are available in case of a surprise inspection (Official Gazette, 2013b).

Support of Occupational Health and Safety Services

A specialist contribution is required for the employer in order to carry out all these responsibilities. The employer should have at least one employee in order to carry out the regulations listed in Occupational Health and Safety Law numbered 6331. There is no difference between small establishments and large scale companies in terms of the execution of the law and the unexecuted items.

It has been stated in the law that the SGK fees that should normally be covered by the employer will be financed by the SGK (Official Gazette, 2012). The amount of the support that will be given per day to employees in the dangerous and very dangerous classification will be respectively 1.4 % and 1.6 % of the lower limit of the pre-determined prime income per day for employees that are older than 16 years of age (Official Gazette, 2013e).

Table 1: Support Amount Per Month Per Employer

Date Interval	**01.01.2014/30.06.2014**	**01.07.2014/31.12.2014**
Minimum Wage	1.071,00 TL	1.134,00 TL
Monthly Support for Hazardous Workplaces Per Month	14,99 TL	15,87 TL
Monthly Support for Very Hazardous Workplaces Per Month	17,13 TL	18,44 TL

(Istanbul Chamber of Certified Public Accountants, 2014)

Administrative Sanctions

The inability of the employer to carry out the obligations listed above brings administrative and economic sanctions to the company which can be listed as administrative fines, the detainment of employees

from work and the detainment of work. Each sanction will bring forth separate financial loads to the company. The financial load that will be brought upon to the companies as a result of the fines that should be paid in case occupational hazards occur due to their neglect of the law are much greater than these general costs.

One of the most talked about issues when the 6331 numbered Occupational Health and Safety Law came into effect was that the fines were too high. Fines were set for some obligations as fixed and for some obligations as per month per employee. The administrative fines that will be applied are calculated according to the reevaluation ratio of the Ministry of Finance and are announced at the beginning of each calendar year. The fines for 2014 range from 1.120 TL to 89.629 TL (Ministry of Labor and Social Security, 2014).

According to 6331 numbered Occupational Health and Safety Law; in case a hazardous issue is determined in the buildings or appendages of the workplace, in the work method or work equipment that may be life threatening; the workplace may be shut down completely or partially until this hazard is cleared completely. In addition, work is also stopped in case risk evaluation has not been carried out at workplaces where employees carry out mine, metal and construction work that are classified as very hazardous (Official Gazette, 2012). The employer will continue to pay the wages of the employees who are out of jobs because of the stopping of the work place (Ministry of Labor and Social Security, 2012). The duration of work stop will vary according to the number and importance of the missing issues and according to how long the necessary actions will take.

Results for Kayseri

Kayseri Organized Industrial Zone contains 17 of Turkey's top 500 companies and over 500 companies are active with a total employment of 43.500 people where 3 % of the companies are large scaled and 97 % are SMEs (Kayseri Chamber of Commerce, 2014).

Ministry of Labor and Social Security published "Work Life Statistics" which includes statistics related with workload market, social security, business relations, government employees, work inspections, rights of work for foreign employees, occupational health and safety, international agreements and contracts (Ministry of Labor and Social Security, 2013). According to the report published in 2013 based on the statistics from 2012, Table-2 and Table-3 have been prepared and we can see from these tables that of the total of 24.944 workplaces at Kayseri, 87 % are small workplaces with a total number of 1-9 employees; that 30 % of the 189 thousand compulsory insured employees work at workplaces with a total of 1-9 employees. In this case, 87 % of the workplaces will be able to benefit from occupational health and safety services support in case they are included in the hazardous and very hazardous workplace classification.

Table 2: Distribution of the Number of 4/A Compulsory Insured Employees at the City of Kayseri According to the Workplace Size

Number of People	1	2-3	4-6	7-9	10-19	20-29	30-49	50-99	100-249	250-499	500-749	750-999	1000+	**Total**
Number of Insured	9.952	15.017	17.808	12.910	23.144	14.531	19.135	18.921	24.592	11.490	6.846	4.817	10.511	**189.674**

(Ministry of Labor and Social Security, 2013)

Table 3: Distribution of the Number of Workplaces According to Workplace Size

Number of People	1	2-3	4-6	7-9	10-19	20-29	30-49	50-99	100-249	250-499	500-749	750-999	1000+	**Total**
Number of Workplaces	9.952	6.331	3.720	1.637	1.704	607	503	273	162	32	11	6	6	**24.944**

(Ministry of Labor and Social Security, 2013)

Cost of Occupational Health and Safety Services

The employer can appoint an occupational safety specialist, a workplace doctor and other health personnel with the required attributes from among the employees or can outsource one or all of these services to a Common Health and Safety Unit (OSGB) (Official Gazette 2012). The stringent provisions in the legal regulations forces the employees to carry out their obligations via occupational health and safety professionals in order to make the workplace safer.

There are a total of 24 OSGB in Kayseri as of October 2014 (Occupational Health and Safety General Directorate, 2014). OSGB is also licensed to serve at the cities where they are founded as well as the neighboring cities (Official Gazette, 2012g) and thus Kayseri is able to serve the cities of Adana, Nevşehir, Niğde, Yozgat, Sivas and Kahramanmaraş (General Directorate for Highways, 2013). In addition, the OSGB that are active in these cities can provide services in Kayseri. Workplace doctoring services can also be given by licensed Public Health Centers (TSM). As of October 2014, there are a total of 79 TSMs that have been licensed from the ministry and that are currently active and the number of centers that have been licensed as TSM in Kayseri are 2 which are Talas TSM and Melikgazi TSM (Occupational Health and Safety General Directorate, 2014) (Table 4). The "duration" for which workplace safety experts and workplace doctors have to provide service is the fundamental determinant of the price and it has been arranged in accordance to the hazard class and number of employees of the workplace (Table 5).

Table 4: OSGB established in the city of Kayseri and neighboring cities

No	City	Number of OSGB	Number of TSM
1	Kayseri	24	2
2	Adana	45	1
3	Kahramanmaraş	8	1
4	Sivas	5	1
5	Yozgat	3	1
6	Niğde	4	1
7	Nevşehir	4	1
8	**Total**	**93**	**8**

(Ministry of Labor and Social Security, 2014)

Table 5: Table for the Work Times of OHS Professionals

Number of employees / Hazard class		OHS Professionals (Per employee)		
		Occupational Safety Expert	Workplace Doctoring	Other Health Personnel
Less than 10	Less hazardous	60 min/year	25 min/year	35 min/year
Other businesses	Less hazardous	6 min/month	4 min/month	6 min/month
	Hazardous	8 min/month	6 min/month	9 min/month
	Very Hazardous	12 min/month	8 min/month	12 min/month

(Ministry of Labor and Social Security, 2013, 2014; Official Gazette, 2012, 2013h, 2013i)

There is no predetermined price policy for the carrying out of occupational health and safety services at the workplace either by the workplace employees or through the OSGB and TSMs except for workplace health services. In accordance with item 28/II of the Turkish Doctors Union (TTB) law numbered 6023, Turkish Doctors Union is authorized to, "prepare guiding price lists that show the fees of general inspection, operation and interventional operations based on the demand from chamber of doctors or one of the institutions of the union". The 2014 price list announced by TTB is not obligatory and is not binding. Workplace doctors can provide their services from a price agreed upon with the employer. According to this tariff, workplace doctor price varies between 1.870.05 TL (minimum for less hazardous workplaces) and 10.095.75 TL (maximum for very hazardous workplaces) (Turkish Doctors Union, 2014).

In addition, the "Occupational Health/Safety Service Prices" have been listed in ANNEX-3 of the "Directive on the Procedures and Principles of Applying Occupational Health and Safety Services at Public Health Centers" published by the Ministry of Health on 07.02.2014. The services provided at TSMs will be charged according to this price list (excluding the tests to be carried out and the examinations). According to this price list, the workplace doctor price varies according to the number of employees and the workplace hazard class and has been determined to be between 5 TL and 10.000 TL per month (Turkey Public Health Institution, 2014).

There is no price tariff in application for occupational safety specialists. 2.500 TL / month has been listed in the 2014/1st Period Minimum Fee Tariff announced by TMMOB Chamber of Geology Engineers for "Occupational Safety Specialist Services" (TMMOB Chamber of Geology Engineers, 2014). However, there is no detail regarding the scope of the services to be provided as well as the number of employees or the hazard class. Associations founded by occupational safety specialists are working to determine the base prices for their services. Offers vary between 350 TL / month and 3.500 TL / month for the occupational health and safety services for a metal factory with 160 employees in the "hazardous" class. The prices have been given in the Directive on the Procedures and Principles of Applying Occupational Health and Safety Services at Public Health Centers (Turkey Public Health Association, 2014) as 100 TL/hour for Occupational Health Services as 50 TL/hour for Occupational Safety Services and as 20 TL/hour for other health services. The OHS prices, hourly fees to be used are listed in the contracts of workplaces.

Conclusion

Legal regulations in the work life started to be clarified with the acceptance of the Labor Law in 2003. However, it is observed that enforcements for application have not been enough until today. The new enforcements regarding the securing of the employees and increasing the awareness of the employers about their responsibilities have come into effect along with the Occupational Health and Safety Law that was accepted in 2012. Legal regulations in different fields have followed this law. But there were problems in turning different enforcements into practice. That is why these enforcements were started in 2014 with severe fines. One of the most important reasons that the enforcements could not be applied until 2014 is the lack of Occupational Safety specialists in every field. One of the most important reasons of this is that those who prepare the execution and the legal regulations are not aware of each other. While preparing the laws and secondary regulations, it is important to take the opinions of those who are in the execution side of things, institutions, vocational chambers, non-governmental organizations or the academics who are experienced in these issues. It is thought that the work that will be carried out in ministries without consulting those who will execute these laws will cause problems.

It will be possible to take into effect the Occupational Health and Safety system in all sectors in 2014 will only be possible with the cooperation of the employers, occupational safety specialists, employees and all other institutions and corporations. First, it is important to instill the thought that the primary responsibility in all things is on the employer. Employers should not think that they are escaping from responsibility when they shake hands with an occupational safety specialist or a partnering healthcare unit. In addition, every employer is obliged to provide training to the employees in all fields of work as well as to supply the relevant personal protection equipment for both administrative and personal protection. Financial expenses should never be considered. Because the spiritual results caused of possible accidents are as high as the financial ones.

It is important that practical and academic knowledge work together in the production sector. That is why first the legal regulations should be understood and it is critical that academics who are experts in this field give support for the understanding of the legal directives as well as to put forth its inadequacies. The publishing of the legislation provisions prior to a thorough examination of the relevant parties leads to failing to reach the desired results as well as continuous changes in the legislations.

The proactive approach that has found a place for itself in the legislations should be emphasized and preventive measures should not be ignored by decreasing the initial investment cost to occupational safety. The objective of this study is to encourage the prevention of hazards in Kayseri by way of a proactive approach and to increase the awareness that the financial costs that occur due to hazards can be eliminated and/or decreased as a result of occupational safety investments. It is expected that this study will lead the way for similar future studies.

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Segmentation Strategies in Dermoscopy to Follow-up Melanoma: Combined Segmentation Scheme

Jorge Pereira[1], Rui Fonseca-Pinto[1,2]

[1] Instituto de Telecomunicações, Leiria, Portugal
jpereira@it.co.pt
[2] School of Technology and Management, Polytechnic Institute of Leiria, Leiria, Portugal
rui.pinto@ipleiria.pt

Abstract: — Image processing techniques constitutes an important tool to improve skin cancer diagnose, whose early detection is still the most relevant prognostic factor.
Nowadays, the follow-up of suspicious melanocytic skin lesions using standard protocols is possible after the development of digital image technology, enhancing the early detection strategy of the skin cancer diagnose.
The correct selection of the borders in these particular images of skin microscopy is sometimes demanding, as these images possess particular artifacts (hairs and air bubbles).A stable algorithm to segment the border of the lesion is also important when the following up of suspicious melanocytic lesions uses quantitative markers, as accessing the geometry of the growth border, symmetry, area, among others. In this paper a new strategy to segment dermoscopy images is presented by merging two different approaches in image processing, the Empirical Mode Decomposition of the Hilbert-Huang Transform to remove common artifacts, followed by a Local Normalization to improve segmentation.

Key words: Segmentation, Local Normalization, Hilbert-Huang Transform, Dermoscopy, Melanoma.

Introduction

Skin cancer is one of the cancer types with most prevalence and it is also one of the most common forms of malignancy in humans (Celebi, 2007). It is expected that its public health impact increases significantly in the coming decades in the absence of effective intervention today (Boyle, 2004).
Skin cancer is classified as a function of the cells from which it expands. Basal Cell Carcinoma (BCC) emerges from the lower layer of the epidermis, Squamous Cell Cancer (SCC) emerges from the middle layer of the epidermis and melanoma is derived from melanocytes, which are pigment producing cells. Although the melanoma type of cancer is least common, it is the most aggressive, the most likely to spread and, to suddenly become fatal (Kasper et al, 2007). Several studies in Europe have documented the increment of melanoma incidence in the last few decades (Baumert, 2005, Holterhues, 2010, Sant, 2009). In the particular case of Portugal, the estimated incidence for 2012 was 7.5 per 100000, mortality 1.6 per 100000 and prevalence at one, three and five years 12.08%, 33.99% and 53.93% respectively (Ferlay, 2012).
Melanocytic lesion is a term used to describe a region of the skin that differs in color from the surrounding area. This difference in color (discoloration) is often a benign nevus found in great number over the entire body and regularly called age-spot. A change in the melanocytic lesion characteristics triggers a marker of warmness and should be investigated. The early detection and monitoring of suspicions lesions is crucial for the disease prognosis. Dermatologists use

epiluminescence microscopy, dermatoscopy or dermoscopy as is usually referred, to perform early diagnosis of melanocytic lesions and to track the progression thereof. Dermoscopy uses a polarized light source and a magnifying lens allowing the identification of dozens of morphological features such as pigmented works, dots/globules, streaks, blue-white areas, and blotches. A fluid is usually spread on the skin surface to minimize light scattering, and thus in-crease the performance of this technique. The use of this fluid together with the presence of hairs in the skin surface, conducts to conspicuous artifacts in dermoscopic images.
The classification of some melanocytic lesions is sometimes difficult, even for experienced specialists. The lesion border is especially relevant for diagnosis since it allows to gather information about the shape of the lesion, growth path, and growth rate. The lesion border detection algorithms applied to dermoscopic images have been widely used in recent works with dermoscopic images (Erkol, 2005, Iyatomi, 2006, Melli, 2006, Celebi, 2006, Huang, 1998). Currently dermatologists often resort to digital dermoscopes and computer storage of the information. Computers can also be used to perform automatic lesion border detection. This process in the presence of artifacts may induce artificial borders, thereby jeopardizing their efficiency. Therefore artifact removal is a required pre-processing step to improve the quality of detection.

Segmentation in Dermoscopy

Hilbert-Huang Transform

Hilbert-Huang Transform (HHT) is a time-frequency signal processing technique whose implementation is divided into two parts, Empirical Mode Decomposition (EMD) and Hilbert Spectral Analysis (HAS). EMD is an iterative and adaptive process designed to separate in components, known by Implicit Mode Functions (IMF), the original signal. Those components, which are signal derived, avoid the use of pre-defined basis functions as is the case when using classic Fourier Techniques. Hilbert Spectral Analysis (HSA) is employed to extract the instantaneous frequency to the previous components obtained after EMD. Further details relating to HHT can be found in (Fonseca-Pinto, 2009 and 2010).

Image Empirical Mode Decomposition

The use of the first part of the HHT in the context of artifact removal in dermoscopic images was used before in a previous work whose results can be found in [15]. In that work the natural potential to identify common artifacts in dermoscopic images by using EMD is enhanced, and in particular in those images classified as "difficult" due the amount of hairs or air bubbles.
EMD was developed for one-dimensional signals but is possible to extend this procedure to two dimensional arrays, a process known by Image Empirical Mode Decomposition (IEMD). An image is an array of pixels that can be treated as a matrix. Each row of this matrix stands for the energy of this set of pixels, and therefore is possible to plot this information. By this way a one-dimensional signal is obtained and it is possible to apply EMD to this one-dimensional source. Performing EMD in succession to all rows, leads to a set of IMF's for each row, and the set of all IMF's of the same order constitutes a set of bi-dimensional IMF's (2dIMF's). The final set of 2dIMF's is obtained after each individual matrix processing, by summing up the results. An example of 2dIMF extraction by IEMD from a dermoscopic image is presented in Figure 1.

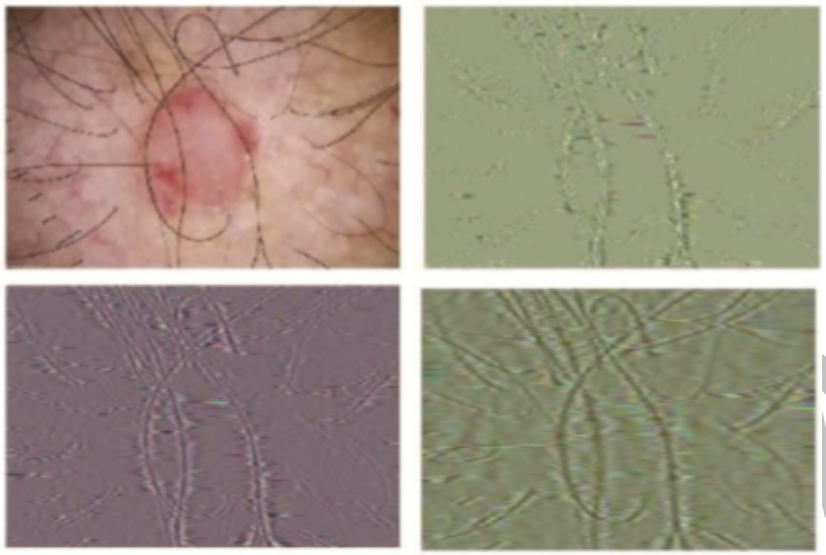

Figure 21: Dermoscopic image (top left), 2dIMF1 (top right), 2dIMF2 and 2dIMF3 (bottom images)

This 2dEMD extraction highlights artifacts, as is possible to see in Figure 1 by the identification of hairs. Artifact removal comprises two steps: 1) detection of corrupted pixels and 2) assignment of new intensity values associated to those pixels, while trying to minimize changes in the relevant image features. The above presented IEMD decomposition is used in this work to detect artifacts.
After the IEMD it is used the first component (2dIMF1) and the maximum (M) and minimum (m) energy value to calculate R=M+|m|, by using (1), where r is the number of rows in the RGB matrix and c the number of columns.

$$M = \max_{\substack{i=1,\ldots,r \\ j=1,\ldots,c}} \{2dIMF1(i,j)\}$$
$$m = \min_{\substack{i=1,\ldots,r \\ j=1,\ldots,c}} \{2dIMF1(i,j)\} \quad (1)$$

After this step, the reassignment of anomalous pixels can be made using several strategies. In (Haylo, 2001) a simple approach consisting in averaging the values of neighboring non-artefact pixel was used, conducting to interesting results. Contrary to the common filter procedures, this IEMD technique targets only those pixels where artifacts exist, leaving unchanged the remaining image. It is not a blind procedure, but rather an adaptive and oriented strategy to remove artifacts in dermoscopic images.

Local Normalization

Local Normalization (LN) processing is a center/surround operation based mainly on characteristics derived from human perception. Our perception of gray levels depends more on local characteristics rather than the absolute magnitude of the image signals. For example, we perceive a pixel with the same absolute gray level as darker if it is surrounded by light pixels, while we perceive the same pixel as light when it is surrounded by dark pixels. To incorporate this information into the processing of the image, LN separates the image into a local average or a low-frequency signal, and a surface detail or high-frequency signal. The locally normalized signal is then obtained by normalizing (i.e., dividing) the detail signal by the local average (Pereira, 2015).
The grayscale image is obtained after the RGB-averaged transformation shown in (2).

$$P_{i,j,m} = \frac{(p_{i,j,m})^2}{\sqrt{(p_{i,j,R})^2+(p_{i,j,G})^2+(p_{i,j,B})^2}}; for \begin{cases} i = 1,\dots,r \\ j = 1,\dots,c \\ m = R,G,B \end{cases} \quad (2)$$

where Pi,j,m represents the pixel (i, j) of the m channel in the image, c is the number of columns in the RGB matrix and r is the number of rows. LN can be computed by using (3)

$$LN = \frac{I-\bar{I}}{\sqrt{(\overline{I^2})-(\bar{I})^2}} \quad (3)$$

where I is the original image and $\bar{I}$ is the output between a Gaussian kernel and I.
This LN strategy depends on the selection of a region of interest (ROI), which is computed in function of the size of the lesion and the Gaussian kernel. Using adaptive kernel orders, it is possible to detect and segment every skin lesion shape. An example of the output of this scale adapted normalization (Multiscale Local Normalization – MLN) joint with the lesion segmentation can be found in Figure 2.

Figure 22: Output of the MLN in dermoscopy

Combined Segmentation Scheme

As reported in (Haylo, 2001), IEMD process shows good performance in removing artifacts, but the proposed methodology (the inpainting adopted scheme, and the segmentation based on a BW threshold) presents some drawbacks. On the other hand, LN and in particular the MLN shows good results when images are absent of difficult artifacts (in number and in quality). The proposed methodology combines MLN and IEMD to improve the segmentation output in those special cases where dermoscopic images are degraded by several and difficult artifacts, as result of a bad preparation of the skin, or related to the time consuming process in the acquisition.

Results and discussion

In order to illustrate the performance of the combined segmentation two images with common artifacts are employed. In the first case depicted in Figure 3(A-C), the image has a large amount of small air bubbles, whose presence interferes with the automatic segmentation.
Figure 3C shows the segmentation using IEMD, where is possible to observe the non-dependence, in this process, of air bubbles. In particular in the top right is possible to see a bigger artifact who is ignored by the segmentation, yielding a realistic border. Another characteristic of the IEMD process is also present, the high sensibility of the segmentation algorithm in the borders.
Figure 3A presents the segmentation after MLN, whose results shows a dependence of the air bubbles in the border (red circle, top right) and a smooth border. The combined segmentation is shown is Figure 3B, allowing to observe a smooth and rational border, which is independent of artifacts.

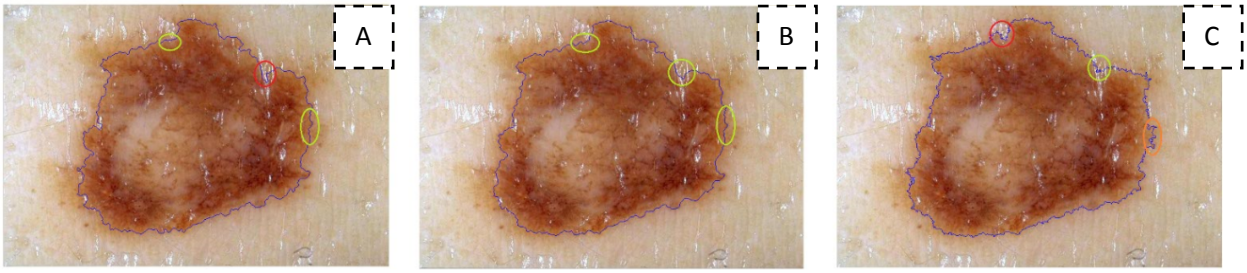

Figure 23: Segmentation strategies: A- segmentation after MLN, C - segmentation after IEMD, and B - proposed combined scheme segmentation.

In the second example (Figure 4) it is used a challenging image corrupted with hairs and air bubbles. Classical filtering and segmentation using commercial software in this image conducts to pour results. Figure 4A shows the segmentation after IEMD. It is possible to observe, as in the former case, a border irregularity and a good performance ignoring the top air bubbles in the image (red circles). In particular, it is possible to observe that the presence of hair in the bottom of the image (green circle) do not interfere with the correct segmentation. In the case of both artifacts, IEMD also demonstrates efficient results.
By using MLN, the segmentation is smoother, but in the presence of artifacts the algorithm follows the artifact path (Figure 4C, bottom, red circle). When the combined method is applied, as in Figure 4B, it is possible to observe a smoother, lesion correlated, and artifact independent segmentation, as in the former Figure 3B.

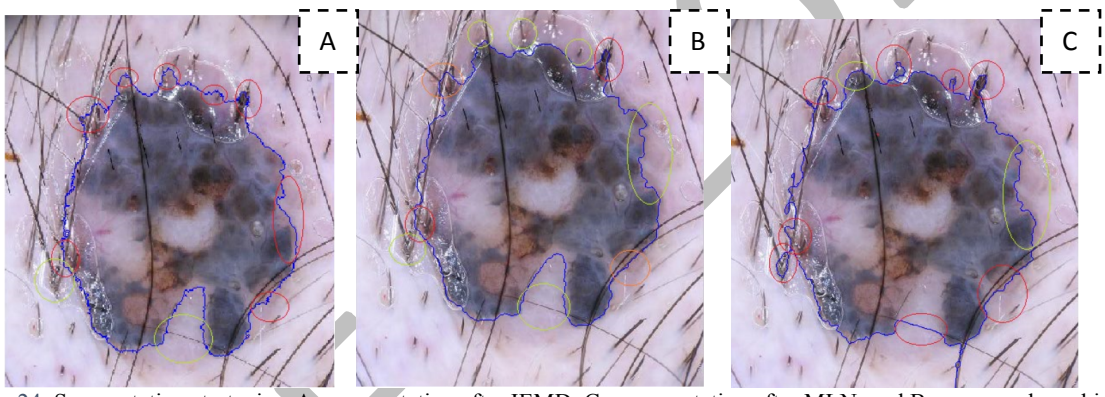

Figure 24: Segmentation strategies: A- segmentation after IEMD, C - segmentation after MLN, and B - proposed combined scheme segmentation.

Conclusions

Strategies to follow the progression of melanocytic lesions are truly dependent on image processing techniques. A diagnosis based on quantitative markers is an important issue, implying a stable, lesion independent and accurate segmentation. In this work it is presented a combined scheme based on IEMD and MLN to segment dermoscopic images with high artifact density. The combined result proved to have a better performance than each one of their individual results. These are preliminary results, and more studies are being conducted related to the segmentation in dermoscopy in order to get independent artifact segmentation strategies. The segmentation output needs a ground truth with clinical correlation to compare results. This ground truth issue is an important open problem whose importance as led to clinical blind independent manual segmentation studies in dermatology. In the following of this work, this combined segmentation automated technique will be compared with manual segmentation.

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Sığ ve derin kriyojenik işlem uygulanmış karbür takımların kesme kuvvetlerine etkisi

Sıtkı AKINCIOĞLU[1]*, Hasan GÖKKAYA[2], İlyas UYGUR[3]

[1*]Duzce University, Gümüşova Vocational School of Higher Education, Turkey
sitkiakincioglu@gmail.com
[2]Hasan GÖKKAYA, Karabük Universty, Machine Engineering, Turkey
hgokkaya@hotmail.com

[3]İlyas UYGUR, Düzce Universty, Machine Engineering, Turkey
ilyasuygur@duzce.edu.tr

Özet: Bu çalışmada Hastelloy-C22 süper alaşımının tornalanmasında sığ ve derin kriyojenik işlem uygulanmış karbür takımların kesme kuvvetlerine etkisi araştırılmıştır. Tornalama deneylerinde karbür takımlara sığ kriyojenik işlem (-80 °C) ve derin kriyojenik işlem (-145 °C) uygulanmıştır. Elde edilen deney sonuçlarına göre kesme kuvvetlerinin en iyi çıktığı takımlar sırasıyla derin kriyojenik, sığ kriyojenik işlem görmüş ve hiç işlem görmemiş takımlar olarak tespit edilmiştir.

Anahtar kelimeler: Hastelloy-C22, Kriyojenik işlem, Kesme kuvveti, Tornalama

Giriş

İşlenmesi zor olan malzemelerle ilgili çalışmalar popüler araştırma alanlarını oluşturmaktadır. Hastelloy C-22 gibi nikel esaslı süper alaşım klor, asetik anhidrit, deniz suyu ve tuzlu çözeltiler gibi güçlü oksitleyiciler gibi kimyasallara maruz kalınan ortamlarda olarak kullanılmaktadır. Düşük ısıl iletkenliğe sahip olan nikel alaşımlı bu malzemelerin işlenmesi esnasında takımın kesici kenarında oluşan yüksek ısı nedeniyle işlenebilirlik özellikleri oldukça düşüktür. Bu tür malzemelerin tornalanması için takım performanslarının yüksek olması gerekmektedir. Son yıllarda kesici takımların performansını arttırmak için takımlara kriyojenik işlem uygulanmaktadır. Yapılan çalışmalarda kriyojenik işlem uygulanmış takımların kesme kuvvetlerini düşürdüğü tespit edilmiştir. Kesme kuvvetleri iş parçasının yüzey pürüzlüğünü, takım aşınmasını ve takım ömrünü etkileyen faktör olduğu için kesme kuvvetlerinin düşürülmesi takımların performansı açısından önemlidir. Ramji ve arkadaşları (2010) kriyojenik işlem uygulanmış HSS matkapla dökme demirin delinmesinde meydana gelen kesme kuvveti ve torkunu değerlendirmişlerdir. Matkaplara kriyojenik işlem - 178.9 °C'de 24 saat bekleterek uygulamışlardır. Kriyojenik işlem sonuçları ile deliklerde daha düşük kesme kuvvetlerine ulaşmışlardır. Ramji ve ark (2010) karbür takıma kriyojenik işlem ve temperleme uygulayarak beyaz dökme demirin delinmesinde kesme kuvvetlerini değerlendirmişlerdir. Kriyojenik işlem ve kriyojenik işlemden sonra uygulanan çift temperleme ile deliklerde daha düşük kesme kuvvetleri elde etmişlerdir. Bal (2012) PVD kaplamalı ve kaplamasız takımlara derin kriyojenik (-190°C) işlem uygulayarak paslanmaz çeliğin tornalama performansını değerlendirmişlerdir. Derin kriyojenik işleme tabi tutulan takımlarda daha düşük kesme kuvvetlerine ulaşmışlardır. Bu sonuca kriyojenik işlem uygulanmış takımların kesici kenarında meydana gelen daha düşük bozulma ile elde etmişlerdir. Yapılan çalışmalar incelendiğinde Hastelloy C-22 süper alaşımın tornalanmasına kriyojenik işlem görmüş karbür takımın etkisi araştırılmamıştır. İşlenmesi zor olan bu malzemenin kesme kuvvetlerinde elde edilecek iyileşme ile malzemenin işlenebilirliğine önemli katkı sağlayacaktır.

Bu çalışmada kaplamasız karbür takımlara sığ ve derin kriyojenik işlem uygulanarak işlemin Hastelloy-C22

süper alaşımın tornalanmasında kesme kuvvetlerine etkisi araştırılacaktır.

Materyal ve Metot

Kriyojenik işlem görmüş takımların etkisini test etmek için Ø82,5x400 Hastelloy-C22 korozyon dirençli süper alaşım kullanılmıştır. Hastelloy-C22 deney numunesine ait kimyasal bileşim Tablo 1'de verilmiştir.

Tablo 1. Hastelloy C22 kimyasal bileşim

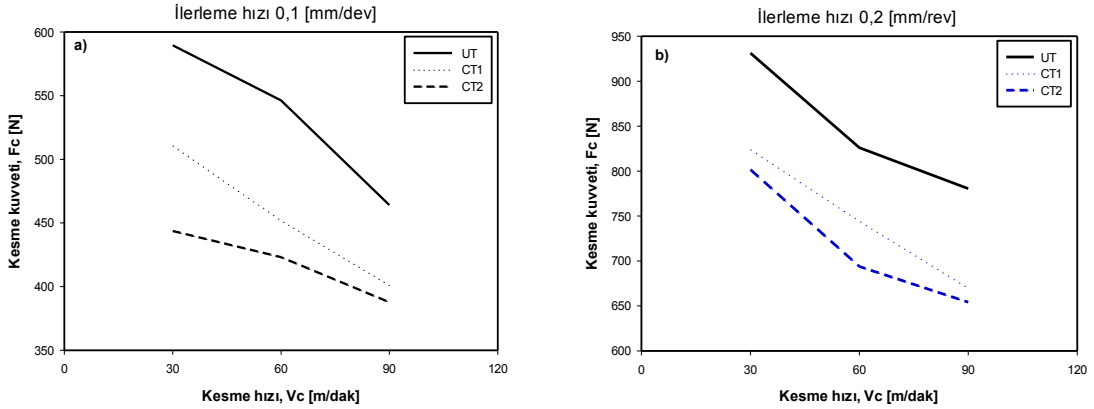
Ni	Cr	Mo	Fe	W	Diğer
58,2	21,28	12,94	4	2,87	0,71

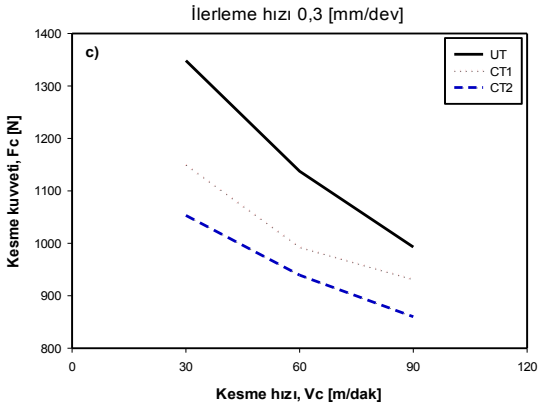
Kriyojenik işlemin etkisinin araştırılması için ISCAR firmasından temin edilen kesici kaplamasız sementit karbür (SNMG 120408) kullanılmıştır. Karbür takımlara sığ (-80 ºC) ve derin (-145 ºC) olmak üzere iki farklı kriyojenik işlem uygulanmıştır. İşlem uygulanmamış karbür takım (UT), sığ kriyojenik işlem görmüş takım (CT1) ve derin kriyojenik işlem görmüş takım (CT2) olarak adlandırılmıştır. Kriyojenik işlem esnasında takımlarda meydana gelebilecek mikro çatlakları engellemek için işlem kademeli soğutup ısıtılarak gerçekleştirilmiştir. Takımlar 6 saatte kademeli olarak -80 ºC ve -145' ye kadar soğutulmuştur. Bu ısılarda takımlar 24'er saat bekletilmiştir. Isınma işlemi sonrasında takımlar kademeli olarak oda sıcaklığına 6 saatte getirilmiştir. Kriyojenik işlem esnasında takımlarda meydana gelen gerilmeleri gidermek için kriyojenik işlemin ardından takımlar 200 ºC'de 2 saat bekletilerek temperlenmiştir.

Hastelloy-C22 çeliğin tornalama işlemleri Johnford T35 CNC Torna tezgahında gerçekleştirilmiştir. Tornalama deneylerinde sabit talaş derinliği (1 mm), üç kesme hızı (30, 60 ve 90 m/dak) ve üç ilerleme hızı (0,1- 0,2 ve 0,3 mm/dev) kullanılmıştır. Deney numunesinin tornalanması esnasında meydana gelen esas kesme kuvveti (Fc) ölçümleri Kistler marka dinamometre kullanılmıştır.

Deneysel Sonuçlar ve Tartışma

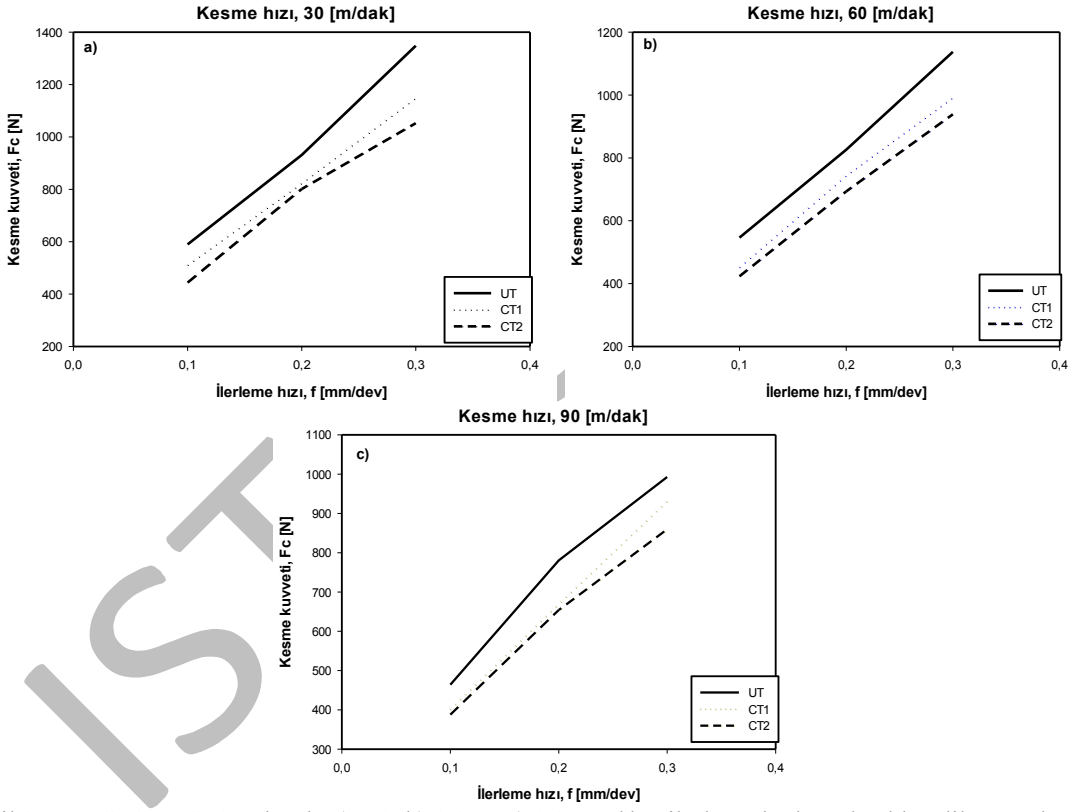
Tornalama esnasında talaş kaldırmak için gerekli güç kesme kuvvetleri ile ilişkilidir. Tornalama işlemlerinde kesme kuvvetleri (Fc) yüzey pürüzlülüğünü, takım ömrünü, takım aşınmasını etkileyen önemli bir faktördür. Bu nedenle kesme kuvvetlerinin düşürülmesi kesme parametrelerinin optimizasyonu veya kesici takımın performansının arttırılmasına bağlıdır (Nalbant, 2007). Bu bağlamda sığ (CT1) ve derin kriyojenik işlem görmüş (CT2) takımlarla Hastelloy C-22 süper alaşımın tornalanmasında kesme kuvvetleri ölçülmüştür. Yapılan deneylerle kesme parametrelerinin optimizasyonu ve kriyojenik işlemin kesme kuvvetlerine etkisi değerlendirilmiştir. UT, CT1 ve CT2 takımla 30, 60 ve 90 m/dak kesme hızlarında elde edilen kesme kuvveti değişimi Şekil 1'de verilmiştir.





Şekil 1. UT, CT1 ve CT2 takımla a) 30, b) 60 ve c) 90 m/dak kesme hızlarında elde edilen kesme kuvveti değişimi

Grafikler incelendiğinde kesme kuvvetleri arttığında kesme kuvvetlerinde düşüşler görülmektedir. Düşük kesme hızı ile takım ucunda BUE oluşmaktadır. Kesici kenarlada oluşan BUE kesme kuvvetlerini arttırmaktadır (Mahamani, 2014). İlerleme hızlarına göre kesme kuvveti değimleri Şekil 2'de gösterilmiştir.



Şekil 2. UT, CT1 ve CT2 takımla a) 0.1, b) 0.2 ve c) 0.3 mm/dev ilerleme hızlarında elde edilen ortalama yüzey pürüzlülüğü değişimi

Kesme kuvvetleri ilerleme hızlarına göre değerlendirildiğinde ilerleme hızlarının artışıyla birlikte kesme kuvvetlerinde de artış olduğu görülmektedir. İlerleme hızının artmasıyla birlikte kesme alanı artmaktadır böylece kesici kenar ile iş parçası arasındaki sürtünme artmaktadır (Mahamani, 2014).. Bu nedenle ilerleme hızı arttıkça kesme kuvvetleri de artmaktadır.

Sığ (CT1) ve derin kriyojenik işlem görmüş karbür takımlar (CT2) işlem görmemiş karbür takımlarla (UT) kıyaslandığında CT2 takımla en düşük kesme kuvvetleri elde edilmiştir. CT1 takımlarla ise UT takımlara

göre daha düşük kesme kuvvetleri elde edilmiştir. Kaplamasız karbür takımlara uygulanan kriyojenik işlemin kesme kuvvetlerini düşürdüğü görülmüştür. Reddy ve arkadaşları (2009) C45 iş parçasını derin kriyojenik işlem uygulanmış çok katlı CVD kaplamalı tungsten karbür (TiCN, TiN) takım ile talaş kaldırma çalışmalarında kesme hızının artışına bağlı olarak esas kesme kuvveti (Şekil 11) ve yüzey pürüzlüğünde (Şekil 12) düşüş tespit etmişlerdir. Kriyojenik işlemin kesme kuvvetlerine etkilerini Ramji ve arkadaşları (2010) Çiçek ve arkadaşları da (2012) yapmış oldukları çalışmalarda bulmuşlardır. Kesme hızının artışına bağlı olarak kesme kuvvetlerinde düşüş aynı zamanda takım aşınmasının düşüşüne de neden olmaktadır. Böylece kesici takımın kesici kenarlarında meydana gelen aşınma ve deformasyonlar da azalmalar olmaktadır (Firouzdor, 2008). Kesici kenarlardaki stabilitenin artması kesici takımları aşınma ve performans açısından daha kararlı hale getirmektedir (Reddy 2009 ve Ramji 2010).

Kesme parametreleri bütün olarak değerlendirildiğinde en düşük kesme kuvvetlerine CT2 takımla 0,1 mm/dev ilerleme ve 90 dev/dak kesme hızında ulaşılmıştır. Bu parametrelerde elde edilen kesme kuvveti 387,750 N'dur. UT ve CT1 takımla 0,1 mm/dev ilerleme ve 90 dev/dak kesme hızında elde edilen kesme kuvvetleri sırasıyla 464,140 ve 400,980 N'dur. Derin kriyojenik işlem görmüş takım ile işlem görmemiş takıma (UT) göre aynı parametrelerde kesme kuvvetinde %19,7 'lik bir düşüş sağlanmıştır.

Sonuçlar

Sığ ve derin kriyojenik uygulanmış Kaplamasız karbür takımların Hastelloy-C22 süper alaşımın tornalanmasında kesme kuvvetlerine etkisinin araştırıldığı çalışmada aşağıdaki sonuçlar elde edilmiştir.

- Kesme kuvvetleri, ilerleme hızlarına göre değerlendirildiğinde ilerleme hızlarının artışıyla birlikte kesme kuvvetlerinde de artış olduğu görülmektedir. Kesme kuvvetleri açısından en iyi ilerleme hızı 0,1 mm/dev olarak belirlenmiştir.
- Kesme hızı arttıkça kesme kuvvetlerinde azalma olduğu görülmüştür. Yüzey pürüzlülüğü açısından en iyi kesme hızı 90 m/dak tespit edilmiştir.
- Sığ (CT1) ve derin kriyojenik işlem görmüş karbür takımlar (CT2), işlem görmemiş karbür takımlarla (UT) kıyaslandığında CT2 takımla en düşük kesme kuvvetleri elde edilmiştir. Derin kriyojenik işlem görmüş takım ile işlem görmemiş takıma (UT) göre aynı parametrelerde kesme kuvvetinde %19,7 'lik bir düşüş sağlanmıştır.
- Kesme parametreleri bütün olarak değerlendirildiğinde en düşük kesme kuvvetlerine CT2 takımla 0,1 mm/dev ilerleme ve 90 dev/dak kesme hızında ulaşılmıştır. Bu parametrelerde elde edilen kesme kuvveti 387,750 N'dur.
- Hastelloy-C22 süperalaşımın tornalanmasında düşük kesme kuvveti elde etmek için karbür takımlara derin kriyojenik işlem uygulanması tavsiye edilebilir.
- Hastelloy C-22 süper işlenebilmesinde farklı takım türlerine de kriyojenik işlemin etkileri araştırılabilir.

Teşekkür

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Spectral Domain Approach for Superconducting Microstrip line

F. Z. Siabah, F. Grine, M.T. Benhabiles, M.L. Riabi

La Bibliothèque Universitaire Centrale BUC Université Constantine 1
Email : si_fati@yahoo.fr

Abstract: Thin high-temperature superconducting film in MMIC transmission lines and circuits offer attractive solutions in applications such as microwave resonator, filter, delays lines and antennas systems.For transmission lines planar, simple layer or multi-layer, the method approved and used is the spectral method, this method is employed according to a choice of basic functions, which satisfies the conditions of singularity on the edge of the conductor, and this choice is a key factor in the process of convergence, In this technique the superconducting strip is treated as an impedance , sheet which introduces new boundary conditions at the surface of the strip.

Keywords : Galerkin Procedure; Microstrip Line; Spectral Domain Approach ; superconducting

Structural Analysis Via XRD, XRF, and SEM Images of Natural Zeolite Obtained From Sivas-Yavu Region in Turkey

Onder ORHUN

Eskişehir Anadolu University
Email : oorhun@anadolu.edu.tr

Abstract: Zeolites were defined as alumina silicates which have crystallographic structures of alkali and earth alkali metals. Natural zeolites have properties of adsorption, ion exchange and molecular sieving. Zeolites were found as biggest reserves in nature. Turkey has about 45 milliard tones of natural zeolite reserve which is about 7% of natural zeolites reserves in the world.

Structural analysis of natural zeolite from Sivas-Yavu region in Turkey were investigated by XRD,XRF and SEM. Investigations showed that natural zeolite from Sivas-Yavu region has two zeolitic phases which were found to be clinoptilolite and mordenite, i.e. double phased natural zeolite. According to x-ray diffraction analysis, the structure of Sivas-Yavu zeolite was made from 15.2% clinoptilolite, 81.5% mordenite, 3.3% quartz. I obtained these conclusions by Rietveld method. According to x-ray fluorescence data, Sivas-Yavu zeolite has ratio of Si/Al which is 6.07 and 11.28% CaO. Thus, this structure is rich from CaO and its colour is white. According to images of SEM, structure of Sivas-Yavu zeolite was made from clinoptilolite which has monoclinical crystallographic structure, and mordenite which has ortorombical crystallographic structure, quartz which has hegzagonal crystallographic structure.

From this conclusions, because of 15.2% clinoptilolite, due to molecular sieving property, Sivas-Yavu zeolite can be used as retentive material for Sr90 and Cs137 isotopes from radioactive waste and heavy metals from environmental waste. Besides, because of 81.5% mordenite, it can be used as gas separation material for oxygen production from air. Both components which are in Sivas-Yavu zeolite can be used catalyst. Other application fields of natural zeolite are agricultural industry as earth improvement material, construction industry as heat insulation material, and medical sector as medicine production for example cancere theraphy, cosmetic sector as skin regulator cream production. The number of application fields reach to two hundred.

Keywords : zeolite, Structure analysis, Sivas

Study of chemical trace elements in deep groundwater of the wilaya of Biskra (Algeria) -case copper and zinc

Abdallah Seddik LABADI
Email: ablabadi@gmail.com

Abstract: This study's main objective is the identification of trace elements in deep groundwater aquifer Albian region of Biskra (Algeria). The area, located on the northern edge of the Sahara, is characterized by an arid climate with low rainfall (between 100 is 200 mm) with very high temperatures during the summer (above a 40o). This deficit in surface waters is largely offset by the existence of significant groundwater. Continental Interleave (Albian) consists of a continental origin sandy clay sandstone formation with very important marine lagoon or sometimes incursions. This is a very important reservoir consists mainly of sandstone and marl age Albian and Barremian with a depth between 1600 and 2500m and an average flow of 80 l/s gushing, the water temperature can exceed 60 Â°C. This layer is exploited in the Wilaya of 19 drilling. The aim of our study was to measure the concentrations of copper and zinc in the Albian drilling, by the method of atomic absorption spectrophotometry with flame. The experimental study we conducted allowed us to see that the water drilling Albian contain copper and zinc with variable amounts. The tests show that there was no relationship between the levels of copper and zinc and the change in temperature, pH and the depths of drilling. The geographical distribution of zinc levels allowed us to see that there is an increase in the concentration of the southern region to the northeast.

Keywords:deep groundwater, chemical trace elements, copper, zinc, Biskra

Supercritical fluid extraction of oil from Mahkota Dewa seed

Md Zaidul Islam Sarker[1*], Jannatul Azmir[1], Khan Md Sharif[1], Sahena Ferdosh[2]

[1]Faculty of Pharmacy, International Islamic University Malaysia, Kuantan Campus, 25200 Kuantan, Malaysia

[2]School of Industrial Technology, University Sains Malaysia, Pinang, Malaysia
*zaidul@iium.edu.my

Abstract Mahkota dewa (Phaleria macrocarpa) which belongs to Thymelaeaceae family is being used as medicinal plant in tropical countries especially in Malaysia and Indonesia. Almost all parts of this plant except seed have importance in traditional medicine. The seed contains high amount of oil. In this study, solvent extraction and supercritical fluid extraction using carbon dioxide were used to extract oil from the Mahkota dewa seed. The effecting parameters of supercritical carbon dioxide extraction were optimized for obtaining higher yield of oil by response surface methodology (RSM) with central composite design (CCD). By solvent extraction, more than 55g per 100g of dry weight of seed was obtained whereas at optimum condition of supercritical fluid extraction, the oil yield was around 53g per 100g of dry weight of seed. However, the purified oil was extracted by SFE that is of organic residues free. The triglycerides in terms of fatty acid constituents of the extracted oil were analyzed by gas chromatography-mass spectroscopy (GC-MS). The extracted oil found to have 73% unsaturated fatty acids and 26% saturated fatty acids. Polyunsaturated fatty acids were in the percentage of 36.25%. Thus, the supercritical CO_2 extracted Mahkota dewa (P. macrocarpa) seed oil of could be claimed as high quality and toxic free food and pharmaceutical grade oil.

Key words: Mahkota Dewa seed oil, supercritical fluid extraction, RSM, fatty acids composition.

Introduction

Mahkota Dewa is a popular herbal plant to the traditional practitioners. Most of the parts of this plant have been used in traditional medicine for its several anti-diseases properties like anti-diabetic, anti-hypertensive, anticancer, anti-allergic, anti-uretic, anti-rheumatic and healing properties (Harmanto, 2003). Different parts (leaves, stem, fruit and seed) of Mahkota Dewa have been examined by several researchers (Ali et al., 2012; Katrin and Winarno, 2011). Alkaloid, lignin, saponin, terpenoid and poly-phenol are the major types of bioactive compounds in this plant. The seed contain bioactive compound responsible for cancer treatment. Benzophenon glucosidase is the main bioactive active compound of seed. The seed of this plant is also important for its high content of oil.

Solvent extraction, mechanical pressing and rendering are common conventional extraction method of oil. But higher oil yield is possible to obtain in solvent extraction method than other two methods. Recently public awareness against the use of health and environmental hazardous organic solvent make difficult to use of organic solvent for oil extraction. On the other hand supercritical fluid extraction does not use organic solvent, environment friendly extraction method and recommended by environment protection agency (EPA). For the extraction of oil, supercritical fluid extraction (SFE) attracts considerable attention as a promising alternative to conventional organic solvent extraction. Carbon dioxide is commonly used solvent in SFE because of its low critical temperature (31.1°C) and critical pressure (7.28 MPa) (Azmir et al., 2013). The lower critical temperature makes supercritical carbon dioxide ($scCO_2$) an ideal solvent for extracting thermally sensitive materials (Sharif et al., 2014a). The effecting extraction parameters for both solvent extraction and SFE can be optimized by experimental design to obtain better oil yield (Sharif et al., 2014b).

The objective of this study was to extract oil from Mahkota Dewa seed using solvent extraction and SFE. The fatty acids composition and characterization were also aimed in this study.

Materials and Method

Sample collection: Mahkota Dewa fruits were collected from a local supplier in Kuantan, Pahang, Malaysia. The sample specimen (reference no. PIIUM 199) was deposited in herbarium of International Islamic University Malaysia (IIUM), Malaysia.

Preparation of Mahkota Dewa seeds: Mahkota Dewa seeds were prepared for experiment according the method described by Azmir et al. (2014a). A total of 15 Kg of ripe and young fruits of Mahkota Dewa were washed properly with running water and then separated into seeds and fruits flesh parts. The seeds were dried to remove moisture at 40ºC using a dryer. The dried seed samples were kept into desiccator before grinding. The dried seeds were ground into powder form using a kitchen blender. The ground seeds were then sieved to unify the particle size and the accepted particle size was ≤1mm. Thereafter, the sample was weighed and stored in air tight containers until use. The moisture content of the ground seed sample was determined using an automatic halogen moisture analyzer (HB43, Mettler Toledo, Columbus, USA) in percentage of dry weight basis.

Extraction of oil: The oil from Mahkota Dewa seed was extracted using two non-polar solvents with different polarity to compare their extractability. N-hexane and diethyl ether were used as extracting solvents. The 15 g of dried and ground seed was weighed to nearest 1 mg by an analytical balance (EL303-IC, Mettler Toledo, Columbus, USA) in order to extract oil using n-hexane and diethyl ether. Solvent of 200 ml was used for each experiment. Extractions by both solvents were carried out for 8 h at 80°C temperature. After extraction, rotary evaporator (R210, Buchi, Flawil, Switzerland) was used to remove the remaining solvents at a temperature of 40°C. All the experiments were carried out twice. In present study each experiment was repeated twice and the solvent which resulted highest yield was considered for further optimization of extraction parameters and final analysis. The total oil yields were determined in percentage of 100 g of ground seed sample on dry weight basis as described in the following equation.

$$\text{Yield } (\%) = \frac{\text{Mass}_{\text{extracted oil}}}{\text{Mass}_{\text{seed powder}}} \times 100 \qquad \text{Equation 1}$$

For every SFE experiment, 10 g of sample was loaded into an extraction vessel (EV-3, Jasco Corporation, Tokyo, Japan) and the vessel was maintained at the desired temperature. A back-pressure regulator (BPR) (BP-1580–81, Jasco Corporation, Tokyo, Japan) was used to control the extraction pressure. The extracts were separated from the supercritical fluid by pressure reduction through an expansion valve. A 20 ml blue cap schott bottle was used for collecting the extract. The extraction process was continued for a total of 3 h. The extracted oil was transferred into a glass vial and kept under refrigeration (0 to 4°C) until further processing and analysis.

Experimental Design: Mahkota Dewa seed oil extraction by conventional solvent extraction method and using SFE was optimized by employing CCD of RSM. The independent variables for solvent extraction studied to optimize the process were extraction temperature, time and solvent-to-feed ratio and the independent variables for SFE to optimize the process were extraction temperature, pressure and CO_2 flow rate. On the basis of trial-error process and literature review, the input variables and their levels were selected. The coded and un-coded variables used for this experiment were shown in Table 1.

Table 1: Ranges of the independent variables used in CCD for solvent extraction and SFE.

Solvent extraction				SFE			
Factors	Levels			Factors	Levels		
	-1	0	+1		-1	0	+1
Temperature (°C)	40	60	80	Temperature (°C)	60	70	80
Time (h)	6	7.5	9	Pressure (MPa)	25	40	45
Solvent-to-Feed ratio (ml/g)	10	12.5	15	Flow rate of CO_2 (ml/min)	3	4	5

Composition analysis of oil:

The oil extracted using conventional extraction and SFE were then analyzed for the determination of fatty acids content by gas chromatography- mass spectroscopy (GC-MS). Fatty acids were derivatized properly to prepare methyl ester of fatty acids before the GC-MS analysis and the derivatization was done according to the method of Ichihara and Fukubayashi (2010) with some modifications. Agilent 6890 N gas chromatography coupled with Agilent MS-5973 mass selective detector (Agilent Technologies, California, USA) was used for the GC-MS analysis of FAMEs.

Physicochemical properties:

The melting point of oil sample was determined using differential scanning calorimetry (DSC 1, Mettler Toledo, Columbus, USA) according to the method of Garcia-Perez et al. (2010). Density of extracted oil was measured by dividing the weight of oil by the volume of oil at 25°C temperature. Weight was measured using an analytical balance and the volume was measured with a measuring cylinder. Refractive index of Mahkota Dewa seed oil was measured using an automatic pocket refractometer (PAL-1, Atago, Tokyo, Japan) at 25.8°C. Reading of this experiment was taken for two times and the average result was calculated. Viscosity is the internal property of a fluid for its resistance to flow. To measure viscosity of the Mahkota Dewa oil, pro programmable viscometer (DV-II, Brookfield, Wisconsin, United States) with CP41 spindle was used at 10 rpm in room temperature (Akbar et al., 2009). Iodine value or iodine number is usually used for determining the amount of unsaturation of fats or oil. It is the mass of iodine in grams absorbed by 100 g of oil under the test condition. The determination of iodine value was carried out according to PORIM p3.2 (PORIM test method, 1995).

Results and Discussion

The total yield of oil in the seed sample extracted by n-hexane and diethyl ether were 54.83±0.24% and 53.38±0.3% of dry seed weight, respectively. The n-hexane is highly non-polar solvent with dipole moment 0.00 and used to consider as appropriate solvent for non-polar fats or oil extraction. The oil yield of Mahkota dewa seed obtained by n-hexane extraction was higher compare to diethyl ether extracted oil yield which was the main reason to choose n-hexane as solvent for further study.

Table 2: Regression analysis of CCD for solvent and $scCO_2$ extraction.

Term	Coefficients (solvent extraction)	Coefficients ($scCO_2$ extraction)	p^a (solvent extraction)	p^a ($scCO_2$ extraction)
βo	-143.096	-117.636	0.001	0.000
Z1	2.058	0.280	0.000	0.204
Z2	19.272	6.750	0.001	0.000
Z3	8.057	5.546	0.012	0.002
Z12	-0.009	-0.001	0.000	0.663
Z22	-0.847	-0.076	0.005	0.000
Z32	-0.226	-0.289	0.022	0.073
Z1*Z2	-0.065	-0.065	0.016	0.039
Z1*Z3	-0.024	-0.024	0.102	0.044
Z2*Z3	-0.097	-0.097	0.593	0.202
R2	0.9726	0.9997		
Adj.R2	0.9422	0.9994		

[a]$p<0.01$ highly significant; $0.01<p<0.05$ significant; $p>0.05$ not significant.

Analysis of RSM for solvent and $scCO_2$ extraction: The multiple regression coefficients for the both models calculated by the least square technique are demonstrated in Table 2. The effect of temperature and extraction time were highly significant ($p<0.01$) and solvent-to-feed ratio also had significant effect on oil yield with $p<0.05$ in solvent extraction. The coefficient of determination (R^2) was 0.97 for solvent extraction and 0.9997 for $scCO_2$ extraction, meaning that the regression model for the oil yield was satisfactory and it adequately fits with the experimental results (Akanda et al., 2012). The interaction between temperature and extraction time was statistically significant, $p<0.05$ for the oil yield. But the interaction between extraction temperature and solvent-to-feed ratio, and extraction time and solvent-to-feed ratio within the experimental range were not significant ($p>0.05$) for solvent extraction. The linear and square effects of pressure were highly significant ($p\leq0.01$) where in both cases the effects of temperature were non-significant ($p\geq0.05$) in $scCO_2$ extraction. The linear effect of CO_2 flow rate was significant ($p=0.002$) but the quadric effect was not significant ($p=0.073$). The interaction between pressure and temperature, temperature and CO_2 flow rate were significant ($p\leq0.05$) within the experimental ranges.

Figure 1 is showing the contour plots of RSM model for solvent and $scCO_2$ extraction, respectively. Contour plot is easier to interpret and to get the level of the variables at which the desired optimization occurred.

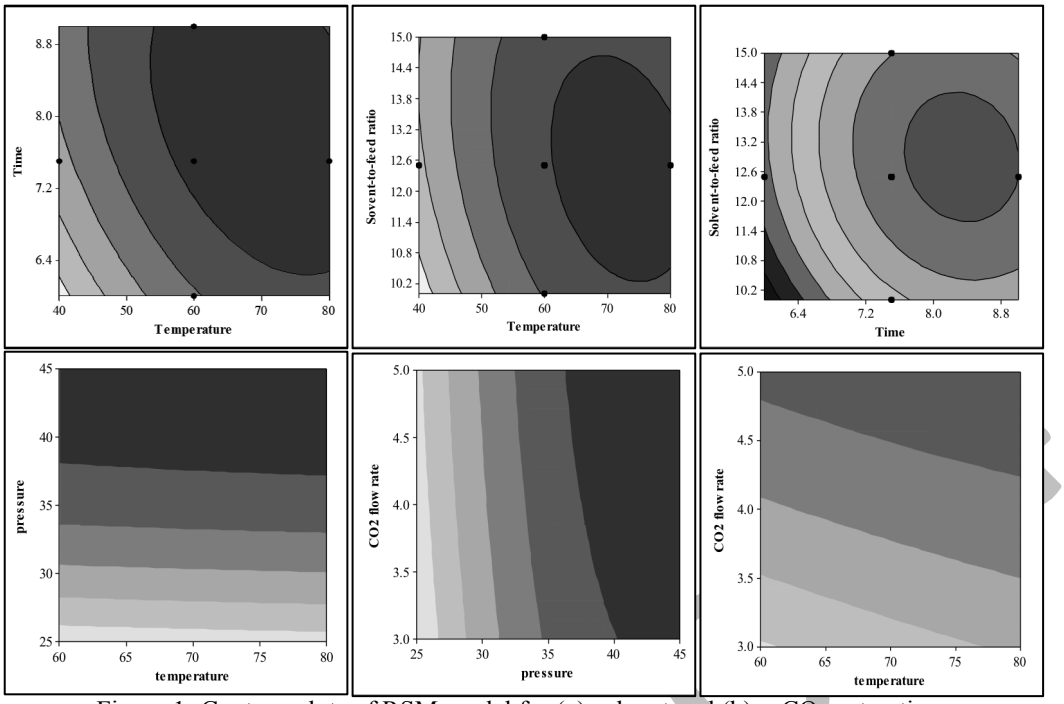

Figure 1: Contour plots of RSM model for (a) solvent and (b) $scCO_2$ extraction.

The optimum conditions for the oil yield in solvent extraction were 72.2°C, 8 h and 10.9 ml/g solvent-to-feed ratio. At this optimized condition, the predicted yield of the oil was 55g/100g. The optimum extraction process parameters for the SFE extraction of oil from Mahkota dewa within the given ranges were 72°C, 42 MPa and 4.5 ml/min CO_2 flow rate. The oil yield in this optimized condition was 52g/100 g of sample on dry basis which was almost 95% of the oil extracted by solvent extraction (Azmir et al., 2014b).

Composition of fatty acid: GC-MS chromatogram of fatty acids is shown in figure 2. In figure 2(a), the peaks at retention time 14.398, 18.439, 18.610, 19.022, 22.662 and 23.211 minutes were responsible for palmitic acid, linoleic acid, oleic acid, stearic acid, gondoic acid and nonadecanoic acid, respectively. In figure 2(b), the peaks responsible for palmitic acid, linoleic acid, oleic acid, stearic acid and gondoic acid were at retention time 13.172, 16.865, 16.995, 17.432 and 21.132 minutes, respectively. Seven fatty acids in terms of triglycerides were identified by GC-MS analysis and 9-octadecanoic (18:1) was the dominant fatty acid with 43% in both extractions. The linoleic acid was in second highest amount in both extracts and palmitic acid also in very good amount (15% in solvent extraction and 19% in $scCO_2$). The highest amount of oleic acids was found in Mahkota dewa seed oil (43%) compared to palm oil (39.2%), sunflower oil (21.1%) and soybean oil (23.4%) (Edem, 2002). Linoleic acid was 36% in Mahkota dewa seed oil which was higher than palm oil but lower than soybean and sunflower oil**.** Nonadecanoic acids and 11-eicosenoic acid were found only in the studied oil but in minor amount.

Table 3: Physicochemical properties of the Mahkota dewa seed oil.

Physiochemical property	value
Melting point	1.86±0.14 °C
Density	0.923±0.03 g/ml
Refractive index	1.46±0.02
Viscosity	52.5±0.50 mPas
Iodine value	50.67±0.06 (gI_2/100g)

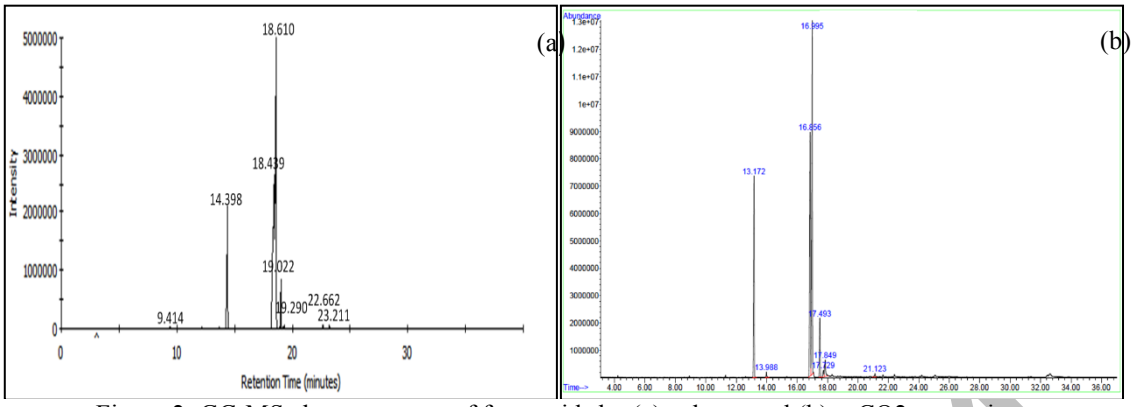

Figure 2: GC-MS chromatogram of fatty acids by (a) solvent and (b) scCO2 extraction.

Physicochemical properties: Table 3 shows the physicochemical properties of the solvent extracted oil. The studied oil was liquid at room temperature which proved that the melting point of the oil is below room temperature. The melting point of Mahkota dewa seed oil was determined 1.86±0.14°C by DSC. Most of the cooking vegetable oils remain liquid at room temperature but few vegetable oils have melting point around 25°C like coconut oil and palm kernel oil (25°C and 24°C, respectively) (Akanda et al., 2013). The density of the studied oil was 0.923 g/ml at 20°C indicating that it is less dense than water. This value is comparable with the recommended density of edible vegetable oil according to CODEX (CODEX, 1999). For example, the density of sunflower oil is 0.912-0.914 g/ml at 20°C which is almost similar to the studied oil. The refraction index of this oil was 1.46 that is almost same with the some other vegetable (cotton seed oil, maize oil, mustard oil etc.) oils (CODEX, 1999). The iodine value of the oil was 50.67 $gI_2/100g$ which is closer to the iodine value of plam olein (50-55 $gI_2/100g$) and palm stearin (≤48 $gI_2/100g$) and lower compared to sunflower oil (118-141 $gI_2/100g$) and soybean oil (124-139 $gI_2/100g$) (CODEX, 1999). The physicochemical properties are helpful to determine the quality of oil and to find the proper application.

Conclusions

Good quality of oil was obtained in the seed of Mahkota dewa. The extraction of this seed oil was performed by conventional solvent extraction using n-hexane and by $scCO_2$ extraction. Supercritical CO_2 extraction can be used as an alternative of conventional extraction for the extraction of Mahkota dewa seed oil as it does not use any organic solvent for extraction oil. Almost 95% oil of conventional solvent extraction was recovered by $scCO_2$ extraction. Oleic acid, linoleic acid, gondoic acid were the unsaturated fatty acids in Mahkota dewa seed oil. Total unsaturated fatty acids were more than 70% in this seed oil. The physical characteristics of the studied oil were comparable with the other edible vegetable oils. The iodine value of this oil was also considerably good. The studied oil remains liquid in room temperature and possessed good physicochemical characteristics that can be helpful to identify the quality of the oil for possible commercial and industrial uses.

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TARAKLI GELENEKSEL KONUT MİMARİSİNİN YAPIM TEKNİKLERİ VE DEPREM İLİŞKİSİ

Tahsin Turgay, Hilal Erek

Sakarya Üniversitesi, Güzel sanatlar Fakültesi, Mimarlık Bölümü

Ahmet Celal Apay

Sakarya Üniversitesi, Teknoloji Fakültesi, İnşaat Mühendisliği Bölümü

Özet: Tarihi dokular şahit oldukları tarih evrelerinin düşünce ve yaşam tarzını, toplum yapısını, ekonomik alt yapısını, sosyal ve psikolojik gereksinmeleri, yapı-insan ilişkilerini ortaya koyarak yapıldıkları döneme ait çok fazla birikimi temsil etmektedirler. Dünyanın birçok yerinde olduğu gibi temin şartları, dayanıklılığı ve maliyeti gibi faktörler neticesinde kullanılan malzemeler yapıldıkları bölge itibari ile değişiklik gösterse de ahşap konut mimarisinde tarih boyunca kullanılan çok önemli bir yapı malzemesi olmuştur.Yüzyıllar boyunca Anadolu da oluşan çeşitli büyük depremler neticesinde kazanılmış tecrübeler doğrultusunda da yapım sistemleri ve kullanılan malzemeler önem arz etmiştir. Anadolu geleneksel sivil mimarisini yansıtan güzel örneklerden biri de tarihi yüzyıllar öncesine dayanan Taraklı yerleşimidir. Yapılan bu çalışmada geleneksel Taraklı evlerinin mimari biçimlenişlerine neden olan etkenler, kullanılan yapım teknikleri ve malzemelerin tespiti, taşıyıcı sistemlerin kullanılan malzemelere göre nasıl şekillendiği incelenmiş ve bu inceleme neticesinde Geleneksel Taraklı ev biçimlenişlerinin oluşumunda sosyolojik, psikolojik ve fiziksel gereksinimlerin yanı sıra bölgenin depremselliğinin de etkili olduğu gözlemlenmiştir.

Anahtar kelimeler: Geleneksel Taraklı Evleri, yapım teknikleri, yapı malzemesi, tarihi evler.

CONSTRUCTION TECHNIQUES AND EARTHQUAKE RELATIONSIP IN TRADITIONAL TARAKLI HOUSES

Abstract: Thoughts of historical textures stage when they are witnesses and lifestyle, social structure, economic infrastructure, social and psychological needs, they represent too much accumulation of the period in which they do by revealing the structure-human relations. Supply conditions as the world's many parts, Although changes durability and cost of such factors as a result of the materials used, as of the regions where they do well used throughout the history of timber structures has become a very important building material. For centuries, in accordance with the experience acquired as a result of several large earthquakes that occurred in Anatolia has importance in building systems and materials used. One good example is the history of civil architecture reflects the

traditional Anatolian centuries ago Taraklı Town based placements. Made factors that contribute to the traditional timber house architectural configurations in this study, construction techniques and the identification of the materials used, according to the materials used in carrier systems examined how the shape and the examination result of sociological formation of traditional timber home formation, the psychological and the region as well as physical needs seismicity of has been observed to be effective.

Keywords: Traditional Taraklı Houses, Construction Techniques, Construction Material,HistoricalHouses

Giriş

Yaşanan büyük depremler neticesi günümüzde yapılan yanlış uygulamaları gözler önüne sererek Anadolu da bulunan mütevazi mimarlık anlayışını tekrar değerlendirme gerekliliğini doğurmuştur. Bunun için taraklı yerleşimi mimari biçimi, yapım sistemleri ve yapı malzemesi yönünden incelenmiştir.

Taraklı İlçesi

Kaynaklarda 'Yenice Tarakçı' olarak geçen ve minyatür bir Osmanlı kenti görünümündeki Taraklı yerleşimi Hititler, Frigler, Romalılar ve Britanyalıların idaresinden sonra Bizans Döneminde Bursa Tekfurluğuna bağlanmıştır. Bir kale içerisinde küçük bir yerleşim birimi olan Taraklı, idari açıdan zaman zaman Bizans ve Selçuklular arasında gidip gelmiştir (Turan, 2004).

XVII. yüzyılda Göynük'ten kuzeye doğru yedi saat yol aldıktan sonra Taraklı 'ya geldiğini ifade eden ünlü gezgin Evliya Çelebi, dükkânlarda kaşık ve tarak imal edildiği ,Taraklı' adının buradan geldiğini, burada işlenen tarak ve kaşıkların İran ve Arabistan'a ihraç edildiğini belirtmektedir. XVIII. yüzyıl salnâmelerinde Kocaeli Sancağı'nın bir yerleşim birimi olarak görülen Taraklı, 1867 Vilayet Nizamnâmesinde Hüdavendigar Vilayeti 'ne bağlandığı bilinmektedir. Taraklı, Cumhuriyet'in ilanından sonra da İzmit iline bağlı Geyve kazasının bir nahiyesi olarak varlığını sürdürmüştür. Sakarya'nın 1954 yılında il olmasıyla da 1987 yılında Geyve'den ayrılarak ilçe olmuştur (Çetin,2013).Marmara bölgesinin güneydoğusunda bulunan ilçe Ankara ve İstanbul şehirleriarasında yer alır. Ankara'ya uzaklığı 270 km, İstanbul'a uzaklığı 200 km'dir.İlçe Adapazarı'na 65 km uzaklıkta, 9220 nüfuslu, 4 mahalle, 22 köy yerleşimbiriminden oluşmaktadır.Bulunduğu konum itibariyle doğuda Bolu ili Göynük ilçesine 28 km, batıdaGeyve ilçesine 34 km, Güneyde Bilecik ili Gölpazarı ilçesine 30 km mesafede bulunmaktadır. İlçenin yüzölçümü 334 km2 olup bu alanın % 20'si tarım alanı , %60'ı orman ve fundalık alan, % 10'u cayır ve mera alanı, % 10'u da tarım dışı alandır(Çavaç,2008).Yapım sistemleri açısından gruplandığında; 651 yapıdan %74'lük bölüme ait 484 adet yapının ahşap karkas yapı olduğu, %25'lik bölüme ait 160 adet yapının betonarme yapı olduğu ve %1'lik bölüme ait 7 adet yapının da kâgir yapı olduğu sonucu ortaya çıkmıştır.Kat adetleri açısından gruplandırıldığın da; toplam 651 yapıdan % 72'lik en büyükbölümünü zemin kat ve üstünde bir kata sahip toplam 469 adet yapı oluşturur. Bunu%16'lık oranla zemin kat ve üstünde iki kata sahip toplam 107 adet yapı izler. Tekkata sahip yapılar ise % 10 oranındadır ve toplam 64 adettir. Zemin kat ve üstündeüç katı ve daha fazla olan 11 adet yapı vardır bu da %2'lik bir orana sahiptir (Özkan,2009).

Şekil 1:Taraklı İlçesinin Sakarya İlindeki Konumu[Wikipedia, 2014](Erek, 2014)

Şekil 2: Taraklı'dan Genel Görünüm

Taraklı Yerleşimindeki Geleneksel Konutların Yapım Teknikleri

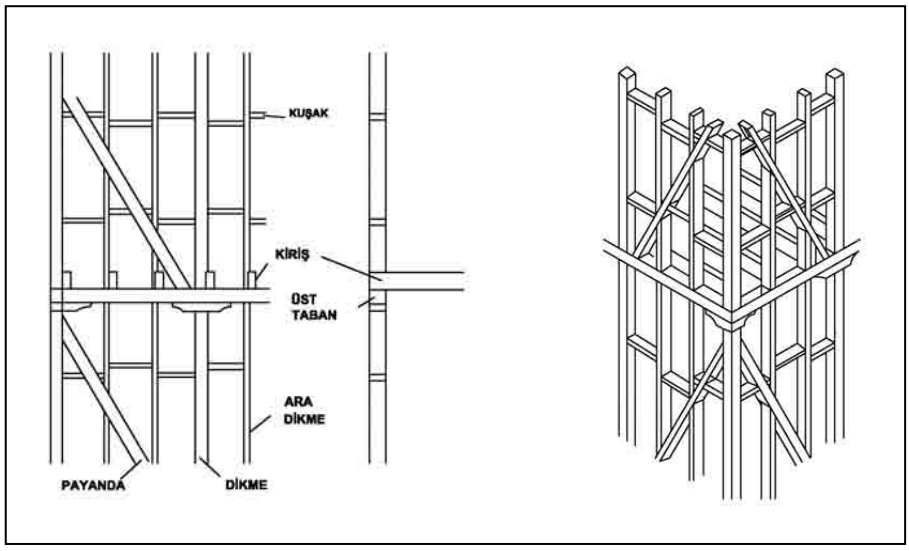
Temeller

Taraklı, jeolojik ve coğrafi açıdan oldukça zengin bir alanda konumlanmıştır. İçinde bulunduğu vadinin yamaçlarında yüksek dereceli eğimli ve kayalık alanlar, Göynük Çayı'nınçevresinde ise alüvyal topraktan oluşan alanlar mevcuttur. Yamaçlarda konumlanan yapılarda temeller 50-100 cm derinliğe inip kayalık zemine oturmaktadır. Diğer alanlarda temel derinliği fazla olmamakla birlikte temel duvarları, doğal zeminin üzerine 50-60 cm yükselmektedir. Temel duvarları çamur harçlı moloz taşlardan oluşturulmaktadır. Üst katlarda yapılacak ahşap blokların üzerine oturacağı ahşap yastık taş duvarın üzerine yerleştirilir. Temel duvar kalınlığı 50-80 cm. arasında değişmektedir. Taş duvarda belirli aralıklarla ahşap hatıllar dönmektedir (Seymen, 2008).

Duvarlar

Bölgede kullanılan üç ana yapı malzemesi olan taş, kerpiç ve ahşap farklı yapım teknikleri ve farklı kombinasyonlarla kullanılmıştır. Yapım tekniği, yapılacak yapının bölge içerisindeki konumu ve malzemenin temin şartlarına göre değişmektedir. Örnek olarak, taşıyıcı yapı bileşeni formunda kullanılan ahşap malzemenin 'kütük', 'yığma' tekniğinde kullanıldığı yerlerin yüksek ve ormanlık araziler olması ile birlikte daha alt kotlarda, yerleşimin orman dokusundan uzaklaştığı bölgelerde taşıyıcı yapı bileşeni olarak kullanılan ahşap diğer yapı malzemeleri olan kerpiç ve taş ile harmanlanarak, taş temel üzeri ahşap çatkı ve arası kerpiç dolgu tekniği kullanılmıştır (Özyer, 2008).

Temel duvarları üzerine atılan hatıldan sonra üzerine genelde kare kesitli bir alt taban yerleştirilmektedir. Alt tabanda kullanılan kesit miktarı yapının yüksekliğine ve üst yapının yüküne bağlı olarak daha da büyütülmüştür. Dikmeler arasına yer yer kuşak bağlantıları, zemin kat döşemesini taşımak üzere de dikdörtgen kesitli dikine kullanılan kirişler yerleştirilir. Pencere alt ve üstlerine, kapıların ise üstlerine kuşaklar atılmaktadır.



Şekil 3:Ahşap Çatkılı Duvar Kesit ve Perspektifi.[KUDEB,2009]

Şekil 4: Taraklı Geleneksel Sivil Mimarisinde Ahşap Çatkılı Duvarlar

Döşemeler

Ahşap dikmeler kat yüksekliğince yerleştirilir. Üst kat hizasına gelince dikmeler üzerine başlıklar konulur, ardından taban kirişi olarak adlandırılan üst kat döşemesinin yükünü taşıyan kirişler yerleştirilir. Üst kat döşemesi oluşturulurken tek tabanlı ve çift tabanlı adını verdiğimiz iki farklı uygulama görülmektedir (KUDEB,2009).Yapının üst katlarında döşemeyi oluşturan tali kirişler döşeme yüzeyinin kısa yönünde yerleştirilerek oluşturulur. Kirişlerin döşeme tabanına oturduğu kesit detayları cephelerde kat silmesi oluşturmak sureti ile gizlenmiştir.

Çatılar

Genel olarak orta sofalı evlerde kırma çatılı, dış ve iç sofalı evlerde beşik çatılı düzene rastlanmıştır. Orta sofalı evlerde çatının kırma ve en yüksek noktasının sofanın ortasına denk gelir halde olması ile konstrüksiyondan da faydalanılarak sofanın tavanı diğer hacimlere göre yükseltilmiştir. İç sofalı evlerde mahya sofanın ortasına isabet eder durumda iken dış sofalı evlerde mahya oda sırasının sofa duvarı üzerindedir. Çatı örtüsünü merteklerin üzerine çakılmış kiremit altı tahtası üzerine dizilmiş alaturka kiremit teşkil eder. Saçakların konsol mesafesi 40-80 cm arasında değişmektedir.

Şekil 5: Taraklı Geleneksel Sivil Mimarisinde Çatılar (Erek, 2014)

Çıkmalar

Geleneksel ahşap yapılarda çıkmalar görsel olarak yapıya zenginlik kazandırmasının yanı sıra mekan içerisinden yer kazanılmasını ve bununla birlikte yapının gün ışığından daha fazla yararlanmasını sağlamaktadır. Yerleşim bölgesinde yapılan incelemeler neticesinde geleneksel sivil mimaride açık ve kapalı çıkmaların sıkça

kullanıldığı gözlenmiştir. Kat hizasında yapılan basit konsol çıkmaların kirişlerin beden duvarlarından 40-50 cm dışarı doğru uzatılmak sureti ile oluşturulduğu, 50cm den fazla olan çıkmaların ise destek elemanları ile gerçekleştirildiği tespit edilmiştir.

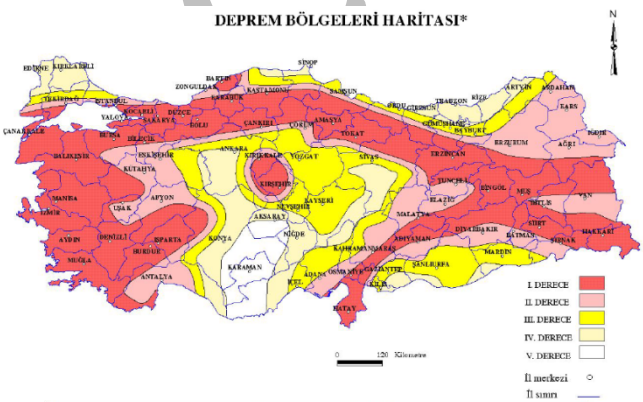
Şekil 6: Taraklı Geleneksel Sivil Mimarisinde Çıkmalar

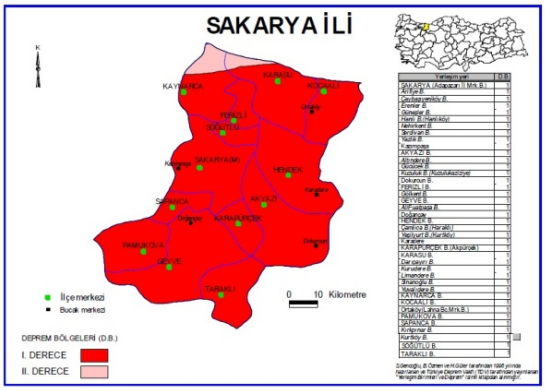
Merdivenler

Geleneksel Taraklı evlerinde yapı içerisindeki merdivenlerde kullanılan yapı malzemesi genellikle ahşaptır. Konutlar içerisinde yapılan incelemelerde tek kollu merdivenlerin yaygın olarak kullanıldığı görülmüş olup döner merdiven tipinde örneklere de rastlanmıştır. Merdivenlerde rıht yüksekliği genel olarak 20-22 cm olmakla birlikte merdiven kol genişlikleri 90 cm ile 120 cm arasında değişkenlik göstermektedir. Basamaklarda kullanılan ahşap kaplamanın kalınlığı 2-3 cm dir.

Taraklı Yerleşimindeki Geleneksel Konutlar ve Deprem İlişkisi

Türkiye, önemli deprem kuşaklarından biri olan ve Azor Adalarından başlayıp Güneydoğu Asya'ya kadar uzanan Alp – Himalaya deprem kuşağında yer almaktadır. Türkiye'de 1900 – 1999 yılları arasında 149 tane hasar yapan deprem meydana gelmiş ve bu depremler 578.544 binanın yıkılması veya ağır hasara uğramasına ve 97.203 insanın ölmesine neden olmuştur. Bu rakamlara göre Türkiye'de ortalama her 7 ayda bir hasar yapan deprem oluşmaktadır.





Şekil 7: Türkiye Ve Sakarya İli Deprem Bölgeleri Haritası

Tablo 1. İlçe Merkezinde Meydana Gelen Ağır Hasarlı Konut Sayısı (Özmen, 2000)

SAKARYA İLİ	Toplam Ağır	Toplam Orta	Toplam Hafif	Ağır (Şehir)	Orta (Şehir)	Az (Şehir)	Ağır (Köy)	Orta (Köy)	Az (Köy)
Adapazarı	16447	8932	14194	11472	4951	7861	4975	3981	6333
Akyazı	793	622	1040	480	307	419	313	315	621
Ferizli	14	30	151	0	0	33	14	30	118
Geyve	526	645	530	240	230	245	286	415	285
Hendek	527	536	941	44	68	185	483	468	756
Karapürçek	65	117	201	18	54	101	47	63	100
Karasu	261	471	449	158	223	230	103	248	219
Kaynarca	6	6	46	0	1	2	6	5	44
Kocaali	153	552	510	65	409	316	88	143	194
Pamukova	6	48	54	6	48	44	0	0	10
Sapanca	214	189	393	168	132	230	46	57	163
Söğütlü	30	37	138	6	8	52	24	29	86
Taraklı	1	15	65	0	5	28	1	10	37
TOPLAM	**19043**	**12200**	**18712**	**12657**	**6436**	**9746**	**6386**	**5764**	**8966**

Sakarya İli Taraklı Yerleşimi Kuzey Anadolu Fay Hattı üzerinde 1. derece deprem bölgesi olmasına rağmen 17 Ağustos 1999 depreminde Sakarya il ve ilçe merkezleri arasında depremden en az hasar almış bölge konumundadır. Sakarya İli içerisinde geleneksel yapım teknikleri ile öne çıkan Taraklı yerleşiminin söz konusu depremde en az hasar alan bölge konumunda olması nedeni ile yerleşimde yer alan geleneksel dokuya depremsellik perspektifinden bakmak son derece önem kazanmış çalışmanın devamında geleneksel yapılar bu düşünce alt yapısı ile değerlendirilmiştir.

Taraklı Sivil Mimarisindeki yapıların ana strüktürünü ahşap oluşturmakta ve dolgu malzemesi olarakta kerpiç kullanılmaktadır. Kerpicin ana malzemesi killi topraktır. Killi toprağın içerisine su ve saman katılarak güneşte kurutulması sureti ile duvarlarda kullanılan dolgu malzemesi oluşturulmuştur. Geleneksel Taraklı evlerinin çoğu taş bir kaide üzerine oturtulmuş ahşap çerçeveden oluşmaktadır. Geleneksel Taraklı evlerinde bulunan cumba ve çıkmalar yapılara bir hareket, görsel karakter, sokağa doğru görüş açısı sağlayan mekan olmasının yanında aslında oturmuş oldukları taş duvarı ağırlıklarıyla sıkıştırarak yatay kuvvetlere karşı direnç sağlayacak faydalı kuvvet oluşturur. Taş duvarların zemin katta sınırlı kalması, sonrasın da yapı yükünü hafifletmek üzere ahşap kullanılması bölgede depreme dayanıklılığa göre tasarımın göstergesidir.

Şekil 8. Taraklı Geleneksel Sivil Mimarisinde Taş Duvar ve Hatıllar

Ahşap yapılar hafifliklerinden ötürü depremden daha az etkilenir. Çünkü depremin yapı üzerinde oluşturduğu kuvvet, yapının kütlesi ile orantılı olarak artar. Yapı ne kadar ağır ise depremden de o kadar fazla etkilenir. Ahşap yapılar, özellikle hafif dolgu duvarlar kullanıldığında gerek beton, gerekse çelik yapılara göre çok hafiftir. Anadolu'nun birçok yöresinde kagir ve ahşap yapılarda karşılaşılan karnıyarık plan tipine Taraklı da darastlanır. Ortadaki sofa ve genişçe koridorun her iki yanında dizilmiş odalar, simetrisinden ötürü depreme karşı düzenli, uygun bir plan şekli oluşturmaktadır.Karnıyarık plan tipi simetrik bir düzen oluşturur ve yapıda dengelenmiş yük aktarımı sağlayarak depremden ötürü gelen enerjinin, gerilme yığılmaları olmadan bünyesindeki ahşap malzemenin yüksek elastisite özelliğiyle absorbe olmasını sağlar.

Depreme dayanıklı yapı tasarımında yapılar da sünekliğin sağlanması istenilmektedir. Taraklı evlerinde taşıyıcı sisteminde ahşap kullanılması, ahşabında gelen yükler karşısında kırılmadan esnek kalması ve büküldükten sonrada eski şekline dönmesi bölge depremselliği açısından ahşabı ideal bir malzeme yapar. Ahşap taşıyıcı sistemini, deprem yüklerine karşı dayanıklı kılan da çatkı sistemdir. Ahşap iskelet, çapraz destekler ile

sağlamlaştırılmıştır. Deprem esnasında yapıya gelen kuvvetlerin yapıda oluşturulan çatkı sistemiyle düzenli bir şekilde dağılımı sağlanarak yapıda ani gerilme yığılmalarından kaçınılmıştır.

Sonuç

Geleneksel Taraklı evlerinde kullanılan ahşap karkas, çatkı sistemiyle güçlendirilerek yüzyıllar boyunca denenip günümüze kadar başarılı bir şekilde varlığını koruyabilmiştir. Günümüzde kullanılan çağdaş yapım sistemleri yakın tarihli bir geçmişe sahip olmasına ve yönetmelikleri her deprem davranışından sonra eksiklikler nedeniyle revize edilmesine rağmen geleneksel yapım teknikleri yüzyıllar boyunca kazanılan tecrübeler neticesinde bu evreyi tamamlamıştır.

Ahşap karkas sistemde özellikle hafif dolgu duvarlar kullanıldığında yapının zati yükü azalmakta dolayısı ile inşa edilen yapılar depremden daha az etkilenmektedir. Bununla birlikte ahşap karkas sistemde kullanılan çapraz destekler deprem yükleri neticesinde meydana gelen yanal yükleri taşıyarak yapıda ani gerilme yığılmalarını önleyip sistemerijitlik kazandırmaktadır. Ahşap malzemenin kırılmadan esneyebilmesi ve sonra eski haline geri dönebilmesi depreme dayanıklı yapı tasarımında çok önemli bir faktör olan sünekliği sağlamaktadır. Geleneksel konut tasarımında sıkça kullanılan simetrik plan anlayışı yapıda dengelenmiş yük aktarımı oluşturmakta ve depremden ötürü oluşan enerjiyi absorbe etmektedir.

17 Ağustos 1999 Gölcük merkezli 7,4 büyüklüğündeki meydana gelen depremde Sakarya'da 19.043 konut ağır hasar almışken bunlardan sadece bir tanesi Taraklı yerleşimi sınırları içerisinde bulunmaktadır. Bu da geleneksel yapım sistemlerinin deprem bölgeleri için ideal çözümolduğunu ve gelişen yapım teknolojilerinin yüzyıllar boyunca deneme yanılma metodu ile edinilen tecrübelerden faydalanması gerekliliğini ortaya çıkarmıştır.

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The Application of Artificial Neural Networks in Environmental Engineering

Muhammad YAQUB, Beytullah EREN, Ahmet CELEBI

Sakarya Üniversitesi Mühendislik Fakültesi
Email : beren@sakarya.edu.tr

Abstract: The development of new programming techniques, increased speed and capacity of the computers results in the use of new technologies and methods for the modeling of the complex problems in environmental systems nowadays. Artificial Neural Networks (ANNs) is one of the Artificial Intelligence techniques that are widely used for this purpose. ANNs is a modeling tool used to process the information for prediction, estimation, forecasting, classification and performance evaluation.

ANNs applied successfully in the field of Environmental Engineering for the prediction of surface and ground water quality parameters, air quality parameters, various pollutant parameters of drinking water and wastewater and wastewater treatment plants performance evaluation, risk assessment of water quality, suspended sediment load estimation in the surface waters. In some of these research papers ANNs based models compared to classical statistical methods and mathematical modeling techniques. Consequently, the use of ANNs based models in Environmental Engineering provides an effective and robust tool in analyzing complex phenomenon.

Keywords : Artificial Neural Networks, Environmental Engineering, Modeling

The Effect of Magnetic Treatment on Retarding Scaling Deposition

M. A. Salman, M. Safar and G. Al- Nuwaibit

Water Research Center, Kuwait Institute for Scientific Research, P.O. Box 24885, Safat 13109, Kuwait. Tel. +965-24878124; Fax: +965-24879238;

email: matallah@kisr.edu.kw

Abstract: The magnetic treatment method has been applied as a scale deposition controlling and/or preventing tool for several decades in the domestic and industrial water systems. However, most of the scientific communities have remained skeptical about the viability of this water treatment method. However, the attention paid to magnetic treatment has increased during the last years as a prevention method.

Hence, a literature review was carried out to seek both positive and negative results. However, a review of the available literature is rather confusing. An experimental laboratory study on the effect of magnetic treatment method was conducted at the Kuwait Institute for Scientific Research's (KISR's) Doha Laboratory for reverse osmosis plant to investigate the effect of magnetic treatment in preventing and/or retarding scaling. Thus, the effect of magnetic treatment in retarding calcium carbonate, calcium sulfate and barium sulfate scaling was investigated within two different configurations (open and closed loop) and by using different techniques at ambient temperature. The current paper summarizes the literature survey and expresses the results of experimental work. The results showed that the magnetic treatment was effective in increasing the retention time required for scaling. Nonetheless, further investigation is recommended to optimize magnetic power, flow rate and operating temperature.

Key Words: Barium sulfate ($BaSO_4$), Calcium Carbonate ($CaCO_3$), Calcium Sulfate ($Ca\ SO_4$), Magnetic Treatment.

Introduction

Magnetic water treatment (MWT) is a proposed method of water treatment. The manufacturers of water treatment devices have claimed that powerful magnetic fields can affect the properties of solutes passing through the magnetic field, therefore, eliminating the need for chemical treatment agents as softening or antiscalant agents. Although the magnetic treatment has been applied as a scale-deposition controlling/preventing tool for

the several decades in the domestic and industrial water systems, most of the scientific communities have remained skeptical about the viability of this water treatment method.

The first commercial device to be used for magnetic treatment was patented in Belgium in 1945 and used in a hot water system; in the United States of America the use of magnetic water treatment devices has been wide spread since 1975.

In 1985, Kronenberg was the first physicist who reported anecdotal evidence to the pseudoscientific theory that magnetic water treatment could prevent the formation of scale even after the magnetic field is removed.

Since the magnetic treatment is a controversial matter, a literature survey was conducted to investigate the viability and reliability of magnetic treatment in retarding the scaling deposition for membrane process.

Several scientific journals supporting magnetic treatment were found and reported positive scientific results.

Martynova et. al. (1967) found that in the presence of oxides of iron, in the industrial water and circulation process, the magnetic treatment of water enlarged the center of the crystals of a certain type of salt after the magnetic treatment of the water solutions. Biochenko et. al. (1977) also found that the effectiveness of magnetic treatment depends on several parameters such as temperature, type of salt, flow rate, and magnetic intensity.

In 1984, Grutsch and McClintock demonstrated a deposit control by using magnetically treated water where they conducted an extensive literature review on magnetic treatment and concluded that those who approved of the viability of magnetic treatment based their approval on proper application or specific experimental procedures. They added that the failure of previous researchers to see the effect of magnetic treatment could be due to the improper use of magnetic equipment such as magnetic intensity, polarity, material and others. They also found that the magnetic treatment equipment could successfully control salt deposition during the circulation of alkaline cooling (tower) water solutions and the treatment has positive control over calcium carbonate ($CaCO_3$) and calcium sulfate ($CaSO_4$) scale. They indicated that the proper parameter such as water velocity (6 m/s) could yield a positive scale control.

Busch et. al. (1986) were the first who suggested that the changes in voltage and current of conducting solutions passing through the field of magnetic treatment devices might be due to the effect of Faraday's law. He applied several precise magnetic field experiments using the commercial magnetic devices with normal stainless steel and plastic pipe housing. He found that the voltage and the current were both produced when the water solution was passed through an orthogonal magnetic field. He also postulated that insoluble iron produced from the magnetic material might be the center for $CaCO_3$ crystals which they believed might be the reason for suspension of $CaCO_3$ on the solution rather than depositing it on the plumbing surfaces.

A saturated solution of calcium sulfate ($CaSO_4 \cdot 2H_2O$) was tested in the magnetic field of a nuclear magnetic resonance spectrometer by Ronald et. al. (1995). Five replicates were performed for each experiment. The experiments were conducted using a magnetic device of 4.75 T and 1200 rpm. Results showed that the magnetic treatment indeed had a significant effect on the precipitation of $CaSO_4$ crystals. Conductivity, soluble Ca, and Zeta potential (ζ) all decreased, whereas the total suspended solid (TSS) increased. A transfer of Ca from the

soluble to the solid phase (crystal as $CaSO_4 \cdot 2H_2O$) was confirmed using mass balance calculations. Thus, the results are consistent with claims in literature that magnetic water treatment can induce precipitation of inorganic crystals from solution, and could possibly prevent scaling by avoiding the precipitation of these salts onto solid surfaces.

A similar positive result was reported by Baker et al. (1997). The test was performed in a flow through the test ring; scale precipitation was induced by controlling a dosing of 0.1-M sodium hydroxide (NaOH) into a flowing solution of calcium chloride and sodium carbonate, the pH was adjusted to 6.5 using 37% HCl. Different strengths and configurations of magnetic fields were tested. The contact time, temperature and velocities (0.8, 1, 2 m/s) were also varied for a five-hour operation. After each experiment, the scale precipitated on the test tube section and wire loops were quantified and analyzed by a scanning electron microscope. The experiments were conducted under flow through reverse osmosis (RO) (open loop) and in a reticulated RO (closed loop) and the run continued until a sufficient flux decline occurred. On the open loop, no reproducible change was found in the nature or in the quantity of the scale adhered to the wire loops, but the physical differences were reported in the nature of the deposit when a magnetic field was applied to a supersaturated solution. The scale from untreated water formed a fine-grained uniform covering the pipe, while magnetically treated scale formed coarser-grained covering of the pipe in two different crystalline forms. The first form was calcite, and the other form was a cauliflower-type structure (aragonite). The author emphasized that these two forms of scale were not apparent when an undersaturated solution was used. But, in the closed loop the flux and the rejection were significantly improved especially at a low flow rate (10-12 l/h). The result of analysis confirmed that the magnetic treatment produced a deposit (aragonite) which was less compact and more amenable to chemical cleaning than that formed under normal conditions.

In 1998, a laboratory experiment was undertaken by Barrett and Parsons to assess the effects of magnetic treatment on $CaCO_3$ precipitate. Static test solutions of calcium chloride, $CaSO_4$ and sodium carbonate were placed in a magnetic field. $CaCO_3$ was magnetically treated and the changes in precipitation were recorded. The results of this study support earlier work which indicates that magnetic fields may influence the formation of $CaCO_3$ by the suppression of nucleation and acceleration in crystal growth. The magnetic effect is maintained for at least 60 h after exposure and magnetic exposure exerts a greater effect on $CaCO_3$. Results indicate that the magnetic field suppresses the formation of $CaCO_3$ nucleation and crystal growth.

Gabrielli et al. (2000) tested magnetic treatment by measuring the remaining ionic calcium at the output of the device by means of ion-selective electrode. The scaling power of the treated water was estimated through an electrochemical scaling test. Chroamperometric curves and chronoelectrogravimetric curves were plotted to obtain the scaling time and nucleation time of scale deposition. Finally, an empirical equation was proposed, relating the efficiency of magnetic treatment to the length and flow velocity. The efficiency of the magnetic treatment through different types of pipe material polyvinyl chloride (PVC), stainless steel (SS) and Copper (CU) were also tested and it was concluded that copper is the most powerful material that can be penetrated through magnetic treatment, followed by SS and finally PVC. The inversion of polarity was found to improve

the efficiency of the magnetic device. The scaling time was doubled when a magnetic device was used without inversion; however, that time would be increased to triple if inversion polarity were used in the magnetic device. The power of magnetic treatment was found to be greater when increasing the length of treatment or the number of polar pieces used in the treatment. The experiment was carried out in a control condition and totally confirmed the effect of magnetic treatment.

Freitas et al. 2000 investigated the effect of magnetic field on the crystallization of zinc sulfate in a series of controlled batch cooling experiments. Zinc sulfate solutions were exposed to magnetic fields of different intensities from 0.3 up to a maximum of 0.7 T (B). A clear increment of saturation temperature, growth rate, and average crystal size was found. However, a decree in the metastable zone width was also reported.

Kobe et al. 2001 and 2002 published many studies on the influence of magnetic field on the crystallization of $CaCO_3$. He concluded that the applied magnetic field can successfully prevent the hard calcite scaling; the main purpose of his work was to understand the mechanism of the beneficial influence of the magnetic treatment. However, his result also confirmed that magnetic treatment has altered the morphology of crystals forming 90% calcite and 9.6% aragonite without magnetic treatment to 28% calcite and 70% aragonite under a magnetic field of 1.22 T. Hence, the influence of the applied magnetic field on nucleation and further crystallization of $CaCO_3$ in hard water was confirmed.

Knez and Pohar (2005) conducted a laboratory study on the effect of magnetic field on the polymorph composition of $CaCO_3$ that precipitated from carbonized aqueous solutions in a closed loop. The experimental work was repeated in different magnetic flux densities, different intervals and flow velocity. The most important conclusion that was drawn from the Knez experiments was that the magnetic field clearly favors and/or promotes the precipitation of aragonite instead of calcite when nonmagnetic treatment was applied.

Saban et al. 2005 investigated the influence of static magnetic field of strength 0.75 T on the nucleation of $CaCo_3$ crystals using the particle size analysis and number of $CaCO_3$ particles formed. The experiment was conducted using 10-ml sodium bicarbonate ($NaHCO_3$) solution in a test-tube under magnetic field. The calcium chloride solution was taken from a vertical burette positioned above the test tube and mixed to a slow flow rate, drop by drop. One of the major findings was that the magnetic field can reduce the size of high percentage number of particles formed and also compress the particle size.

Kney and Parsons (2006) conducted a laboratory-based study to test the effect of treating solutions and particulate of $CaCO_3$ through magnetic treatment. Reproducible results were observed, but only when $CaCO_3$ particulates were exposed to magnetic fields, and not when a solution of sodium carbonate ($NaCO_3$) was exposed to magnetic fields. The result of the experiment was based on mixing the solution of sodium carbonate and calcium chloride in a test cuvette, and then absorbance measurements were taken at seven-s intervals over 30-min period.

Alimi F. et al. (2007) conducted a series of experiments on the effect of magnetic field on the calcocarbonic pure water containing calcium, carbonate, and bicarbonate ions only under 0.16-T magnetic field. A magnetic device consisting of five pairs of permanent magnets with north and south faces facing each other was used; the solution was flowed into a 150-mm plastic tube with a sectional area of 0.38 cm^2. The test tube was immersed in a water bath to control the temperature for 90 min. the tested solution was heated to a desired temperature Then, the concentration of dissolved calcium was measured before and after heating every 10 minutes. The difference in calcium ion concentration represents the amount of $CaCO_3$ precipitated. The influence of the applied magnetic field on the nucleation and precipitation of calcium carbonate was confirmed.

Lipus in 2007 evaluated the effectiveness of the magnetic field by the amount of scale precipitated in boilers and pipes during a three-week run using tap water, which contained (Mg^{2+}) and (Fe^{3+}) ions in a concentration exceeding the thresholds for calcite inhibition. All of the scales were identified to be aragonite, but in the case of magnetic treatment, the scale occurred in much smaller amounts. The scale on a heating copper-pipe was 2.5 times thinner due to magnetic water treatment, and the zinc-coated steel pipe occurred as a very thin powder–like coating, while in the line without treatment, abundant hard lining was formed.

Magnetic treatment recorded a revolution in solid-liquid separation as reported by Nirschl (2009), where he confirmed that he could separate between two inorganic components using magnetic field in a magnetic filter. The author also reported in another study that the magnetic field effects influence the filtration process positively.

Although Prisyazhniuk in 2009 explained different methods that are used for preventing scaling in heat exchanger, only the magnetic method was tested on his study. A predictive equation was also proposed in the study, relating the increase of power consumption to the degree of saturation of $CaCO_3$ on the surface and adjoining layer.

Purified potable water was then circulated at a constant flow rate in a magnetic field by Cai et al. (2009). Then, the physicochemical properties of water were measured; a decrease of surface tension and an increase of viscosity over the treatment time were observed. The correlation time (τ_c) was calculated in terms of spin–lattice relaxation time of proton, which verified that the rotational motions slowed down after the magnetic treatments. A two-phase model was set up to prove that the proportion of free water molecules was reduced. The results suggested that the average size of water clusters have become larger through magnetic treatments.

On the other hand, many other researchers reporting negative results such as Eliassen et al. in 1985 reported that no positive results were achieved when the magnetic treatment was applied in preventing scaling.

Hasson and Bramson in (1985) found that the magnetic treatment failed to suppress the scale formation of $CaCO_3$. In addition, Limpert and Raber (1985) reported that the magnetic treatment device failed to prevent scale formation in a heat exchanger system. Sohnel and Mullin in 1988 believed that the magnetic treatment has no hard scientific evidence to improve the performance of tested system.

The most obvious example of the negative result was reported by Al-Qahtani in 1996, where several samples of seawater (43,000 mg/l) were circulated through a high magnetic field intensity of 7,000 gauss for several hours at fixed temperature, flow rates, and nitrogen concentration. The pH and conductivity of all of the samples were increased during the circulation time. Using RO, both the treated and untreated solutions were desalinated in a seawater RO unit at several pressures. No significant difference was seen between circulated and uncirculated solution.

Smothers et. al. (2001) tested the effect of three different magnetic devices on the type and the quantity of scaling mineral deposit on the three shell and tube heat exchangers using potable water as supplied water. The results did not indicate any clear advantage for any of the three devices tested versus a control for the inhibition of mineral scale formation or the corrosion of copper. The amount of mineral scale formed for the control versus device heat exchange tubes was relatively constant. The scale formed was found to be a type of calcite ($CaCO_3$) and had the same crystalline structure for each heat exchange tube. There was no effect on the crystalline structure of the scale formed by any of the tested devices. On the other hand, many other researchers also reported a positive result and proposed a model to explain the effect of magnetic treatment as given below.

Mergen et al., (2008) tested the magnetic ion-exchange resin treatment for the removal of natural organic material using a bench scale method in a continuous operation. Treatment shows a high percentage removal. Tai et al. (2008) used permanent magnets of different intensities to investigate its effect on the crystal growth of calcite in a fluidized bed using the constant composite technique. The result confirms that the calcite growth rate in the presence of a magnetic field was lower than those in the absence of magnetic field. Alimi F. et al. (2009) investigated the influence of the material of the pipe on calcium carbonate precipitation under magnetic treatment. The result of the experiments proved that magnetic water treatment affects calcium carbonate crystallization by favoring its formation in bulk solution, instead of its incrustation on the wall. Stuyven B. et al. (2009) offered a new explanation for the mechanism of magnetic treatment's ability to prevent scale. The results of the experimental work prove that water contains suspended micron size particles that can be fragmented by application of orthogonal magnetic field on a turbulent flow, which results in size-reduction by two to three orders of suspended salt particles and increases the surface area of these particles by four to six orders. So

precipitation will occur in the larger surface area present that could explain why the precipitation will increase in the bulk solution instead of the surface area of the container or pipes.

Gryta M. (2011) investigated the effect of using magnetic water treatment to reduce calcium carbonate deposit during membrane distillation. The result confirmed that the flow of water through the magnetic field has a considerable influence on the morphology of $CaCO_3$ precipitation during the thermal decomposition of bicarbonates. Bin et al., (2011) investigated the effects of magnetic field on sodium, magnesium and calcium ions in chloride solutions. He concluded that magnetic treatment leads to an increase of diffusion coefficients of magnesium, sodium and calcium and a decrease of chloride ions. The result confirms that magnetic treatment is beneficial for the separation process of brine water from seawater. Madsen (2004) reported that the calcium carbonate crystal formed from mixing calcium chloride solution with sodium carbonate solution under magnetic treatment, results in the crystal-size decrease with increasing strength of the magnetic field.

Cefalas et al., (2008) used the x-ray diffraction analysis to analyze the effect of 1.2 T magnetic fields on the calcium carbonate precipitated crystal form. The magnetic field was found to increase the precipitation of aragonite and decrease the formation of calcite. Cefalas et al. also proposed a quantum mechanical model which stated that, magnetic fluctuation inside the liquid can be amplified by exchanging energy with the magnetic field through an angular momentum of the water molecular rotors and with the macroscopic angular momentum of the turbulent flow. The gain is higher if the magnetic fluctuation is in resonance with the rotational frequencies of the molecular rotors or low frequencies of the turbulent flow. The authors added that, at low external magnetic field, the formation of aragonite takes place when a vacuum state electromagnetic mode is trapped, amplified and sustained in a coherent antisymmetric state, which is created by an ensemble of individual molecular rotors which are excited coherently by the external magnetic field. The amplified magnetic mode will not decay to the ground symmetric state of the ensemble of water molecular rotors due to the forbidden nature of transition between the antisymmetric and the symmetric state. The ensemble of water molecular rotors is then driven to a higher, free-energy state for a longer period of time, allowing thus the $CaCO_3$ precipitants to be crystallized as aragonite. Furthermore, the existence of the coherent antisymmetric state, elucidate the memory effects observed previously in water solutions. Coey and Stephen also reported an increase in aragonite and/or calcite ratio in the deposit when using a magnetic field of 0.1 T, and the authors also confirmed that the memory of magnetic treatment can last up to 200 hrs. Szczes et al. (2011) reported that, when an electrolyte solution was exposed to a weak static magnetic field (MF) generated from a stack of magnets (B = 15 mT) at the flow rate of 1.4 ml/s, a change in the electrolyte conductivity was recorded. it was found that the changes in electrolyte conductivity depended on the kind of electrolyte and the magnetic exposure time and are related to the thermodynamic function of hydration. The magnetic treatment was founded to increase the amount of evaporated water. The literature review showed that the effect of magnetic treatment was tested in numerous scientific journals, which obviously showed that the attention to this treatment method has been increasing in recent years. However, a review of the available literature is rather confusing due to the often contradictory results that are reported. The main drawback in the literature is that a part from many conventional theories, the effect of magnetic field on the physical and chemical properties of water, was recently interpreted on the basis

of quantum field theory which was proposed by Cefalas et al., (2008) in agreement with previous work. Moreover, there is difficulty in getting reproducible results on a laboratory scale. However, it can be said that the available literature generally agrees on some principles of operating conditions for such devices given as follows:

- The magnetic treatment can lead to the formation of $CaCO_3$ particles in the bulk of scaling solution, instead of precipitating on the internal surface, and these particles are carried away by the water flow.
- The result of experimental research confirmed that homogenous nucleation increased in the presence of magnetic treatment, resulting in the formation of crystals that are greater in numbers with smaller sizes
- Furthermore, it has been reported that the fluid must be orthogonal with respect to the direction of the applied magnetic field (Busch et al., 1986). However, some studies have mentioned that a magnetic field strength of at least 0.05 T is required for successful treatment, although this would depend on the composition of water and the type of device.

Testing the Magnetic Treatment at Doha Reverse Osmosis Plant (DROP)

The magnetic treatment methods have been tested at KISR for a different client at DROP. Different types of experiments were conducted on the magnetic treatment but with different objectives. The first experiment studied the effect of magnetic treatment on the quality of feed water (chemical-physical and biological effect) using a stagnant magnetic field. The second experiment was conducted at DROP to test the effect of magnetic treatment on the operation parameters of RO system as salt passage, salt rejection, recovery, and differential pressure in an open cycle system. The result of both the experiments proved to be negative, except for a few physical parameters showing a little difference, as TSS and turbidity, and the effect of magnetic treatment were considered to be invisible. However, when a further research was conducted to investigate the previous research done on magnetic treatment, it was found that the pH, conductivity, salt passages, chemical compositions are not suitable tools for evaluating the efficiency of magnetic treatment. Similar treatment methods used by many other researchers also yielded a negative result, since the effect of magnetic treatment is visible only when there are suspended particles or during the formation of scale particles. The magnetic treatment was found to have a positive effect only when either the morphology of crystals formed or the number and size of crystals formed was studied. In addition, the magnetic treatment showed a positive effect on the retention time required for scale formation.

Therefore, the effects of magnetic treatment on different types of scaling compounds were tested in KISR at DROP using other tools for evaluation. $CaCO_3$, calcium sulfates ($CaSO_4$) and barium sulfates ($BaSO_4$) were tested in two identical operating conditions with magnetic treatment and without magnetic treatment.

Experimental Details

The magnetic unit used in the experiments consisted of three pairs of permanent magnets with north and south poles facing each other. Each polar piece is the assembling of two rectangular permanent magnets. Fixed at steel frame 14 mm apart (The induction of the magnetic field (B) is 0.16 T in the air gab, for each pair of magnet

device. The magnetic effect on the formed scaled was tested under an ambient temperature at DROP (22°C). The effect of the magnetic treatment on retarding scaling deposition was tested using three different synthesis-saturated scaling solutions.

Each solution was saturated with one type of scaling compounds such as $BaSO_4$, $CaCO_3$, or $CaSO_4$. The prepared saturated solution in the feed water tank will flow to the test tank, through a magnetic device oriented orthogonally to the direction of flow as shown in the tested unit in Fig 1. First $NaCO_3$ solution will be circulated through the magnetic device without mixing with $CaCl_2$ solution for 24 hours before starting the experiment. Then the zero time will be considered exactly as the time of mixing $CaCl_2$ solution with $NaCO_3$ solution, and then a sample will be drawn from the test tank every one minute for analyzing the scaling species. Turbidity and concentration of scaling species were used for evaluation the magnetic treatment. Turbidity was measured continuously using a dipping turbidity meter as shown in the tested unit. Dipping turbidity meter is able to display an automatic reading for turbidity. All of the proposed test solutions were tested under the same magnetic field's strength and at stagnant condition. The turbidity and concentration of soluble scaling ions versus time used as indicators for scaling precipitation versus time. Whereas, when the initial concentration of the scaling compounds in the tested solution decreased, the precipitation of the scaling compound is indicated. However, if the magnetic treatment is effective in retarding the precipitation of the scaling compounds, the concentration of the scaling species will be constant for a period equal to the retention time. Then, the concentration of scaling species will be plotted versus time and the evaluation of magnetic treatment will be based on these graphs.

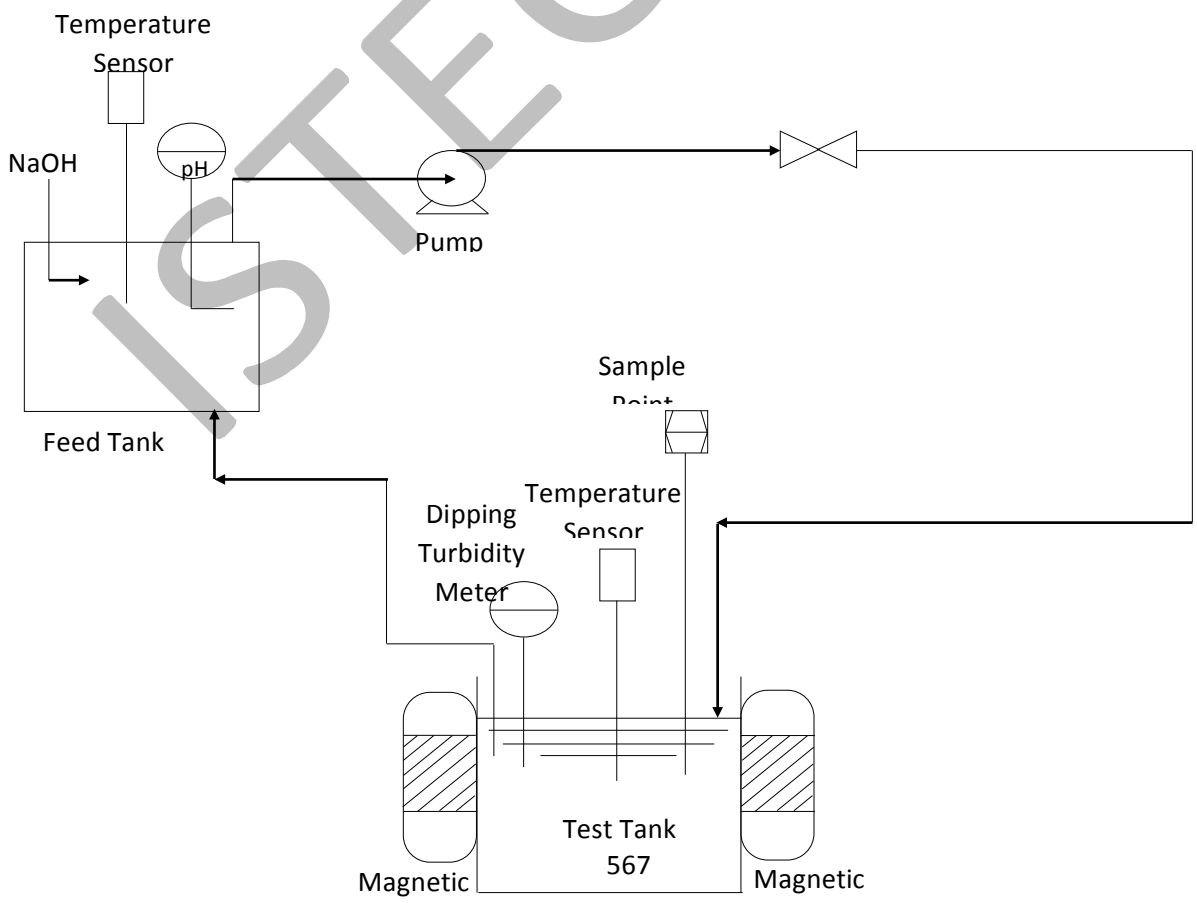

Fig. 1. The schematic of the experimental test plant.

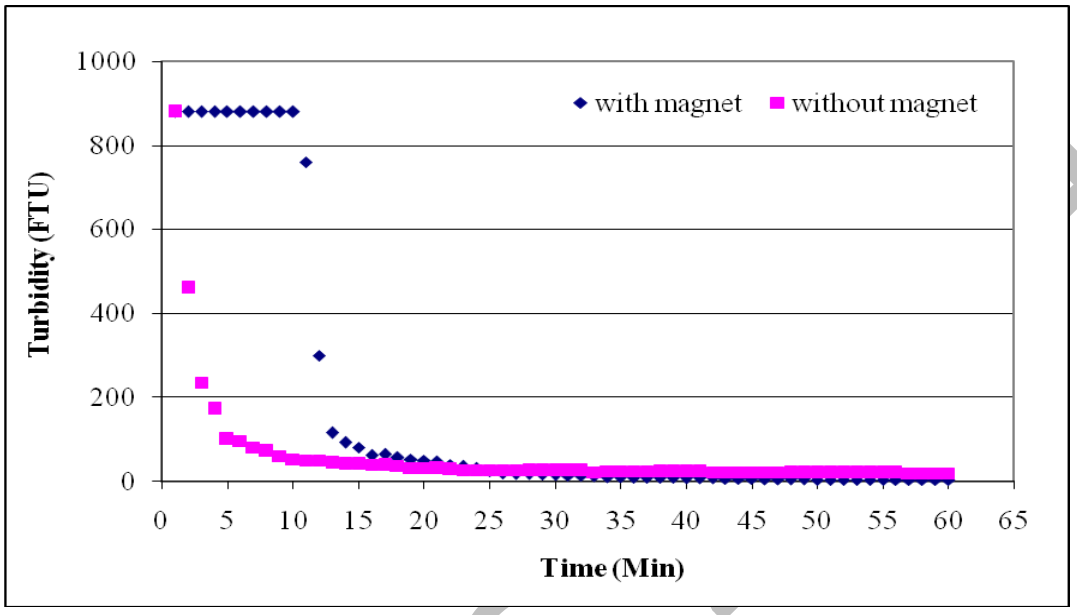

Fig. 2. Turbidity of $CaCO_3$ solution under stagnant condition versus time.

The Effect of Magnetic Treatment on Calcium Carbonate Scaling

Calcium carbonate ($CaCO_3$) solution was prepared by mixing 0.5 M of calcium chloride ($CaCl_2$) with 0.5-M sodium carbonate ($NaCO_3$) in the feed tank. When applying a magnetic treatment, the $NaCO_3$ solution was treated with the magnetic unit for about 24-h before mixing. Then turbidity of the solution was measured immediately after mixing in the tested tank. The turbidity of the mixed solution, which contained $CaCO_3$ particle solution was measured every one minute; the first solution under the magnetic treatment, the second solution without magnetic treatment. The measurement of the turbidity was continued for about 60 min. Fig. 2 shows the effect of magnetic treatment on a solution containing $CaCO_3$ particles in a stagnant condition. The effect of the magnetic treatment on the $CaCO_3$ scale particles was confirmed. Hence, the magnetic treatment succeeded in keeping the particles of $CaCO_3$ formed in a suspension state for almost 10 min. Furthermore, without any treatment, the turbidity of $CaCO_3$ solution decreased after one minutes of mixing from 800 FTU to 500 FTU. The decreasing trends continued until it reached 100 FTU after 6 min of mixing.

Zero turbidity was reached after about 13 min of mixing. Under the magnetic treatment, the turbidity of the $CaCO_3$ solution reached the 100 FTU turbidity after about 16 min instead of six min without magnetic treatment. However, figure 2 shows that the effect of magnetic treatment was almost negligible after 16 min of $CaCO_3$ formation. The second experiment was conducted using similar conditions as the previous experiment, but the dissolved calcium ion was analyzed before mixing and after mixing every 10 s to three minutes, then the

analysis was conducted every one minute for almost one h. The decrease in Ca^{2+} ion from the initial concentration represented the precipitated salt as $CaCO_3$ scale.

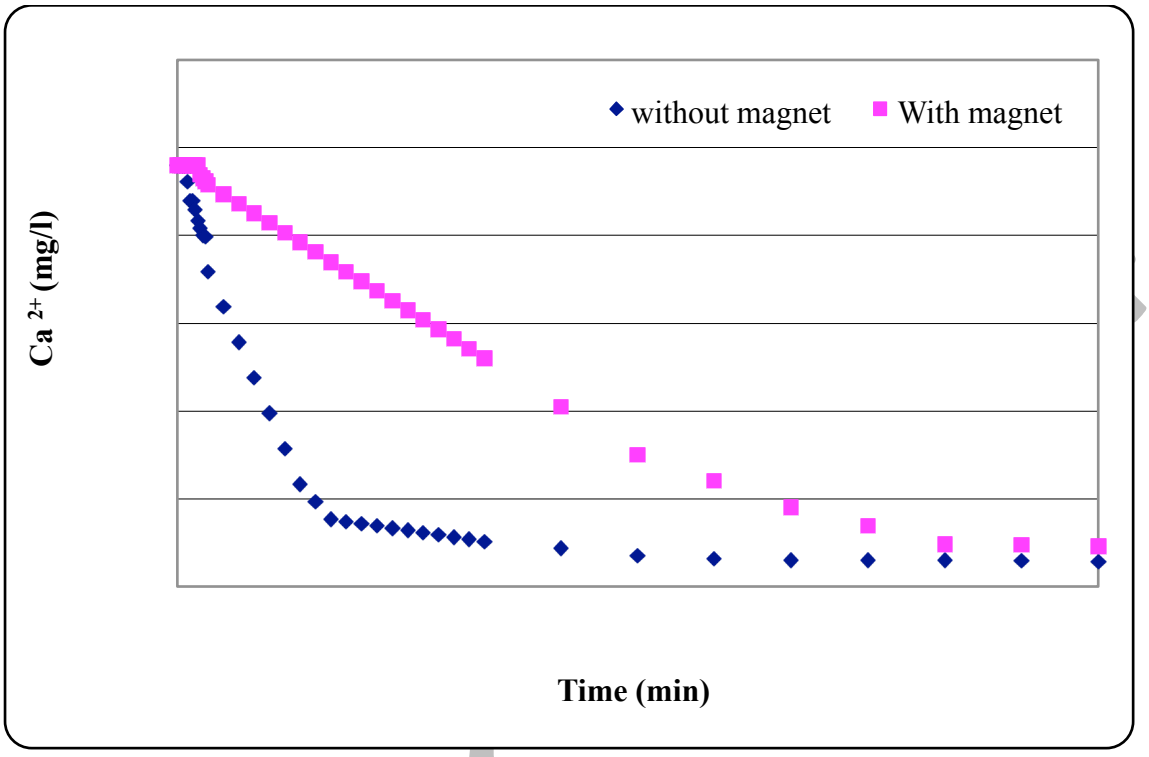

Fig. 3. Calcium ion analysis of $CaCO_3$ solution in flowing condition versus time.

Figs. 3 shows the analysis of Ca^{2+} ion in a flowing solution directly after the formation of $CaCO_3$ particles. The effect of magnetic treatment on the Ca^{2+} ions was found to be stronger than the effect of magnetic on the turbidity of $CaCO_3$ solution. Hence, a higher concentration of Ca^{2+} in the solutions would mean a higher prohibition for scale formation.

In other words, as the concentration of calcium ions becomes constant for a longer time (suspended), the scale precipitation would be lower and the scale prevention would be stronger.Fig. 3 shows that the magnetic treatment up to 25 min has succeeded in keeping the concentration of Ca^{2+} ions two and half times more than the concentration without magnetic treatment. This implies that the inhibition of $CaCO_3$ precipitation was increased through the magnetic treatment by two and half times than that without any treatment. However, the effect of magnetic treatment was also negligible after 50 min of treatment (Fig. 3) It is worthy to mention that the Ca^{2+} was not prevented totally from decreasing, indicating precipitation of $CaCO_3$, although in fewer times than without treatment.

The Effect of Magnetic Treatment on Calcium Sulfate Scaling

Calcium sulfate was formed by mixing 0.5-M $NaSO_4$ and 0.5-M $CaCl_2$ in the same procedure as described for $CaCO_3$. Figs. 4 and 5 show the effect of magnetic treatment on $CaSO_4$ solution directly after the formation of $CaSO_4$ particles. It is worth noting that, the magnetic treatment was found to have a strong effect during the first five minutes after the formation of $CaSO_4$. However, the effect of magnetic treatment on $CaSO_4$ decreased gradually until 40 min after mixing when the magnetic effect was hardly noticeable. However, during the first four min, the magnetic treatment succeeded to keep the turbidity of the $CaSO_4$ solution above 400 FTU. Whereas, the turbidity of the same solution was found to be less than 100 FTU after only one minute of $CaSO_4$ formation without treatment. Therefore, the inhibition was almost four times compared to the solution without any treatment during the first four minutes.

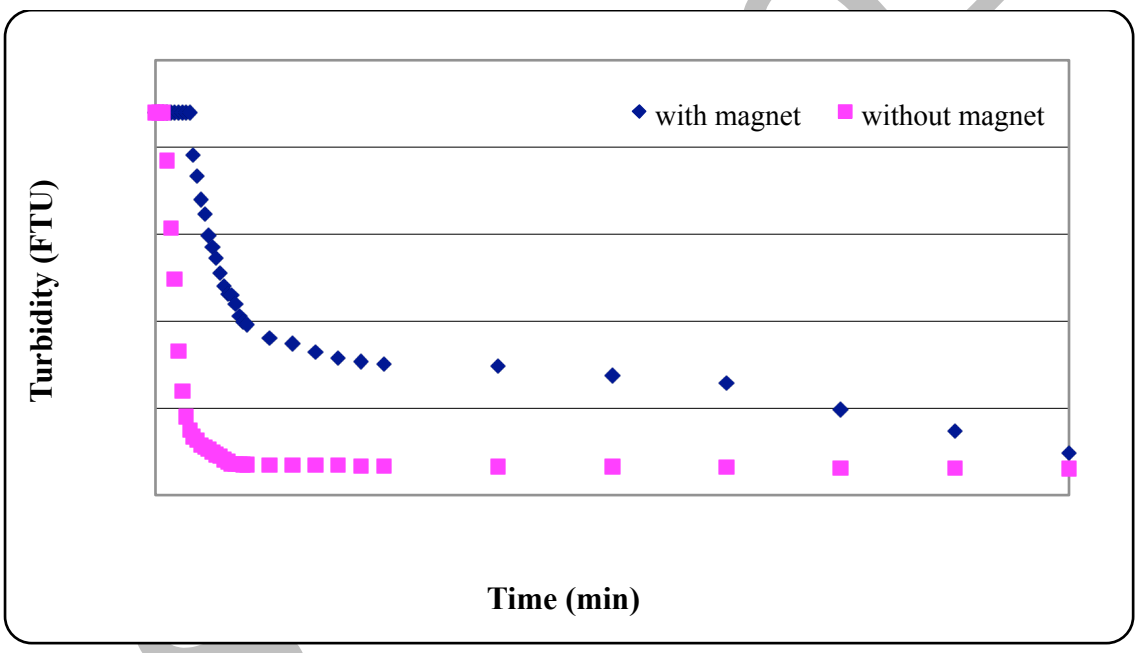

Fig. 4. Turbidity of solution of $CaSO_4$ in a stagnant condition versus time.

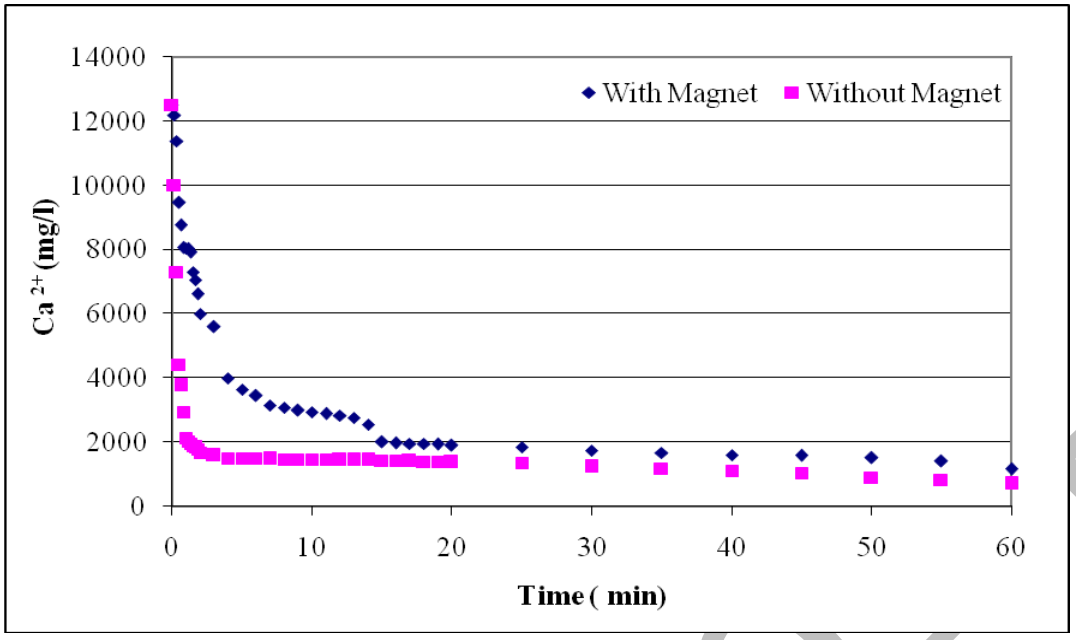

Fig. 5. The concentration of calcium ion of CaSO4 in stagnant condition.

The effect of magnetic treatment on the Ca^{2+} was also studied and illustrated in Fig 5. The same theory was applied to the Ca^{2+} precipitation. If the Ca^{2+} ion's concentration decreased with the tested solution, this indicated a precipitation of $CaSO_4$ particles.

The concentration of Ca^{2+} ion decreased from 12000 mg/l to 4000 mg/l during the first minute of $CaSO_4$ formation without any treatment, while the concentration of Ca^{2+} ion decreased to 8000 mg/l when given magnetic treatment (Fig. 5). After two minutes, the magnetic treatment succeeded in keeping the concentration of Ca^{2+} within the range of 6000 mg/l, while the concentration was below 2000 mg/l, without magnetic treatment and in stagnant conditions. The same behavior was noticed in the flowing condition, where the magnetic treatment affected the concentration of Ca^{2+} strongly during the first 10 minutes. However, this effect decreased as time increased and became almost negligible after 20 min of $CaSO_4$ formation (Fig. 5).

The Effect of Magnetic Treatment on Barium Sulfate

$BaSO_4$ was prepared by mixing barium chloride with $NaSO_4$. The effect of magnetic treatment on the turbidity of $BaSO_4$ solution is shown in Figs. 6 . It is worth mentioning that the figure shows that for almost 6 to 7 minutes, no changes or differences were seen directly after mixing $BaCl_2$ and $NaSO_4$, and whether the tested solution was magnetically treated or not.

The turbidity of $BaSO_4$ solution was 450 FTU for about 10 min with the magnetic treatment, decreasing to 250 FTU after 11 min and continued to decrease to 100 FTU after 12 min of mixing. However, the turbidity of the same solution decreased from 450 FTU to 250 after 7 min of $BaSO_4$ formation and reached zero FTU after only 8 min of mixing (Fig.6).

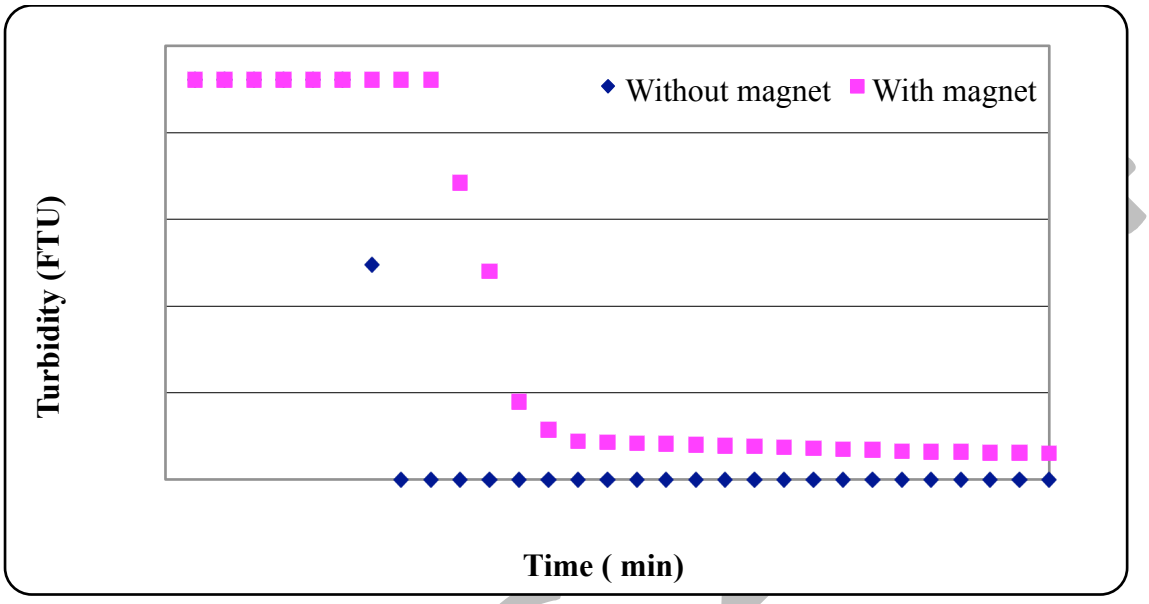

Fig. 6. Turbidity of $BaSO_4$ solution in a stagnant condition versus time.

Figs. 7 shows the concentration of SO_4^{2-} in a stagnant condition, in a $BaSO_4$ solution. The magnetic treatment succeeded in keeping the concentration of SO_4^{2-} at the same initial concentration (7000 mg/l) for 45 min (fig.7), while without magnetic treatment, the concentration of SO_4^{2-} was found to decrease to 6000 mg/l after only five minutes in a stagnant

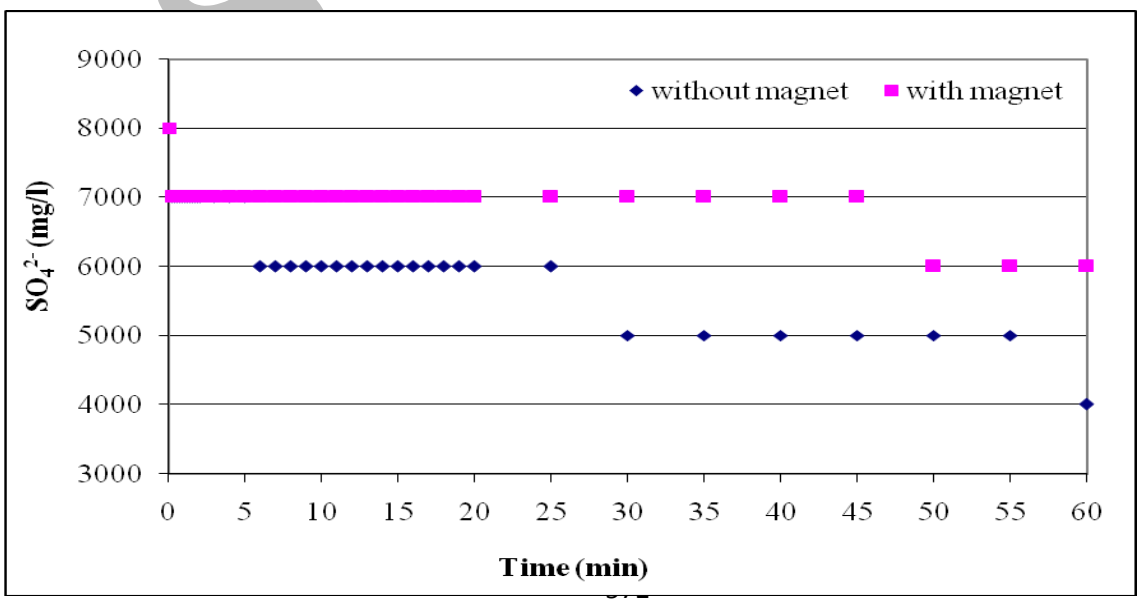

Fig. 7. The SO_4^{2-} concentration in $BaSO_4$ solution in stagnant condition versus time.

Conclusions and Recommendations

The literature survey and the results of the experimental investigation both confirm that the magnetic treatment could be effective in scale control, but the effect of the magnetic treatment on $CaCO_3$ was found to be stronger than the effect of the magnetic treatment on $CaSO_4$ or $BaSO_4$. Another major finding was that the magnetic treatment could not prevent the formation of $CaCO_3$, $CaSO_4$, and $BaSO_4$ scaling although it could reduce or retard the scale, where the experimental investigation showed that the magnetic treatment could keep the scale formed in a state of suspension long enough for it to be disposed along with the brine discharge even without any treatment. Since it is well-known that the time required for the feed water to enter and exit the desalination plant is not longer than 15 minutes. From the experimental investigation, the magnetic treatment succeeded in keeping the scale suspended for 45 min for $BaSO_4$, and 20 min for $CaCO_3$. On the other hand, the magnetic treatment inhibited the $CaSO_4$ from precipitation, for only 10 min. Thus, the effect of magnetic treatment proved to be different depending on the type of scale formed. However, in general, the effect of magnetic treatment in preventing scaling species from precipitation on the inside surface of pipes cannot be ignored. The result of the experimental investigation confirmed that the magnetic treatment depended on different parameters such as the magnetic power used, type of scale tested, and the condition of water, whether stagnant or flowing. Further investigation is recommended on this regard.

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The effects of cutting methods of surface roughness of aluminum porous material produced via vacuum method

Lutfiye DAHIL, M. Serhat BASPINAR, Abdurrahman KARABULUT

Aydın Üniversitesi
Email : lutfiyedahil@aydin.edu.tr

Abstract: In this study, the surface roughness values of 3 aluminum porous materials, which were produced via vacuum method and have different porous structures, depending on the implemented cutting method after processing them were assessed comparatively. 3 different cutting methods have been implemented on each of samples, as Water Jet, Wire Erosion, and Band Saw. Setting the speed to 20 m/min, the methods were compared under same conditions. The smoothness measurement has been executed by taking the mean of 3 measurements in parallel with surface and 3 measurements in vertical to surface. By comparing the obtained results, it has been determined that the most advantageous method is the Wire Erosion method.

Keywords : Aluminum porous material, Pore, Cutting method, Surface roughness.

The Motion of Slovak Vocabulary As a Reflection of Society Development After Year 1989

Janka Píšová

Department of Slovak Language and Literature, Faculty of Arts, University of St. Cyril and Methodius, Slovakia
janka.pisova@gmail.com

Abstract: Vocabulary belongs to the most flexible part of the language and it often changes and evolves together with the society and nearly immediately reacts on the movement is society system and mirrors its social, community and political relationships. Slovak language as a state language had a function in variety of state establishments. The noticeable changes in these units often had as well an influence on the Slovak language. Since the year 1989 is considered the considerable milestone change in our society, we are concentrating on the vocabulary movement before and after this period. We note the dynamics of the lexical Slovak language in the last decades, in other words the spontaneous processes direct or lead in the retreat of certain lexical units, stylistics review, semantic changes and revitalization of those units as well as the growth of new words and phrases from domestic and foreign languages.

Key words: Slovak vocabulary, vocabulary units, creation of new vocabulary units, revitalization of vocabulary units

Introduction

In general it is accepted that within the timeline language and society are interrelated systems and are interconnected by a variety of links, and therefore any change in the society reflects the changes in the language. These changes occur in social society changes and they are most obvious when it comes to vocabulary.

Vocabulary belongs to the most flexible parts of the language and it often changes and evolves together with the society and nearly immediately reacts on the movement is society system and mirrors its social, community and political relationships. This is reflected by the same lexical units with the emergence of new facts, the development of new technologies and new phenomena in politics, government and in everyday life entering the vocabulary as new members, for example. In recent decades these words have been added to lexical resources such as: internet, hardware, recycling, insulate etc. Some words on the other hand are having declining tendency when it comes to occurrence. These are, first, the terms that depicts the now non-existent realities and facts, for example: drab (beadle), panské (manor), etc. and secondly, these are the words that have been replaced by newer terms, although realities that depict them remain in society e.g.: merba (geometry), dejespyt (History) etc. Some older and decades unused words are revitalized or in other words re-introduced, for example: starosta (mayor), executor (bailiff).

Materials and Method

Slovak language as a state language had a function in variety of state establishments. The noticeable changes in these units often had as well an influence on the Slovak language. One of the major milestones in the

development of our society and, therefore in the language can be seen in November 1989. On this basis, we will provide few examples in the movement of the lexicon in Slovakia after 1989, which it will be based on the excerpted material from the dictionary of Slovak language (SSSJ, 1959 – 1968), three issue Short Dictionary of Slovak Language (KSSJ, 1987, 1997, 2003) and two volumes of the Dictionary of Contemporary Slovak language (SSJ, 2006, 2011). One great advantage of tracking the meaning of words after 1989 is the existence of special kind of dictionaries, such as analyzing ones, processing ones as they consist lexical stock, which overlaps with the period by period in History of Slovak language and it is defined as the current standard Slovak allowing to achieve, even in principle, synchronous description of the current language and has a certain temporal depth (SSSJ, 2006, p. 13). Another advantage is that the dictionaries are existing in electronic form, as well as the fact that one of the sources of the third and fourth output Short Dictionary of Slovak Language has been computerized in texts (containing material from the period of the nineties of the 20th century) and Dictionary of Contemporary Slovak language is virtually from the beginning processed as a work computer lexicography. The authors of the Dictionary are using electronic information resources from Slovak National Corpus plus they are using electronic versions of basic lexicographical works, with the help of search on the internet and Slovak websites.

Results

In the observed Glossary of the Slovak language, the radical political and social changes after 1989 are mainly reflecting the re-evaluation of lexical items which somehow reflect the ideology of the previous regime. Such examples in the lexical units after 1948 are relegated to passive vocabulary, as they were nearly fifty years not been used, but in November 1989 they got into the active vocabulary that means they were revitalized. Concrete reflection of these facts is to change the time of inclusion of these words and phrases in the interpretation of meanings and in the explanatory notes.

In KSSJ (1987) in their interpretation of every denomination holders of traditional crafts in the meaning of "samostatný živnostník" ("independent tradesman") (Pisárčiková, 1984, p. 63), the owner or lessee shall apply note "v minulosti" ("in the past"), for example. cukrár (confectioner)... person that makes or sells sweets or chocolates; "v minulosti" i samostatný živnostník; krajčír (tailor)... clothes maker "v minulosti" i samostatný živnostník. The SSJ (1959 – 1968), when these lexemes abbreviated predsoc. (pre-socialist concept) or notice pred znárodnením (before nationalization), for example hotelier (hotelier) ... a person who manages or owns a hotel (pred znárodnením), obchodník (businessman) ... predsoc. a man who works in business. The total change in socio-economic relations after 1989 and especially the emergence of various forms of private property was immediately reflected in the interpretation of these lexical units in the third and fourth editions KSSJ. Those lexical units are supplemented and revised in edition of the Dictionary without explanatory notes "v minulosti" ("in the past"), respectively. predsoc. (before nationalization). In the past SSSJ the notes draws attention to the period of the 19th and early 20th centuries.

The evaluation notes of the type v kapitalizme (of capitalism), v kapitalistickom zriadení (the capitalist establishment), v kapitalistických štátoch (in capitalist countries), v kapitalistickom hospodárstve (in the capitalist economy) and so on. occur at the SSJ at headwords, eg. bankrot (bankruptcy), detektív (detective), maklér (broker). The same remarks also found in KSSJ (1987). Although KSSJ hardly contain elements tendentious interpretations, yet reflects the period in which they arose. In such headwords not the idealized interpretation, but a realistic description of the meaning of words that are not used in the previous period, since the relevant economic phenomena operate differently and otherwise also named by (Pisárčiková, 1996, p. 132). In KSSJ (1987), the abbreviation kapit. used in interpretation passwords bankár (banker), bankrot (bankruptcy), burza (burza), kartel (cartel), nezamestnanosť (unemployment), producent (producer). Because these words, given the change in social situation and international relations, returned after 1989 again active vocabulary in KSSJ (1997, 2003) and SSSJ (2006, 2011) are given without qualifier qualifiers or admin. (administrative), fin. (financial), ekon. (economic).

Relatively large group of words and phrases in the analyzed dictionaries are forming lexical units from 50th to 80th years of the 20th century. These terms, meanings and phrases could be labeled by qualifier as historicism, as meeting the essential characteristic of historicism that named by the now non-existent realities and facts. After 1989, in connection with the already mentioned social and political changes, namely

disappeared many institutions, enterprises, organizations as well as their names, for example: bezpečnosť (the police), káder (member of the former communist structures, especially in higher positions), papaláš (higher public official, especially for socialism), pionier (member of the past Pioneer group), spartakiáda (mass workout performance), súdruh (depiction and also a greeting in the former socialistic establishment), zväzák (member of the youth union in the former Czechoslovakia in the years 1949 – 1989). While the SSJ and KSSJ (1987) when these passwords used notes v socialistickej spoločnosti (in socialist society), v socialistickom hospodárstve (in the socialist economy), etc., in the analysed editions KSSJ running off after 1989 they involve not only a change in the content of the evaluation notes, but also relieved's notes abbreviations býv. (former), v min. (in the past) or notes v bývalom socialistickom zriadení (in the former socialist establishment), za socializmu (under socialism).

The political changes after 1989 brought the release of various social conventions and allow the opening of many topics that previously were considered as social taboos or somehow circumvented or concealing. This was also reflected in KSSJ third edition (1997). Words were added to the dictionaries which were known even before 1989, but the same ideological reasons were officially not used. These are words of type eštébé (State security for a totalitarian regime); eštébák (member or associate of the State Security for the totalitarian regime); normalizácia (restoration of hard-line communism after year. 1968 in the former. Czechoslovakia; the period of the event to r. 1989); pétépé (PTP, Auxiliary Technical Battalions; unit for military service in the form of forced labor for politically unreliable citizens in the first half of the 50s), which is in the dictionary "new" as a socio-political Breaking the taboo vocabulary (Šimková, 1999, p. 126.)

Analysis headwords in dictionaries showed that compared to a spontaneous process that lead to the withdrawal of lexical items from the period 50th to 80th years of the 20th century, standing processes that enrich their vocabulary with new words and phrases. Already in the third edition KSSJ been added "new words, without which the image of contemporary literary language was not true and relatively complete" (KSSJ, 1997, p. 11). In KSSJ (2003) and SSSJ (2006, 2011), the processing of vocabulary updated with additional naming realities of domestic resources from other languages.

Among the new words and phrases as the same topics show:

names related to the field of informatics and new technologies, for example

bajt (byte), displej (display), e-mail, hardvér (hardware), softvér (software), processor (processor), formátovať (format), modem, scanner/skener, server, hacker/heker, fax, telemost (teleconference session), odkazovač (answering machine), handsfree, hi-fi, stereo, video, videokamera (video camera), videoprehrávač (video recorders), videokazeta (video cassette), volkmen/walkman (walkman), mikrovlnka (microwave);

names related to the field of sport, for example.

hetrik (hat-trick), nohejball (football), ragby (rugby), skialpinista (skialpinist), snoubording (snowboarding), snoubordista (snowboarder), triatlon (triathlon), windsurfista (windsurfer);

names in music and film, for example.

disco, metal, heavy metal, pop, pop music, rap, rock and roll, hip-hop, punk, single (single), sci-fi, western, šéfproducent (chief producer), upútavka (teaser), happening, happyend/happy end;

expressions characterizing individual garment parts, kinds of textile products, for example.

legínsy (legins), rifle (jeans), slipy (shorts), rifľovina (Denim);

expressions characterizing food and drinks, for example.

hamburger, pizza, nealko (soft drinks), neska, neskafé, preso (espresso);

names associated with the economy, banking, finance, for example.

audit, akciovka (stock company), bankomat (ATM), eseročka (limited company), etablovať (establish), hedging/hedžing (hedging), holding, konkurencieschopnosť (competitiveness), lízing (leasing), manažment (management), mikroekonómia (microeconomics), privatizácia (privatization), portfolio (portfolio), rating (rating);

names associated with the government, the organization of social and economic life, the judiciary, for example.

bezdomovec (homeless), dissent (dissent), dissident (dissident), euroskepticizmus (euroscepticism), líder (leader), lobby, lobista (lobbyist), mafián (mobster), migrant, mimosúdny (non-judicial), narkomafia (drug traffickers), normalizátor (normalizer), ombudsman, ponovembrový (the post-November), postkomunistický (postcommunists), samit/summit, samizdat, spolitizovať (politicize), totalitne (totalitarianism), vicepremiér (Deputy Prime Minister).

In some passwords were added current so called live-link-type progresívna daň (progressive tax), daň z pridanej hodnoty (value added tax), čierna diera (a black hole), ozónová diera (the ozone hole), skleníkový efekt (the greenhouse effect), kreditový system (the credit system), tvrdé drogy (hard drugs), mobilný telefón (cell phone), umelý sneh (artificial snow), also added some of the latest idioms such as type to je iba špička ľadovca (the tip of the iceberg), mať rovnakú krvnú skupinu (be on the same page, having same blood line), robiť niečo na doraz (be grinding, striving to be the best), robiť mŕtveho chrobáka (playing dead rat), (ne)vedieť, kde je sever (be out of the mind, be wired to the moon), to je gól (something surprising), slovenská hádzaná (Slovak handball; drinking alcohol); nemať ani haka/háka (be skint); tým to pre mňa hasne (it is over for me).

Conclusions

Movement in Slovakia lexicon after 1989 is characterized on one hand with the processes that leads to the withdrawal of certain units associated with the previous regime and semantic change (in increase or decrease of existing meanings of words). On the other hand is the Slovak vocabulary enriched by new words and phrases not only from domestic sources, but also from other languages (especially English) what helps the language to get more updated with new phrases and idioms.

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The Therapeutic Role of Bone Marrow-Derived Stem Cells on Some Immunological Parameters of Murine Schistosoma Mansoni

Wafaa A. Mansour[1] , Magda M. El-Mahdi[2], Olfat Hammam[1], Ibrahim Rabiaa[1], Noha A. Mehana[2], Taghreed M. Hasan[2]

[1]Department of Immunology, Parasitology & Pathology,Theodor Bilharz Research Institute

[2]Department of Zoology, Faculty of Science, Cairo University,

Abstract: Liver fibrosis due to different diseases including schistosomiasis leads to cirrhosis and finally liver malignancy. The technique of stem cells or hepatocytes transplantation has recently improved in order to bridge the time between whole-organ liver transplantation. The present study was designed to evaluate the effect of bone marrow-derived stem cells (BMSCs) on improvement of the S. mansoni-induced liver fibrosis in murine model. **Methods:** Mice stem cells were isolated from bone marrow cells harvested from the tibia and femoral marrow compartments of male mice, then cultured with and without hepatocyte growth factor (HGF) and dexamethasone for 48 hours in 5% CO_2 incubator, then transplanted into Schistosoma mansoni-infected female mice via tail injections. Mice were sacrificed monthly until the third month of bone marrow transplantation, serum was collected. Liver histopathology and immuno-histochemistry were detected for identification of liver fibrosis and to evaluate changes of granuloma size and number. Also, hydroxiproline, collagen and OV-6 cells were detected for identification of newly formed hepatocytes. Worm burden and egg load were evaluated. The sry gene that was used as the Y chromosome marker was detected in liver tissue from the Schisto-BMSCs groups and Schisto-BMSCs-HGF groups. Albumin concentration, ALT, AST and alkaline phosphatase were assayed. The cytokines correlates positively with tissue fibrosis through inducing fibrogenic effect (IL-2, IL-10, TNF-α and IFN-γ) and also nitric oxide were analyzed in serum. **Results**: There was no significant change in the mean total number of worm burden in mice groups received BMSCs supplemented with HGF and the group received only BMSCs, but a significant reduction ($P < 0.05$) in the intestinal egg load was recognized. Sections of stem cells treated groups revealed appearance of fewer fibrocellular granulomas than the infected control groups, and significant decrease in their number and area was recognized. Histopathological examination showed that BMSCs were differentiated into hepatocyte-like tissue after HGF treatment. Serum ALT, AST and ALP were markedly reduced in the group of mice treated with BMSCs than in the BM-untreated control group. Collagen and hydroxiproline contents showed marked decrease after the third month of treatment with BMSCs. On the other hand, the expression of OV-6 cells increased detecting the presence of newly formed hepatocytes after BMSCs treatment. Treatment of S. mansoni infected mice with BMSCs and BMSCs-HGF induced significant decreases in the level of IL-2 only at the 3rd month post treatment (PT) compared to its level in the infected control group, whereas the level of IL-10 in the treated groups showed significant increase at the 1st and 2nd month PT compared to that of the infected control group. Reduction in level of IFN-γ as well as TNF-α in comparison to the infected controls was detected in both BMSCs and BMSCs-HGF treated groups. Increase in NO level in comparison to control healthy animals was detected in treated groups. **In conclusion,** BMSCs transplantation into Schistosoma mansoni infected mice found to restore liver function, decrease granuloma size and number, improve liver cytokines levels in serum and reduce liver fibrosis. So,the curative action of stem cells would be considered as a potential strategy for future liver treatment, including malignant liver.

Key words: Bone-marrow, Stem cells, Hepatocytes, Liver fibrosis, Transplantation, Malignant liver, Granuloma, OV-6, IL-2, IL-10, TNF-α, IFN-γ, Collagen, Albumin, ALT, AST, ALP.

Introduction

Amongst the tropical diseases caused by parasites, schistosomiasis ranks second only to malaria as a cause of catastrophic worldwide morbidity and mortality **(Bica et al., 2000; WHO, 2002)**. Schistosomiasis is considered one of the major public health problems in rural Egypt **(El-khoby et al., 1998)**. Schistosomiasis is an important cause of hepatic fibrosis. The key event in Schistosomiasis mansoni is the formation of granulomas around eggs trapped in the portal venules of the liver tissue**,** the eggs release a variety of substances of which some are toxic to host tissues whereas others are antigenic, leading to antigen-specific humoral and cell mediated immune responses which is a complex patho-physiological cascade event which terminates in fibrosis and portal hypertension **(Phillips and Colley, 1978; Ghanem el al., 2010)**. Serum ALB level is reduced due to S. mansoni infection when fibrosis lead to suppression of transaminase activity. Serum ALB level as an indicator of liver function **(Salama et al. 2010),** is reduced due to schistosomiasis infection and also, the initial cytokines generated is critical for the development of long-lasting adaptive immunity mediated by T cells and depend on the stage of infection. It was found that interleukin-2 was stimulating differentiation and activation of T-cells (Weinstock, 1992). Also, it appeared to play an important role in the generation of Schistosome eggs induced granulomas (Fidel and Boros, 1990). Interleukin-10 was reported to be the key factor in preventing the polarization towards a Th1 or Th2 profile (Pyrrho et al., 2002). The down-regulation of egg induced pathology in schistosomiasis by IL-10 is due to the inhibition of accessory and T-cell secretion of inflammatory cytokines such as TNF-α, IFN-γ, IL-2, IL-3, IL-6, IL-8, lymphotoxin, and IL-12 (MooMorris et al., 1994; Flores et al., 1996). Immuno-modulated granulomas have been shown to display elevated IFN-γ levels (Grzych et al., 1991) and an exogenous IFN-γ has been found to suppress fibrosis in schistosome infected mice (Czaja et al., 1989). Tumor necrosis factor-α has been reported to play an important role in the granulomatous response and is one of the earliest cytokines released during an inflammatory response (Boros, 1993), and neutralization of TNF-α with polyclonal antibodies resulted in a reduction in granuloma size during the acute stage of S. mansoni infection (Joseph and Boros, 1993). So, these cytokines play distinct roles in granuloma formation and hepatic fibrosis depending on the particular cytokine milieu in which it is expressed **(Hoffmann et al., 1998).**

Collagen is a group of naturally occurring proteins; it is the main protein of connective tissue and making about 25-35 % of the whole body protein content **(Pan el al., 2010)**. Excessive production of collagen has been documented in proliferate disorders such as liver cirrhosis. In other clinical situations such as tissue repair and wound healing, the overproduction and deposition of collagen are required to heal the damaged tissues. Fibrosis results when the rate of collagen synthesis is higher than that of collagen degradation (Chen et al., 2002). It can lead to impairment of liver function, development of hepatocellular carcinoma and portal hypertension with all its associated complications (Bhat and Bhat, 2008). Hydroxyproline is an essential amino acid component of collagen. The amount of collagen could be estimated by determining the content of Hyp and could be used to reflect the extent of fibrosis **(Hanauska, 2003; Lai et al., 2009)**.

Hepatic progenitor oval cells (OV) cells were mentioned to express stem cell factor (SCF) indicating a potential hematopoietic origin. Oval cells have lineage options similar to those displayed by hepatoblasts in early stages of liver development. In patients with extensive chronic liver injury or submissive hepatic necrosis, regenerative structures have been identified by cells with the morphological appearance and immuno-histochemical markers consistent with OV cells **(Xiao et al., 2003)**.

Treatment of hepatic fibrosis and cirrhosis are limited to remove the causative agent **(Fang et al., 2010)**. Cell therapy has emerged as a novel approach for the treatment of many human degenerative diseases. Cell-based regenerative strategies aimed to replace, repair or enhance the biological function of damaged tissues or organs by utilizing cells and bioactive molecules to trigger, enhance, support and complement the residual capacity for repair. Transplantation is a highly successful treatment for end stage cirrhosis with a 75% five years survival rate. As a result, effective anti-fibrotic treatment is

urgently needed. So, cell therapy has emerged as a novel approach for many liver diseases **(Fang et al., 2010)**.

Stem cells were reported to have a potential role to support tissue regeneration, requiring minimally invasive procedures with few complications. They have recently shown promise in cell therapy because they have the capacity for self-renewal, multilineage differentiation, and are applicable to human diseases (**Salama el al., 2010**). Transplanted BMSCs reported to give rise to hepatocytes and exert significant influence on hepatic architecture according to **Abdel Aziz el al. (2012)**. Therefore, it can significantly improve the liver functions of patients with terminal liver diseases (as albumin, ALT, AST, ALP), with good safety and effectiveness.

Materials and Methods

Experimental Animals and Parasites:

Ninety sixth female BALB/c mice aging 6-8 weeks and weighting 20-22 g, were divided into four groups (24 mice/group). Group A contained normal uninfected control mice which had injected intravenously with saline; group B were infected subcutaneously with S. mansoni cercariae (obtained from infected Biomphalaria alexandrina snails) and not subjected to BM inoculation, group C and D were infected with cercariae and subjected to treatment with BMSCs (one million cell/mouse) alone and BMSCs in combination with 2 µg/ml HGF, respectively on their 8^{th} week post-Schistosoma infection, BMSCs were derived from male BALB/c mice by peripheral injection route.

Eight animals from each group were sacrificed after the first, second and third month post treatment and their livers were subsequently processed for histological and immuno-histological examinations. Blood samples were also taken individually for sera preparation, the sera were taken individually and kept at -20°C until used for immunological and liver function examinations.

Isolation, Culture and Purification of BMSCs:

Treatment with BMSCs:

Isolation, Culture, Purification and Inoculation of BMSCs:

BMSCs were harvested from BM of the femurs and tibiae of donor male BALB/c mice according to **El-Khafif et al. (2010)**, then cells were flushed with serum free media, vortexed, then filtered. After that the solution was centrifuged and the supernatant was decanted and 10% lysing buffer (Bio Whittaker) was added to get rid of RBCs then incubated on ice, after that centrifuged. The pellet was suspended in complete media, and then divided into two aliquots, 2µg/ml HGF with dexamethasone (Koma Biotech) was added to one of them. Finally, the cells were incubated for 48 hrs at 37^{o}C under 5% CO_2 for pre-stimulation of BMSCs. The cells viability was measured after 48 hr incubation and counted using haemocytometer under graduated microsope (BOECO, Germany). Then, a single intravenous inoculation of one million male unfractionated BMSCs was applied per each S. mansoni infected mouse of **group C** on the 8^{th} wk post infection. Also, another single inoculation with the same number of unfractionated BMSCs supplemented with HGF was injected intravenously into the S. mansoni infected mice of **group D** on the 8^{th} wk post infection.

PCR Detection of Male Derived BMSCs:

Isolation of DNA:

The presence of donor-derived Deoxy ribonucleic acid (DNA) in liver tissue was analyzed after BMSCs transplantation in mice of all studied groups. Genomic DNA was prepared from liver tissue homogenate of the mice in each group using the acid guanidinium thiocynate-phenol-chloroform extraction methods (Sigma). The presence or absence of the sex determination region on the Y chromosome male (sry) gene in recipient female mice was assessed by Polymerase chain reaction (PCR) accordimg to **Innis et al (1990)**. The reaction was done in PTC100^{TM} system (MJ, USA), using PCR-reagent kits from (Bio Basic Inc, Markham Ontario, Canada).

Parasitological Parameters:

Worm Burden: Adult worm load (Hepatic and intestinal) was harvested by a perfusion technique previously described by **Duvall and De Witt. (1967).**

The number of worms, sex , or couple were determined. They were counted in a round bottomed plate either by direct visualization or under a stereomicroscope as described by **Kloetzel (1967).**

The degree of protection or the percent reduction in challenge was calculated by comparing the number of worm recovered from each group of mice with their respective controls, using the formula:

$$\text{Protection \%} = \frac{\text{Mean worm (control group)} - \text{Mean worm (test group)}}{\text{Mean worm (control group)}}$$

Tissue Egg Load (Liver and Intestine):

At the time of perfusion, livers and pieces of small intestine were collected to find out the number of eggs per gram (EPG) of tissue (liver or intestine) according to the method described by **Cheever (1968).**

Hepatic Histopathology and Immunohistochemistry Parameters:

Liver specimens were fixed in 10% formalin, processed to paraffin blocks and sectioned at 4-mm thickness. Sections were stained with Hematoxylin and eosin stain (H&E) to study the hepatic morphological changes and hepatic schistosomal fibrosis.

Measurement of Granuloma Diameter:

Liver tissue lesions from 5-6 animals were measured for each group. Measurements were done only for granulomas containing a single egg in their center. The mean granuloma diameter (MGD) was obtained in microns by measuring two diameters of the lesion at right angles to each other with the help of an ocular micrometer. The count was done under the light microscope. The MGD of each liver granuloma obtained in microns by dividing the sum of the measured vertical and transverse diameters of the lesion by two. The mean diameter of all lesions measured was then calculated for each group **(Mahmoud and Warren, 1974)**. According to **Boros and Warren (1970)**, lesion counts between 50 to 100 were taken into consideration. Then the percent suppression of MGD/treated group was calculated.

Measurement of Granuloma Number:

Granuloma count was carried out at low power of magnification (10x10) of serial tissue section of more than 250 μm a part in all fields of liver sections. The mean number of granuloma was calculated for each mouse. The mean was calculated for each experimental group from the mean values of the individual mice. Granuloma structural configuration, including cellular components and associated histopathological changes was also studied according to **Mohamed el al. (2008)**.

Sirius Red Staining for Collagen:

The collagen content of the liver sections stained with Picrosirius Red was evaluated quantitatively for the percentage areas of collagen using Computerized Cell Image Analysis. Collagen fibers within the squares of the ocular reticule were counted at x200 magnification as described by **Junqueira el al. (1979)**.

Detection of OV-6 in Hepatic Tissue Using Immunohistochemical Technique:

The presence of transplanted BMSCs in the liver tissue was analyzed by staining OV cells using a biotinylated anti-OV-6 antibody followed by universal diaminobenzidine tetrahydrochloride (DAB) immunostaining detection kit.

Liver Function Parameters:

Determination of Serum Albumin Concentration:

Formation of albumin/bromcresol-green complex at pH 4.2 and photometric measurement of the absorbance were detected by the Biodiagnostic kits.

Determination of Serum Aminotransferase Enzymes (ALT, AST):

The alanine aminotransferase (ALT) and aspartate aminotransferase (AST) activities were determined in serum using Biodiagnostic kit.

Determination of Serum Alkaline Phosphatase (ALP) Activity:
ALP was determined in serum using Biodiagnostic test kit.
Determination of Hydroxyproline Content:
The total collagen present in the liver was determined by estimating Hydroxyproline (Hyp) content using base hydrolysis for the dissolution of tissue according to **Pinlaor et al (2009)**.

Immunological Parameters:
Enzyme Linked Immunosorbent Assay (ELISA) (Engvall and Perlmann, 1971):
Serum murine IL-2, IL-10, TNF-α and IFN-γ levels were measured using ELISA kits (www. Koma Biotech.com). Pre-coated 96 wells ELISA microplates with IL-2, IL-10, TNF-α and IFN-γ were washed 3 times by 300 µl/well washing solution, after the last wash, the plates were inverted on paper towel to remove any residual solution. 100 µl/well of 1µg/ml standard or sample in sterile water were added in duplicate, sealed and incubated 2 hr at RT. The wells were aspirated to remove any residual solution, then washed 4 times using 300 µl/well washing solution, after drying the plate wells, all wells were incubated for 2 hr at RT in 100 µl/well of detecting antibody (0.25 µg/ml) IL-2, TNF-α or IFN-γ or 0.5 µg/ml IL-10 then sealed. 100 µl/well colour development enzyme (1:200) in diluent was added and then the plates were sealed, incubated for 30 min. After washing 4 times by washing buffer, 100 µl/well stopping solution was added after the proper color development. The absorbance was read spectrophotometrically at 450 nm with a Benchmark reader (Bio-Rad Laboratories Inc., Hercules, Calif.). The cytokine concentration was obtained from a regression curve prepared with the help of microplate Manger software (Bio-Rad).

Determination of Nitric Oxide level:
The determination of total NO is based on the enzymatic conversion of nitrate to nitrite by nitrate reductase . Nitric oxide concentration was determined using the Griess reaction **(Tracey et al., 1995)** with modification.

Statistical Analysis:
The statistical analysis was performed using the SAS, ver.9.2 software program. Data were summarized as mean (M) ± standard error (SE) for values and percentages. For comparison more than two groups, the analysis of variance, ANOVA test was used. Comparison between percentages was calculated by the chi-square test. Significant differences between means were determined by Duncan Post Hoc test. $P < 0.05$ implies statistically significance.

Results
In the present study, the therapeutic effect of BMSCs in regeneration of liver in S. mansoni infected mice was performed by assessment of parasitological, histopathological, immunological, biochemical and immunohistochemical criteria.

Parasitological Parameters:

Worm Burden:
The mean number of total worm burden was calculated for each studied group as showed in **Table (1).** At the 1st and 3rd month PT with BMSCs, the mean total number of worm burden was reduced non-significantly with a percent of 13.8% and 15.9% respectively, related to the infected control group. While, the group of mice treated with BMSCs supplemented with HGF showed a significant reduction ($P < 0.05$) in the mean total number of worm burden with a percentage of 19% and 28.3% respectively, related to the infected control group. The mean number of total worm burden in mice treated with BMSCs only and BMSCs in combination with HGF 2nd month PT reduced non-significantly with a percentage of 11.8% and 16.8% respectively, related to the infected control group.

On the other hand, there was no significant change in the mean total number of worm burden in mice group received BMSCs supplemented with HGF compared to the group received only BMSCs through the three months PT.

Table 1: Mean of total number of worm burden in S. mansoni infected, BMSCs and BMSCs-HGF treated groups.

Months PT	Animal groups	M±SE	PR
	Normal		
1st month	Infected	26.25±0.9[a]	
	BMSCs	22.63±1.3[ab]	13.8
	BMSCs-HGF	21.25±1.9[b]	19
	Normal		
2nd month	Infected	20.13±1.2[a]	
	BMSCs	17.75±1.87[a]	11.8
	BMSCs-HGF	16.75±1.4[a]	16.8
	Normal		
3rd month	Infected	16.50±1.3[a]	
	BMSCs	13.88±1.6[ab]	15.9
	BMSCs-HGF	11.83±1.1[b]	28.3

,Data are expressed as M±SE, the symbols a and b represents significance where $P < 0.05$ (Means with different letter are significantly different).

Ova Count:

A significant decrease ($P < 0.05$) in the mean number of eggs/g of liver and intestine was detected after the 1st, 2nd and 3rd month PT with BMSCs as compared to infected control groups **(Table 2**).

At the 1st month, treatment of mice with BMSCs induced a significant decrease ($P < 0.05$) in the number of hepatic egg load with a percent reduction (PR) of 19% compared to infected control group. The group of mice treated with BMSCs supplemented with HGF showed a significant reduction ($P < 0.05$) in the mean number of egg load with PR 19.5% compared to the infected control group.

At the 2nd and 3rd month PT, the number of total hepatic egg load in mice treated with BMSCs reduced significantly ($P < 0.05$) with a percentage of 23.7% and 27.7% respectively, related to the infected control group. On the other hand, the mean total number of egg load in mice received BMSCs supplemented with HGF showed a significant decrease ($P < 0.05$) with PR of 24% and 27.4% at the 2nd and 3rd month PT respectively, related to the infected control group.

Accordingly, treatment with BMSCs showed a significant reduction ($P < 0.05$) in the intestinal egg load represented by 23.3%, 26.2% and 36.4% at the 1st, 2nd and 3rd month PT respectively, related to the infected control group. Also, treatment with BMSCs supplemented with HGF showed a significant reduction ($P < 0.05$) represented by 23.4%, 25.9% and 36.5% respectively, after the 1st, 2nd and 3rd month PT related to infected control group.

There was no significant change in the number of eggs/g of tissue (liver and intestine) in mice received BMSCs supplemented with HGF compared to mice received only BMSCs in all periods PT.

Table 2: Effect of BMSCs and BMSCs-HGF on the number of ova/g tissue (liver and intestine) of S. mansoni infected mice.

		Number of ova/gm tissue (liver and intestine)			
Months PT	Animals groups	Liver	PR	Intestine	PR
	Normal				
1st month	Infected	9850±58.79[a]		18600±86.74[a]	
	BMSCs	7975±35.36[b]	19	14275±71.04[b]	23.3
	BMSCs-HGF	7925±62.53[b]	19.5	14250±72.88[b]	23.4
	Normal				
2nd month	Infected	9475±60.54[a]		18350±12.96[a]	
	BMSCs	7225±56.34[b]	23.7	13550±44.48[b]	26.2
	BMSCs-HGF	7200±37.25[b]	24	13600±45.98[b]	25.9
	Normal				
3rd month	Infected	9300±60.19[a]		17650±10.23[a]	
	BMSCs	6725±36.37[b]	27.7	11225±44.49[b]	36.4
	BMSCs-HGF	6750±38.13[b]	27.4	11200±52.99[b]	36.5

Data are expressed as M±SE, the symbols a and b represents significance where $P < 0.05$ (Means with different letter are significantly different).

Hepatic Histopathology and Immunohistochemistry Parameters:

Examination of liver tissue of mice groups received BMSCs (C) and BMSCs in combination with HGF (D) showed marked improvement. Sections of treated groups revealed appearance of fewer fibrocellular granulomas than the infected control groups. The miracidia were degenerated in many of these granulomas. Amelioration of pathological changes in these groups was improved by the decrease in the number and area of scattered inflammatory cells **(Plates 1, 2 and 3)**.

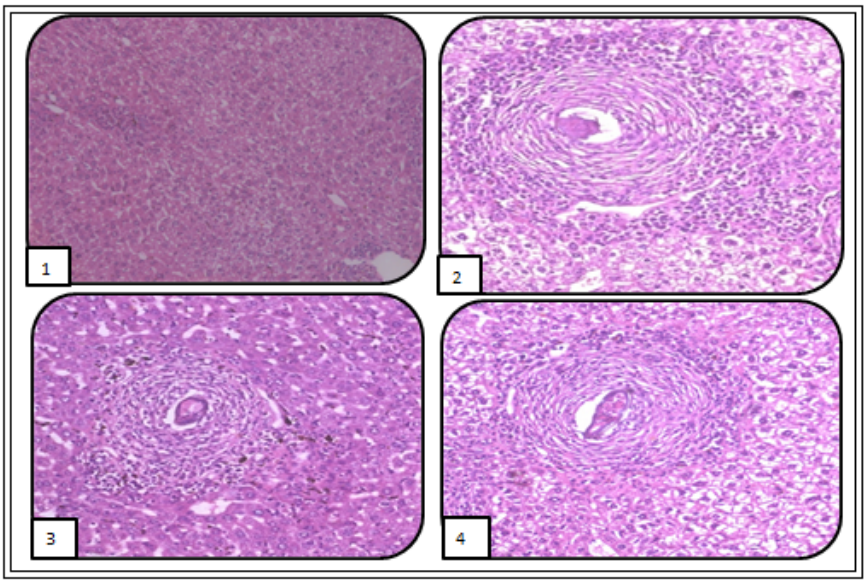

Plate (1)

Fig. 1: Liver tissue section of **normal uninfected negative control** mice with normal liver architecture and normal hepatocytes (H&E x200).

Fig. 2: Liver tissue section of mice **infected** with *S. mansoni* (60 cercaria/mouse) at the 12 wk PI showing large fibrocellular granuloma in the portal tract with living miracidium in the center surrounded by large number of lymphocytes, eosionphils, epithelial cells, pigmented macrophages, plasma cells and collagen bundles (H&E x200).

Fig. 3: Liver tissue section of **BMSCs** recipient female mice at the 1st month PT showing regressive medium fibrocellular granuloma in the portal tract with dead ovum in the center surrounded by large number of lymphocytes, eosionphils, epithelial cells, pigmented macrophages, plasma cells and collagen bundles (H&E x200).

Fig. 4: Liver tissue section of **BMSCs-HGF** recipient female mice at the 1st month PT showing regressive medium fibrocellular granuloma in the portal tract with dead ovum in the center surrounded by large number of lymphocytes, eosionphils, epithelial cells, pigmented macrophages, plasma cells and collagen bundles (H&E x200).

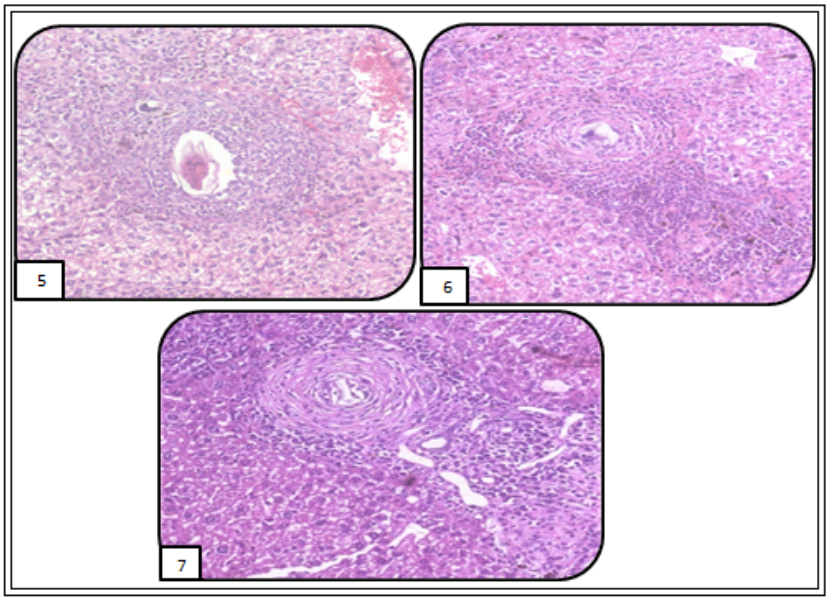

Plate (2)

Fig. 5: Liver tissue section of mice **infected** with *S. mansoni* (60 cercaria/mouse) at the 16 wk PI showing large fibrocellular granuloma with living miracidium in the center surrounded by large number of lymphocytes, eosionphils, epithelial cells, pigmented macrophages, plasma cells and collagen bundles (H&E x200).

Fig. 6: Liver tissue section of **BMSCs** recipient female mice at the 2nd month PT showing small fibrocellular granuloma with dead and degenerated ovum in the center surrounded by medium number of lymphocytes, eosionphils, epithelial cells, pigmented macrophages, plasma cells and collagen bundles (H&E x200).

Fig. 7: Liver tissue section of **BMSCs-HGF** recipient female mice at the 2nd month PT showing small fibrocellular granuloma with dead and degenerated ovum in the center surrounded by medium number of lymphocytes, eosionphils, epithelial cells, pigmented macrophages, plasma cells and collagen bundles (H&E x200).

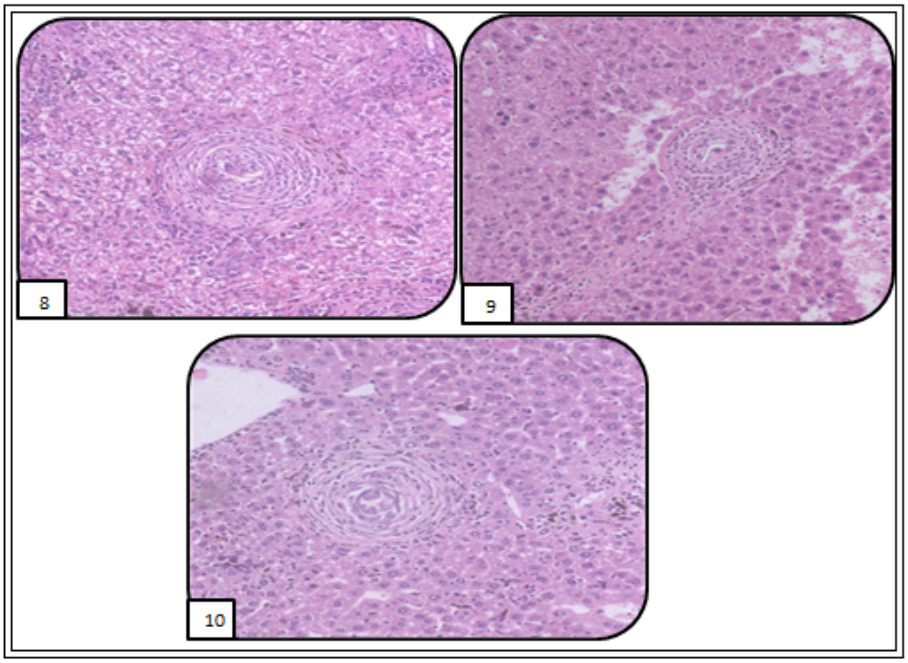

Plate (3)
Fig. 8: Liver tissue section of mice **infected** with *S. mansoni* at the 20 wk PI showing large fibrocellular granuloma with living miracidium in the center surrounded by few number of lymphocytes, eosionphils, epithelial cells, pigmented macrophages, plasma cells and collagen bundles (H&E x200).
Fig. 9: Liver tissue section of **BMSCs** recipient female mice at the 3rd month PT showing small fibrocellular granuloma with dead and degenerated ovum in the center surrounded by few number of lymphocytes, eosionphils, epithelial cells, pigmented macrophages, plasma cells and collagen bundles (H&E x200).
Fig. 10: Liver tissue section of **BMSCs-HGF** recipient female mice at the 3rd month PT showing small fibrocellular granuloma with dead and degenerated ovum in the center surrounded by few number of lymphocytes, eosionphils, epithelial cells, pigmented macrophages, plasma cells and collagen bundles (H&E x200).

Effect of BMSCs and BMSCs-HGF Treatments on the Mean Number and Diameter of Hepatic Granuloma:

The mean granuloma count in treated groups with BMSCs and BMSCs-HGF revealed a marked reduction accompanied by reduction in the mean granuloma number and diameter as shown in **Table (3)**.

Table (3): Effect of mice treatment with BMSCs and BMSCs-HGF on mean hepatic granuloma diameter and number.

Months PT	Animal groups	No. of granuloma M±SE	PR	MGD (µm) M±SE	PR
	Normal				
1st group	Infected	22.8±0.66[a]		281.2±12.7[a]	
	BMSCs	19±2.68[a]	16.7	205.58±8.6[b]	26.9
	BMSCs-HGF	17.4±1.75[a]	23.7	204.28±7.4[b]	27.4
	Normal				
2nd group	Infected	19.8±0.73[a]		272.95±12.5[a]	
	BMSCs	12.4±1.4[b]	37.4	162.51±7.6[b]	40.5
	BMSCs-HGF	11.6±0.51[b]	41.4	160.49±7.3[b]	41.2
	Normal				

3rd group	Infected	16.6±3.22[a]		260.74±16.5[a]	
	BMSCs	5.6±0.8[b]	66.3	100.56±4.9[b]	61.4
	BMSCs-HGF	5.4±0.8[b]	67.5	108.49±10.9[b]	58.4

Data are expressed as M±SE, the symbols a and b represents significance where P<0.05 (Means with different letter are significantly different).

Months PT	Animal groups	Optical density of red stained collagen	PR
	Normal	-	
1st month	Infected	14.23±0.83[a]	
	BMSCs	5.78±0.64[b]	59.38
	BMSCs-HGF	4.88±1.27[b]	65.71

Collagen Content as Determined by Morphometric Image Analysis (Plates 4, 5 and 6):

The paraffin sections of mice liver were stained with Sirius red and the sections were examined microscopically to determine the effects of BMSCs treatment and BMSCs-HGF on the collagen content after S. mansoni infection through the periods of the experiment. The histo-pathological examination of liver tissue sections showed that BMSCs and BMSCs-HGF treatment have a marked antifibrotic effect as evidenced by the decrease in red staining compared to the S. mansoni infected control group **(Table 4).**

Table 4: Effect of BMSCs and BMSCs-HGF treatment on the morphometric analysis of S. mansoni infected and treated groups.

	Normal	-	
2nd month	Infected	12.32±0.73[a]	
	BMSCs	1.71±0.53[b]	86.12
	BMSCs-HGF	1.66±0.47[b]	86.53
	Normal	-	
3rd month	Infected	9.84±1.05[a]	
	BMSCs	1.25±0.06[b]	87.3
	BMSCs-HGF	0.85±0.18[b]	91.4

Data are expressed as M±SE, the symbols a and b represents significance where $P < 0.05$.
(Means with different letter are significantly different).

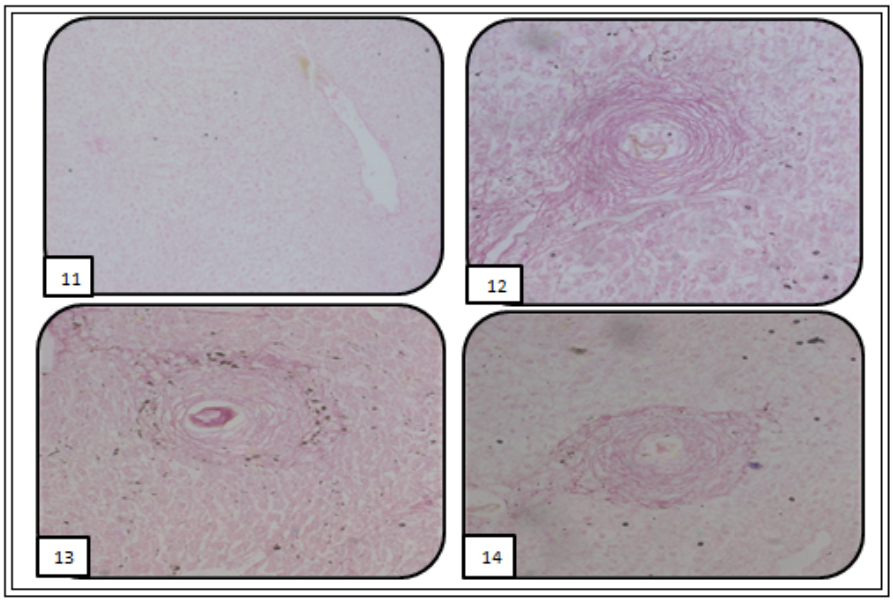

Plate (4)
Fig. 11: Liver tissue section of **normal uninfected negative control** mice (Sirius Red x200).
Fig. 12: Liver tissue section of **infected control** mice at the 12th wk PI showing a large fibrocellular granuloma surrounded by pink-red dense collagen bundles (Sirius Red x200).
Fig. 13: Liver tissue section of **BMSCs** recipient female mice at the 1st month PT showing a medium fibrocellular granuloma with red-stained concentric collagen bundles (Sirius Red x200).
Fig. 14: Liver tissue section of **BMSCs-HGF** recipient female mice at the 1st month PT showing a characteristic medium fibrocellular granuloma surrounded by red-stained dense collagen bundles (Sirius Red x200).

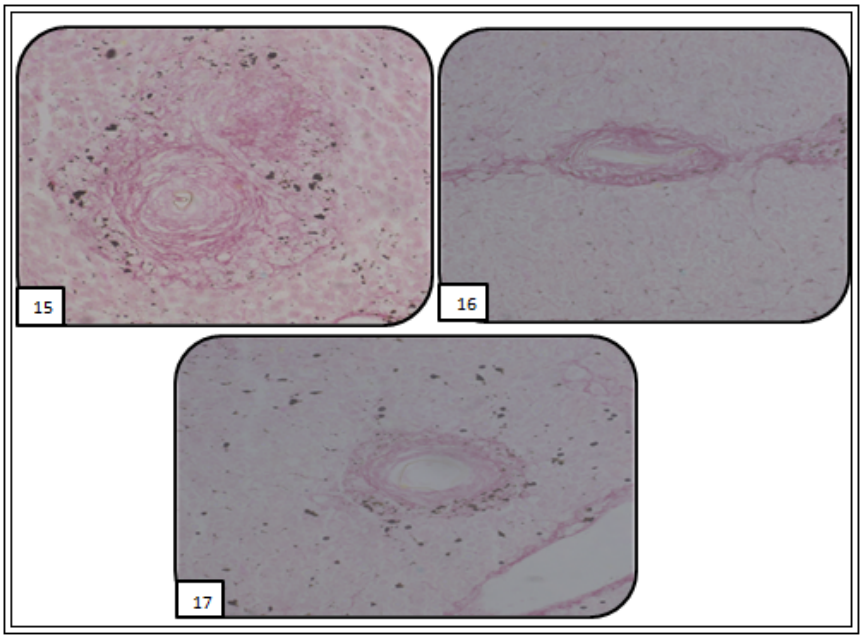

Plate (5)
Fig. 15: Liver tissue section of **infected control** mice at the 16th wk PI showing a medium fibrocellular granuloma surrounded by red-stained concentric collagen bundles (Sirius Red x200).
Fig. 16: Liver tissue section of **BMSCs** recipient female mice at the 2nd month PT showing a small fibrocellular granuloma surrounded the parasite's ovum with scattered concentric red-stained collagen bundles (Sirius Red x200).
Fig. 17: Liver tissue section of **BMSCs-HGF** recipient female mice at the 2nd month PT showing a small fibrocellular granuloma surrounded the parasite's ovum with concentric red-stained collagen bundles (Sirius Red x200).

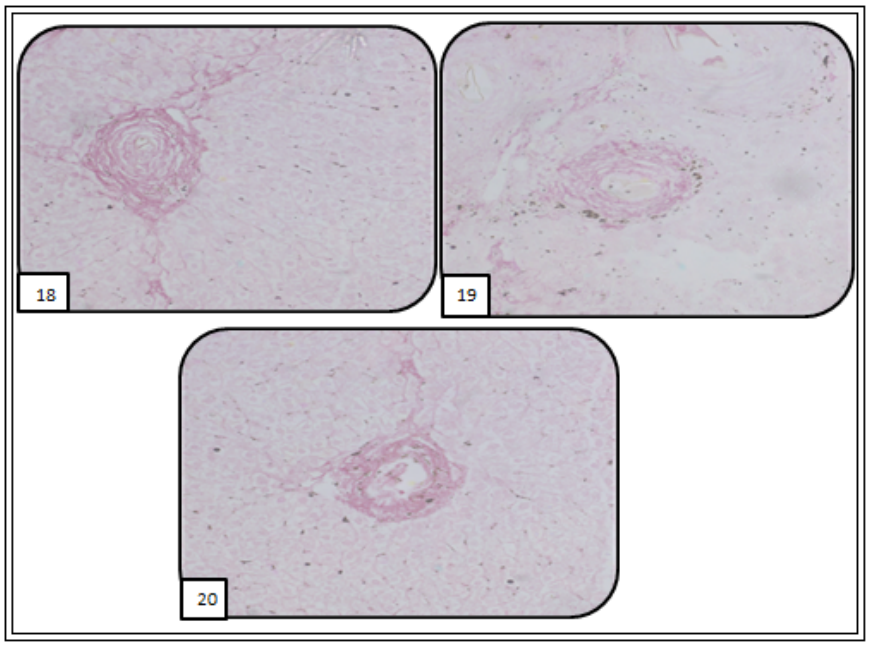

Plate (6)
Fig. 18: Liver tissue section of **infected control** mice at the 20th wk PI showing a characteristic large fibrocellular granuloma surrounded the parasite's ovum with dense red-stained collagen bundles (Sirius Red x200).
Fig. 19: Liver tissue section of **BMSCs** recipient female mice at the 3rd month PT showing a diminished fibrocellular granuloma surrounded the parasit's ovum with scattered concentric red-stained collagen bundles (Sirius Red x200).
Fig. 20: Liver tissue section of **BMSCs-HGF** recipient female mice at the 3rd month PT showing a diminished fibrocellular granuloma surrounding the parasit's ovum with scattered concentric red-stained collagen bundles (Sirius Red x200).

Detection of OV-6 in Hepatic Tissue Using Immunohistochemical Technique:

The presence of OV cells in liver sections of normal, S. mansoni infected mice and treated with BMSCs and BMSCs supplemented with HGF was detected immuno-histochemically using monoclonal anti-mouse OV-6 antibody as a marker for newly formed hepatocytes differentiated from BMSCs. Normal uninfected negative control and S. mansoni infected control mice showed negative expression of OV-6 in hepatocytes and granuloma cells.

At treatment with BMSCs only and BMSCs in combination with HGF, positively stained hepatocytes with brown colour appeared indicating the presence of newly formed hepatocytes. As the period after treatment with BMSCs increases, the expression of OV-6 in hepatocytes increased. The greatest increase in the expression of OV-6 was recorded in hepatocytes of mice treated with BMSCS at the 3rd month PT. The staining of cells occurs intercalated between mouse hepatocytes and around granulomas presents either singly or in clusters **(Plate 7, 8 and 9)**.

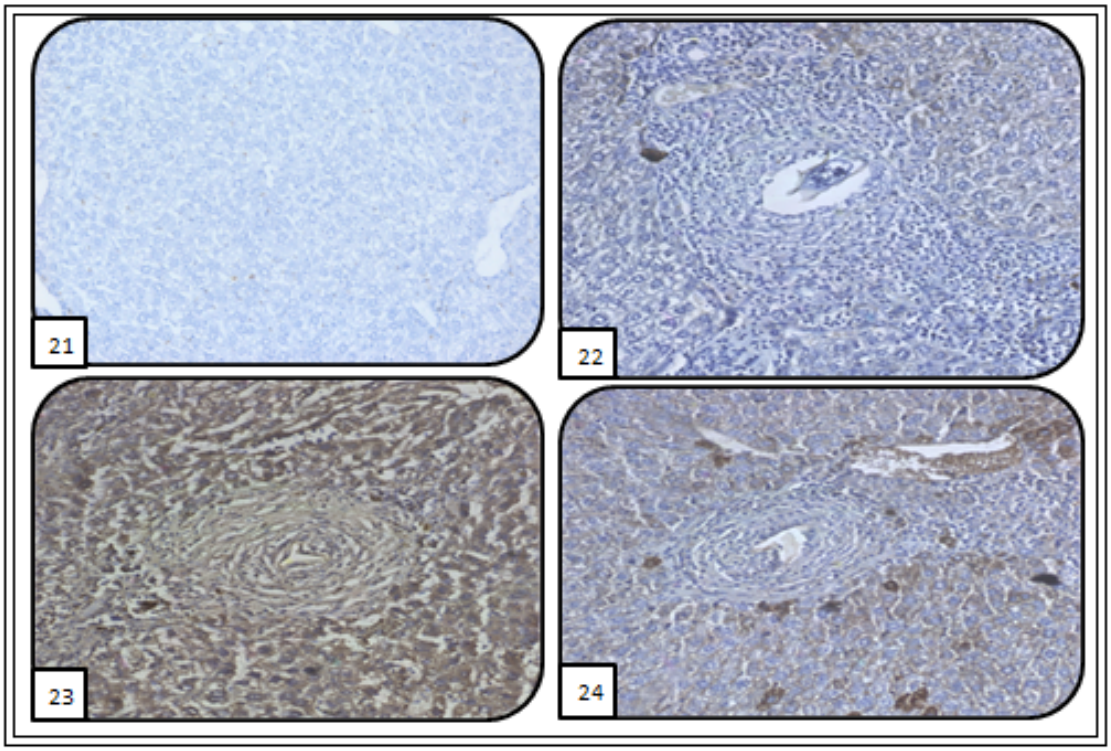

Plate (7)

Fig. 21: Immunostain for OV-6 antibody (DAB, x200) in liver section of **normal uninfected negative control** mice showing negative expression for OV-6 monoclonal antibody.

Fig. 22: Immunostain for OV-6 antibody (DAB, x200) in liver section of **infected control** mice at the 12 wk PI showing negative expression of OV-6 monoclonal antibody in hepatocytes and granuloma cells.

Fig. 23: Immunostain for OV-6 antibody (DAB, x200) in liver section of **BMSCs** recipient female mice at the 1st month PT showing markedly mild expression of OV-6 monoclonal antibody (as cytoplasmic brown colour) in hepatocytes like cells and granuloma cells.

Fig. 24: Immunostain for OV-6 antibody (DAB, x200) in liver section of **BMSCs-HGF** recipient female mice at the 1st month PT showing mild expression of OV-6 monoclonal antibody (as cytoplasmic brown colour) in hepatocytes like cells and granuloma cells.

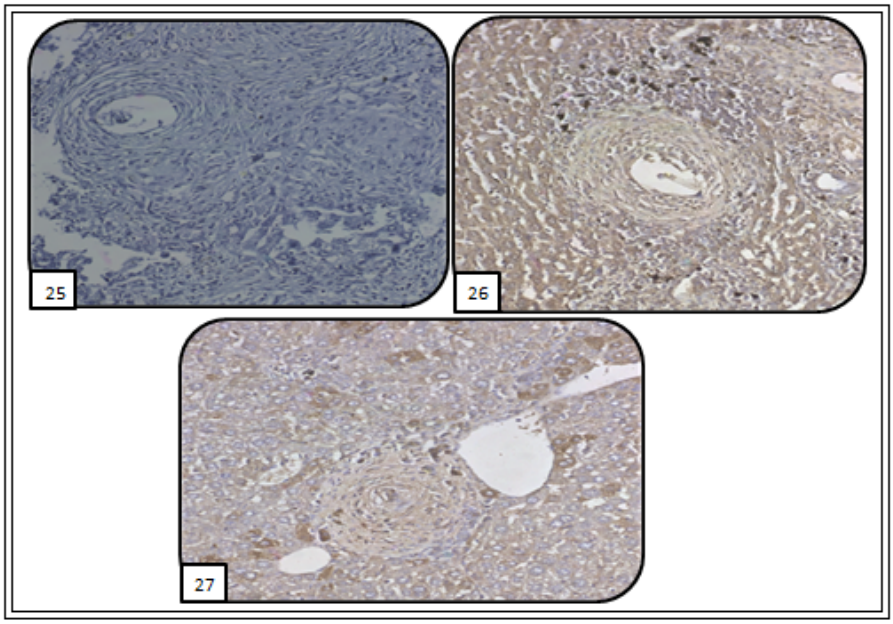

Plate (8)

Fig. 25: Immunostain for OV-6 antibody (DAB, x200) in liver section of **infected control** mice at the 16 wk PI showing negative expression of OV-6 monoclonal antibody in hepatocytes and granuloma cells.

Fig. 26: Immunostain for OV-6 antibody (DAB, x200) in liver section of **BMSCs** recipient female mice at the 2nd month PT showing marked and mild expression of OV-6 monoclonal antibody (as cytoplasmic brown colour) in hepatocytes like cells and granuloma cells.

Fig. 27: Immunostain for OV-6 antibody (DAB, x200) in liver section of **BMSCs-HGF** recipient female mice at the 2nd month PT showing moderate expression of OV-6 monoclonal antibody (as cytoplasmic brown colour) in hepatocytes like cells and granuloma cells.

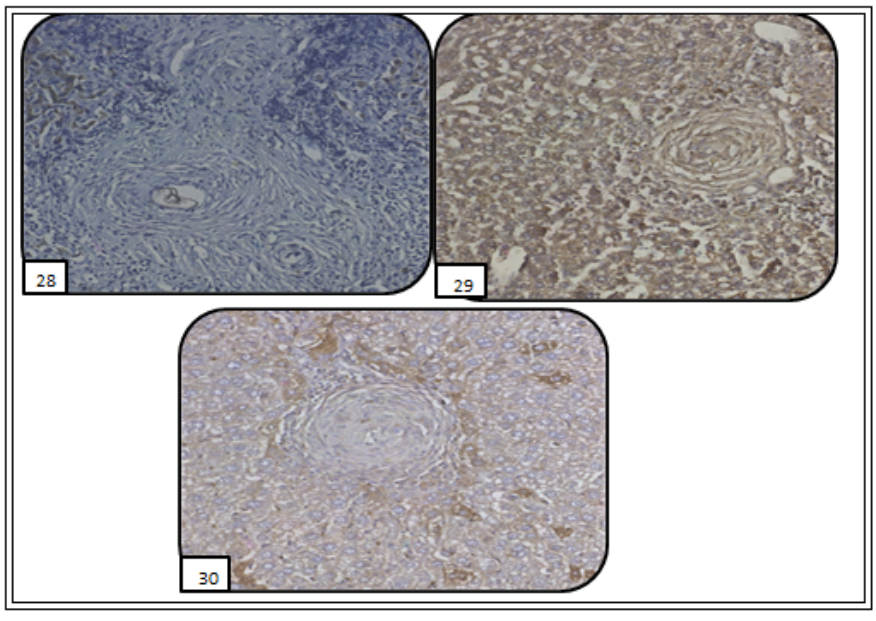

Plate (9)

Fig. 28: Immunostain for OV-6 antibody (DAB, x200) in liver section of **infected control** mice at the 20 wk PI showing negative expression of OV-6 in hepatocytes and granuloma cells.

Fig. 29: Immunostain for OV-6 antibody (DAB, x200) in liver section of **BMSCs** recipient female mice at the 3rd month PT showing marked and mild expression of OV-6 monoclonal antibody (as cytoplasmic brown colour) in hepatocytes like cells and granuloma cells.

Fig. 30: Immunostain for OV-6 antibody (DAB, x200) in liver section of **BMSCs-HGF** recipient female mice at the 3rd month PT showing moderate expression of OV-6 monoclonal antibody (as cytoplasmic brown colour) in hepatocytes like cells and granuloma cells.

Liver Function Parameters:

The performance of the liver was monitored by the serum level of liver proteins and enzymes as presented in **Table (5).**

At the 1st month PT, both groups treated with BMSCs only and BMSCs supplemented with HGF showed non-significant increases in serum albumin (ALB) concentration related to the infected control group. At the 2nd and 3rd month PT, the ALB concentration in sera of mice treated with BMSCs and BMSCs supplemented with HGF increased significantly ($P<0.05$) compared to the infected control group.

At the 1st month PT with both BMSCs only and BMSCs supplemented with HGF, there were significant reductions ($P<0.05$) in both ALT and ALP activities, whereas, this reduction was non-significant in serum AST activity related to the infected control group. At the 2nd and 3rd month PT, the activities of ALT, ALP and AST in sera of mice treated with BMSCs and BMSCs supplemented with HGF was reduced significantly ($P<0.05$) in relation to that of the infected control group.

Table (5): Effect of treatment of mice with BMSCs and BMSCs-HGF on serum concentration of liver albumin (ALB) and activities of ALT, AST and ALP.

Months PT	Animal groups	ALT (GOT) U/L	AST (GPT) U/L	Alkaine phosphatase IU/L (ALP)	Albumin (ALB) g/100 ml
	Normal	46.7±0.46^{c}	45.44±1.61^{b}	65.51±2.1^{c}	3.28±0.14^{a}
1st month	Infected	62.51±2.33^{a}	72.81±2.89^{a}	178.08±3.52^{a}	2.75^{b}
	BMSCs	56.43±1.83^{b}	69.73±1.86^{a}	161.33±6.67^{b}	2.81±0.1^{b}
	BMSCs-HGF	56.16±2.29^{b}	69.54±2.18^{a}	161.61±5.9^{b}	2.82±0.33^{b}
	Normal	46.7±0.46^{b}	45.44±1.61^{c}	66.65±2.43^{c}	3.28±0.13^{a}
2nd month	Infected	65.63±2.82^{a}	67.33±1.36^{a}	128.69±5.31^{a}	2.56±0.13^{b}
	BMSCs	50.63±1.1^{b}	57.53±1.9^{b}	100.93±4.61^{b}	2.96±0.06^{a}
	BMSCs-HGF	50.34±0.53^{b}	57.34±1.5^{b}	100.76±3.8^{b}	2.96±0.095^{a}
	Normal	46.7±0.46^{b}	45.44±1.61^{b}	65.56±1.65^{b}	3.28±0.13^{a}
3rd month	Infected	69.3±2.19^{a}	63.81±2.1^{a}	110.55±4.89^{a}	2.23±0.05^{b}
	BMSCs	49.29±0.85^{b}	49.93±1.39^{b}	56.88±2.05^{bc}	3.11±0.1^{a}
	BMSCs-HGF	49.23±1.14^{b}	49.81±1.21^{b}	55.81±2.4^{c}	3.12±0.1^{a}

Data are expressed as M±SE, the symbols a and b represents significance where $P < 0.05$.
(Means with different letter are significantly different).

PCR detection of male-derived BMSCs:

The sry gene that was used as the Y chromosome marker was detected in liver tissue from the Schisto-BMSCs groups and Schisto-BMSCs-HGF groups, but not in the control infected or normal uninfected negative control groups as showed in **Fig (1).**

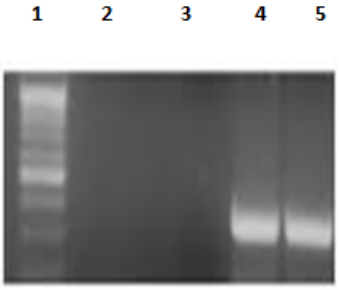

Figure 1: UV transilluminated agarose gel of PCR products of sry gene. Lane 1: PCR marker, lane 2: Normal group, lane 3: Infected group, lane 4: BMSCs treated group, Lane 5: BMSCs-HGF treated group.

Immunological Parameters:

IL-2, IL-10, TNF-α and IFN-γ levels in serum:

The cytokines levels in sera of all mice groups were quantified after the 1st, the 2nd and the 3rd month PT by ELISA as shown in **Table (6).**

Table(6): Effect of BMSCs and BMSCs-HGF on IL-2, IL-10, TNF-α and IFN-γ level in sera of S. mansoni infected and treated groups.

Months PT	Animal groups	IL-2	IL-10	TNF-α	IFN-γ
	Normal	59.56±0.4^{b}	239.45±28.26^{b}	390.37±48.8^{b}	129.23±14.6^{b}
1st month	Infected	292.51±80.1^{a}	581.55±62.03^{b}	1312.88±130.92^{a}	382±85.39^{a}
	BMSCs	298.32±89.82^{a}	925.51±75.12^{a}	1086.04±119.48^{a}	319.24±83.93^{ab}
	BMSCs-HGF	163.74±27.35^{ab}	905±56^{a}	1037.09±151.08^{a}	287.96±69.87^{ab}
	Normal	60.05±0.6^{b}	268.13±29.13^{c}	377.43±33.66^{c}	124.69±15.09^{b}
2nd month	Infected	221.1±42.47^{a}	539.65±64.12^{b}	1427.45±78.86^{a}	1065.03±151.34^{a}
	BMSCs	178.17±8.15^{ab}	605.12±55.61^{a}	985.84±204.2^{b}	176.23±41.72^{b}
	BMSCs-HGF	156.78±25.48^{ab}	726.21±34.34^{a}	782.87±117.26^{b}	185.4±48.82^{b}
	Normal	59.82±0.43^{c}	246.03±28.37^{c}	380.8±40.36^{a}	127.11±16.93^{b}
3rd month	Infected	209.73±28.92^{a}	513.43±49.67^{a}	962.28±397.4^{a}	1484.12±104.62^{a}
	BMSCs	138.14±20.56^{b}	696.06±31.86^{a}	682.44±107.57^{a}	140.36±20.5^{b}
	BMSCs-HGF	125.41±13.8^{b}	572.19±41.17^{a}	654.92±79.87^{a}	140.23±17.12^{b}

Data are expressed as M±SE, the symbols a, b and c represents significance where $P < 0.05$.
(Means with different letter are significantly different).

Determination of Nitric Oxide level:

Schistosoma mansoni infection showed in the study a great influence on NO production as noticed from **Fig. (2).** The mean reduction of NO levels in BMSCs ± HGF treated groups were shown in the figure.

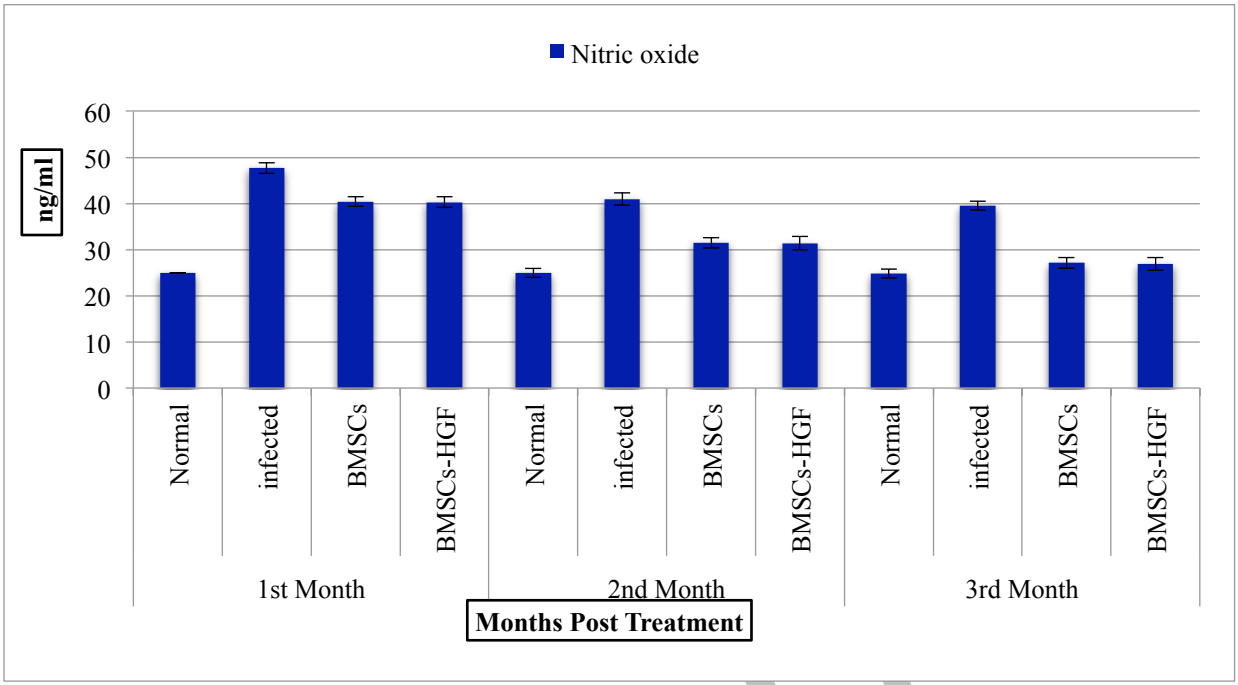

Fig. 2: Effect of BMSCs and BMSCs-HGF on serum nitric oxide level of S. mansoni infected mice in different studied groups.

Determination of Hydroxyproline Content:

The efficacy of treatment with BMSCs on protection of the liver against fibrosis was evaluated by using a quantitative method to determine the hepatic content of Hyp. After treatment with BMSCs only and BMSCs supplemented with HGF, the liver Hyp content was reduced significantly ($P < 0.05$) at all months PT in relation to the infected control group. The decrease in Hyp content was gradually until reaching normalization at the third month PT as shown in **Fig. (3)**.

To evaluate the efficiency of treatment using BMSCs, the PR rate of Hyp content was calculated. The mean reduction of Hyp content in BMSCs groups were 32.9%, 69.9% and 84.78% respectively, after the 1st, 2nd and 3rd month PT related to the infected control group. Also, the mean reductions of Hyp content in BMSCs supplemented with HGF groups were 32.89%, 69.87% and 84.75% respectively, after the 1st, 2nd and 3rd month PT compared to the infected group.

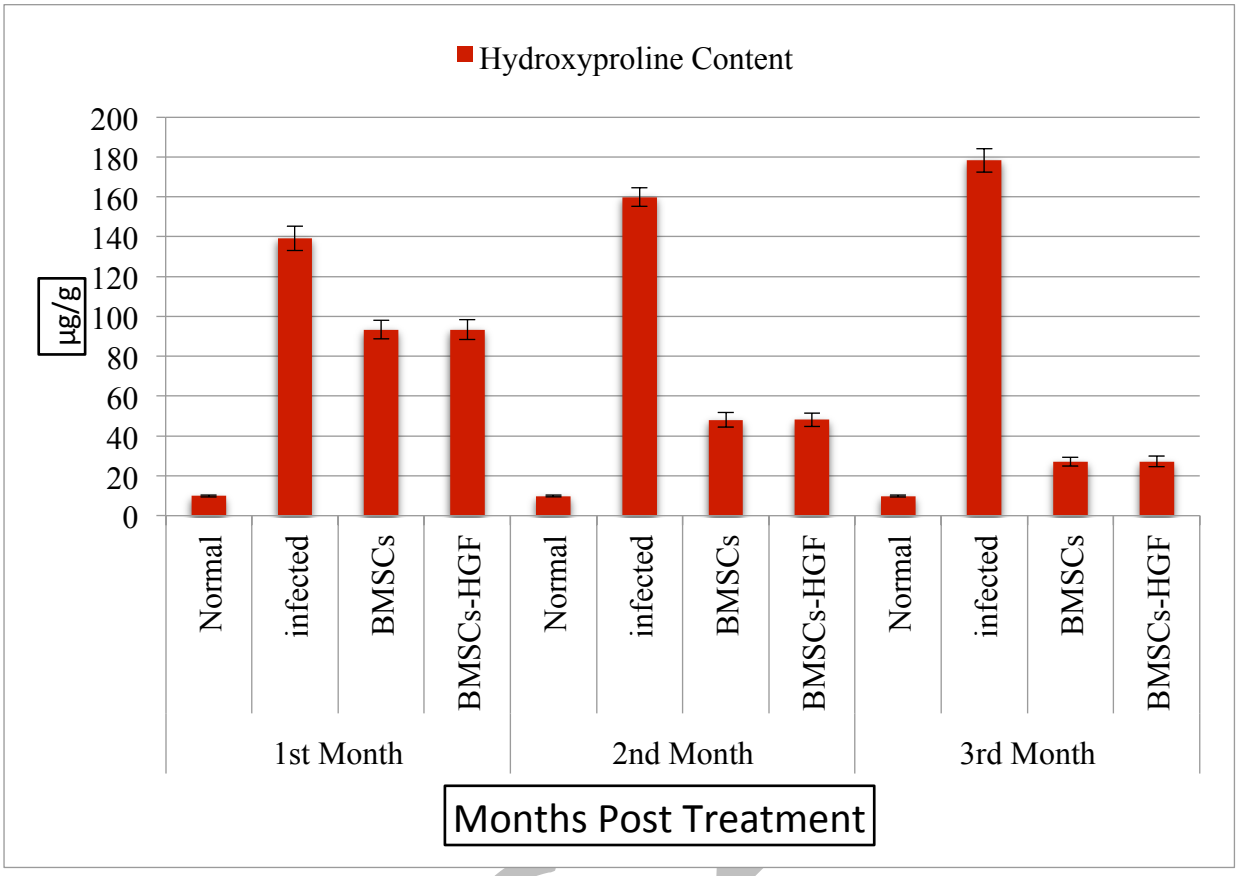

Fig.(3): Effect of BMSCs and BMSCs-HGF on liver hydroxyproline content of S. mansoni infected mice in different studied groups.

Discussion

Schistosomiasis is a wide spread chronic helminthic infection contributes to the death of over half a million people yearly. Schistosoma induced liver disease associated with granulomatous inflammation constitutes the most prevalent disease among Egyptians. This disease is characterized by disorganized proliferation of hepatocytes, excessive scarring and excessive collagen deposition which leads to chronic liver failure. So, chronic schistosomiasis was selected as an experimental model of chronic liver disease which allows evaluation of stem cell migration to sites of damage and their subsequent contribution to repair and survive **(Ghanem el al., 2010)**.

This study was intended to demonstrate the fate of murine BMSCs after inoculation into murine diseased liver, in an attempt to set an experimental model of in vivo hepatocyte differentiation from bone marrow-derived stem cells (BMSCs).

Previous studies revealed that the intensity of schistosomal infection which represented by the worm burden and egg count increase the degree of liver fibrosis and granulomatous reaction **(El-Lakkany el al., 2004)**. The number of granulomas correlated with the severity of disease. As granulomas develop in response to egg deposition in the tissue, it can be possible to assess the amount of eggs retained in liver and intestine **(Ghanem el al., 2010)**. This is in agreement with the present histopathological finding of schistosomal liver which confirmed by increased number and diameter of granuloma, liver and intestinal eggs and extensive accumulation of fibrous tissues.

In this study, the transplanted BMSCs were detectable in the liver by "sry" gene analysis only in the mice groups infected with S. mansoni and after granulomas formation they treated with both BMSCs and BMSCs-HGF. This indicates that liver injury is required for BMSCs migration to the liver. Sry gene positive analysis result provided evidence of successful transplantation and migration of BMSCs and BMSCs-HGF to liver of the experimental S. mansoni infected mice. This result are in agree with

El-khafif et al. (2010), who stated that the murine schistosomiasis model showed the importance of liver injury as a selective pressure as observed nearly no donor Y chromosome in control liver of mice transplanted with BMSCs in the absence of hepatic schistosomiasis infection. According to **Zheng and Liang (2008)**, about 10% Y chromosome positive hepatocytes occurred in the damaged liver after three months post BMSCs transplantation after diethylnitrosamine (DEN) induction.

After treatment with BMSCs alone or in combination with HGF, there was an improvement in the histopathological picture of liver which appeared in diminution in number and diameter of granulomas accompanied with a reduction in the fibrotic content. Similar to the present finding, a study of **Abdel Aziz el al. (2012)**, who focused on the antifibrotic effect of MSCs on liver of S. mansoni infected mice. In his model, once the granulomas formed around the S. mansoni ova, the rate of spontaneous change of the collagen content of the granuloma is low, thereby providing a relatively stable in vivo model for analyzing collagen turnover. The histopathological examination of the liver of the S. mansoni infected mice showed characteristic granuloma, which were cellular and contain thick collagen bands. After MSCs infusion, the granulomas decreased in size and number and become less cellular, although the concentric fibrous bands were still discernible. In this study, the extent of fibrosis was estimated by the quantitative morphometric analysis of collagen content in Sirius red stained liver sections. The results revealed significant decrease in collagen content after treatment with BMSCs alone or in combination with HGF.

Hydroxyproline is an amino acid found almost exclusively in collagens. The alteration of Hyp levels in liver is considered as an index of collagen metabolism and provided valuable information about the biochemical and pathologic events of hepatic fibrosis. Determination of the content of liver Hyp is regarded as a good method to quantify fibrosis and to evaluate the effectiveness of new potentially antifibrotic agents **(Dong et al., 2009)**. **Sakaida et al. (2004)**, investigated the effect of BMSCs transplantation on mice with liver fibrosis induced by CCl_4 administration. The mice showed significantly reduced liver fibrosis as assessed by Hyp content in the livers. Liver fibrosis in response to S. mansoni infection in the current study was documented by marked increase in the level of liver Hyp in group of infected mice versus normal healthy animals. Similar result was obtained by **Metwally (2006) and Mohamed, et al. (2008),** who emphasized that elevated liver Hyp content was associated with S. mansoni infection and this may be attributed to that S. mansoni egg granulomas contain factors responsible for the elevation of free liver Hyp content in the fibrotic liver. In the present study, After cell therapy with BMSCs only and BMSCs-HGF, the significant reduction of liver Hyp content related to control infected mice appeared to indicate antifibrotic effects of these cells and their effective role in reducing granuloma formation which is associated with liver fibrosis.

Oval cells are hepatic precursors of hepatocytes and bile duct cells. **Petersen el al. (1999**), stating that OV cells originated from BMSCs. In a study carried out by **Oliveira el al. (2008)**, it was reported that transplanted BMSCs migrated to granuloma areas caused an increase in the number of OV cells which were mainly found in periportal areas of the hepatic lobe. The results of the current study showed that OV cells constituted the dominant forms of newly formed cells observed in the grids of the stem cells treated group. Negative reaction for OV-6 marker was noticed in the liver sections of either normal uninfected negative control groups or the infected untreated groups.

According to **Chen et al. (2006)**, the transplanted cells take part in the immune regulation of the liver causing the modulation of fibrosis and cytokines production. Cytokines are believed to modulate the amount of fibrosis and granuloma size and to play a fundamental role in the pathology of schistosome infection **(Aly et al., 2010).** In the present study, treatment of S. mansoni infected mice with BMSCs and BMSCs-HGF induced significant decreases in the level of IL-2 only at the 3rd month PT compared to its level in the infected control group, whereas the level of IL-10 in the treated groups showed significant increase at the 1st and 2nd month PT compared to that of the infected control group. Interleukin-10 is an important immuno-regulatory cytokine in acute schistosomiasis **(Wynn et al., 1998a)**. It has an important role in the modulation of Th2 immune response in chronic patients and this cytokine is the key factor in avoiding an increase in disease morbidity **(Aly et al., 2010)**.

The present study demonstrated that, the mean granuloma size in animals treated with BMSCs only and BMSCs-HGF have shown significant decrease, probably due to the high levels of IL-10 induced

by treatment. This observation is in accordance with that of **Franchimont et al. (1999)**, who showed that administration of exogenous IL-10 resulted in reduction of granuloma size. Furthermore, an opposite effects was seen in IL-10 deficient mice **(Wynn et al., 1998)**. Also, human studies have suggested a pivotal role for IL-10 in the modulation of the immune response in chronic schistosomiasis **(Montenegro et al., 1999)**. **Teixeira-Carvalho et al. (2008)** reported a clear increase on the number of IL-10 cells as the major putative regulatory event controlling morbidity during chronic schistosomiasis.

Hoffman et al. (1998), stated that IFN-γ and TNF-α appears to play an important role in generation and maintenance of egg-induced granuloma. The diminished focal and systemic production of IFN-γ and TNF-α may be implicated in the down-modulation of the granulomatous response **(Hassanein et al., 1999)**. **Singh et al. (2004)** stated that the decrease of the gene expression of TNF-α and TGF-β few months following successful treatment of S. mansoni infected mice, was correlated with resorption of liver fibrous tissue **(Rabia et al., 2010)**. Interferon-γ is known to limit Th2 cytokine dependent events **(Wilson et al., 1999)** and can augment macrophage functional activity by promoting the production of TNF-α. Also, IFN-γ was shown to play an anti-inflammatory role in egg induced lesion formation **(Wynn et al., 1995)**. Previous studies showed that IFN-γ could suppress hepatic fibrosis in schistosome infected mice **(Czaja et al., 1989)**. So, IFN-γ emerged as a central mediator because depleting of this cytokine alone exerted the most dramatic effects on pathology while simultaneously decreasing the expression of the other cytokines **(Hoffmann et al., 1998)**. TNF-α behaved in a manner similar to IFN-γ, acting as a key macrophage activating cytokine. It regulates IL-2 receptor expression leading to enhanced IL-2 mediated T cell response **(Shalaby et al., 1988)**, and IL-2 has been suggested to enhance TNF production **(Joseph and Boros, 1993)**.

Tumor necrosis factor-α has a crucial role in the modulation of granulomatous reaction induced by the eggs **(Joseph and Boros, 1993; Haseeb et al., 2001)**. Increased level of this inflammatory cytokine after egg excretion may an indication of its effect in complications of schistosomiasis, it capable of inducing tissue injury and fibrosis through inducing reactive oxygen species production, collagen synthesis, other fibrogenic risk factors and inhibiting MMPs production, the key enzyme in the degradation of collagen. Chronic exposure to TNF-α was found to be associated with high risk of periportal fibrosis, ascites accumulation and splenomegaly (**Mohamed et al., 2008)**. **Pulavendran et al. (2010)**, reported that the low level of TNF-α in the MSCs treated group clearly demonstrate the down regulation of pro-inflammatory cytokines by BM-MSCs. Also, in the present study the protective effect induced by BMSCs only and BMSCs-HGF manifested by reduction in level of IFN-γ as well as TNF-α in comparison to the infected controls, showing the pronounced reduction of granuloma diameter. Those results indicated that the previously mentioned cytokines play an important role in the regulation of inflammatory granulomatous response of schistosomiasis.

It was reported that nitric oxide plays a unique role in liver, and its involvement in a verity of hepatic processes (**Brunet et al., 1999),** and the majority of cells found in the liver are able to produce NO under adequate stimulation and a balance between NO and other inflammatory cytokines and mediators (such as TNF-α, IFN-γ, reactive oxygen species) is crucial in determining its effect on the host. It was mentioned that NO has a functional role during schistosomiasis, At the onset of egg deposition when the host immune response is characterized by the production of Th1 cytokines **(Sher et al., 1991)** and NO may act in limiting hepatocyte damage caused by the arrival of eggs in the liver. With the induction of the Th2 response stimulated by the parasite eggs themselves, the Th1 response is down-regulated and NO is no longer required to protect hepatocytes. Also, NO can induce oxidative stress and inflect tissue injury **(Harrison, 2002**). On the other hand, the production of NO was found to be associated with the elevated level of TNF-α in response to the activation of Th1 cells as an early response to parasitic infection **(Mohamed et al., 2008).** The direct toxicity of NO is enhanced by reacting with superoxide radical to give powerful secondary toxic structure and causes lipid peroxynitrite which is capable of oxidizing cellular structure causing lipid peroxidation **(El-Sokkary et al. 2002; Eboumbou et al. 2005)**, that process leads to membrane damage and correlates positively with tissue fibrosis through inducing fibrogenic cytokines and increase collagen synthesis.

In the present study, serum NO level increased in comparison with healthy control groups. After BMSCs and BMSCs in combination with HGF treatment, there was a significant reduction near to normalization after the third month post treatment.

Schistosoma mansoni infection resulted in a hepato-cellular injury, which in turn leads to release of the enzymes from the injured hepatic cells into blood circulation **(Hanna el al., 2003)**. In this regard, serum biochemical profiles in terms of ALT, AST, ALP and ALB provided supportive evidence to the pathological alterations observed in response to schistosomal infection. Amino-transferases are considered as marker enzymes for cell toxicity and their elevated level in serum give an additional support for S. mansoni cytotoxicity. In consistent with previous studies, the present study showed that the inflammatory reactions induced in livers of S. mansoni infected mice are ensured by liver dysfunction reflected by elevated level of serum ALT, AST and ALP. This observed high relative concentration of ALT and AST in serum is attributed to the hepato-cellular damage resulting from egg deposition where the transaminases level showed an intimate relationship to cell necrosis and/or increased cell membrane permeability to discharge of the enzyme to blood stream **(El-Rigal and Hetta, 2006)**.

In the present study, supplementation of BMSCs effectively ameliorated the above serum marker levels characteristic of schistosomal hepatopathy and the best results were observed at the 3rd month PT. Schistosoma mansoni infection caused hypo-albuminemia in mice and this phenomenon occurs simultaneously to the increase in collagen deposition and could be associated with the decrease in albumin mRNA **(Saber el al., 1983**).

Also, the present results are in accordance with **Abdel-Rahim el al. (1990)**, who reported that the low serum ALB level reflected an impaired protein synthesis due to liver destruction of parenchymal liver cells. The same results were also reported by **Mahmoud el al. (2002),** who found significant reduction in ALB level due to S. mansoni infection.

After treatment with BMSCs, or BMSCs-HGF, the present results revealed significant increases in serum ALB level at the 2nd and 3rd month PT in both groups as compared to the infected control group reaching normalization at the 3rd month PT. The autologous transplantation of BMSCs may be differentiate into hepatocytes, restore serum ALB and suppress transaminase activity and liver fibrosis in the present experimental model of liver injury. Also **Salama el al. (2010),** demonstrated that there were borderline significant improvements in the serum ALB level of the transplanted group compared to the control group at the end of the 6th month PT.

Mohsin el al. (2011), showed that the significant reduction in ALP serum level was observed in experimental animals transplanted with pretreated MSCs compared to the control. Level of ALP serum has been used previously as indicator of improved liver function.

Pulavendran el al. (2010), found that increase in ALB and decrease in ALT and AST levels in the serum are indicative of normalization of liver function by MSCs treatment. The reversal of the functional parameters of fibrotic liver could be either due to prevention of apoptosis of parenchymal cells or inhibition of proliferation and infiltration of inflammatory cells. In agree with the present results, **Abdel Aziz el al. (2012),** induced that BM-MSCs infused intravenously, localized to the liver and resulted in improvement of liver functions. Also, **Sakaida el al. (2004)**, investigated the effect of BMSCs transplantation on mice with liver fibrosis induced by CCl_4 administration. Four weeks after BMSCs transplantation, the mice showed significantly reduced liver fibrosis as assessed by improvement of liver functions, such as ALB and bilirubin levels and prothrombin time.

In conclusion, generally BMSCs infusion significantly enhanced hepatic regeneration and alleviated hepatic fibrosis in a S. mansoni induced fibrotic liver model and has therapeutic effects which appeared in reduction of immnuo-pathology, granuloma formation and hepatic fibrosis related to S. mansoni infection. Also, this infusion could generate new hepatocytes to improve the function of residual hepatocytes. Therefore, autologous BMSCs transplantation may be considered as a curative or supportive therapy for liver disorders.

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Ti6Al4V Biyomedical Sac Malzemenin Şekillendirme Sınır Diyagramının (ŞSD) Deneysel Olarak Elde Edilmesi

Osman ANKET [*], Şemsettin VAROL [1], Selahattin TUNCER [2]

[*] Dr.Maj., Gulhane Military Medical Faculty, ANKARA,
oanket@gata.edu.tr

[1] Gulhane Military Medical Faculty, ANKARA,
svarol@gata.edu.tr

[2] Gulhane Military Medical Faculty, ANKARA,
stuncer@gata.edu.tr

Özet: Ti6Al4V en yaygın kullanılan titanyum alaşımıdır. Bu alaşım, % 6 alüminyum, % 4 vanadyum, % 0.25 (maksimum) demir, % 0.2 (en fazla) oksijen ve geriye kalanı titanyum olan kimyasal bileşime sahiptir. Ti6Al4V ağırlığına göre dayanımı yüksek bir malzemedir. Korozyon direnci ise oldukça iyidir. Mükemmel biyo-uyumluluğa sahiptir. Ti6Al4V doku ve kemik ile direk temas gereken ortamlarda kullanılmaktadır. Sac malzeme olarak dayanımı yüksek, hafif ve korozyon direncinin yüksek olması özellikle havacılık, uzay endüstrisinde ve gemicilik alanında aranır bir malzeme olmasını sağlamıştır.

Üretim işlemlerinde sac malzemeleri verimli olarak kullanabilmek için, şekillendirilebilirlik sınırlarının belirlendiği yeni tekniklere ve verilere ihtiyaç duyulmaktadır. Son yıllarda sac malzemelere yönelik olarak şekillendirilebilirlik sınırlarının belirlendiği yeni çalışmalar arasında "Şekillendirme Sınır Diyagramı (ŞSD)" tekniği kullanılır hale gelmiştir. Bu teknik, derin çekme ve gererek şekillendirme şartlarında sac malzemelerin sergilemiş olduğu davranışları ortaya koymak için kullanılmaktadır. ŞSD kullanılarak, çekme ve basma testleri uygulanmış sac malzemelerin davranışları değerlendirilebilmektedir. Bir malzemeye yönelik ŞSD'nin bilinmesi üretim öncesi simülasyonlar yapılması ile kullanıcılara büyük kolaylıklar sağlayacaktır.

Bu çalışmada, Ti6Al4V titanyum alaşımının şekillendirme sınır diyagramının deneysel olarak elde edilmesi amaçlanmıştır. Şekillendirme Sınır Diyagramlarının belirlenmesi ve yorumlanması, sac malzemelerin daha etkin kullanılması için yol gösterici olacaktır.

Anahtar Kelimeler: Ti6Al4V, Şekillendirme Sınır Diyagramı (ŞSD)

Giriş

Titanyum alaşımları türbin motorları, gövde uygulamaları ve uzay uygulamalarında ağırlığına göre üstün mukavemeti sebebi ile yaygın olarak kullanılmaktadır. Ti6Al4V mevcut kullanımın %80'i havacılık endüstrisi olmak üzere tüm titanyum türleri içerisinde %50 kullanıma sahip olup en çok kullanılan titanyum alaşımıdır. Bu alaşımın diğer uygulamaları ise Tıbbi protez ve bir miktar otomotiv, denizcilik ve kimya endüstrisidir. Ti6Al4V'nin piyasadaki % 95'i dövme, dökme ve toz metalurji ürünleridir. Dövme ürünlerin örnekleri içerisinde külçe, kütük, sac levha ve teller vardır (Odenberger, 2005).

Titanyum ilk olarak William Gregor tarafından 1791 yılında keşfedilmiştir. Titanyum oksitten titanyum metalini elde etmek için yüz yıldan daha fazla bir süre geçmiştir. İlk alaşım Titanyumlar 1940'ların sonunda geliştirmiştir. Ti6Al4V alaşımı piyasada bulunan titanyum alaşımları arasında en yaygın kullanılan titanyumdur. Bundan dolayı son altmış yıldır Ti6Al4V alaşımının yoğunluğunun ve özelliklerinin geliştirilmesi için çok fazla

çalışma yapılmaktadır (Leyens, 2003).

Vanadyum (V), Molibden (Mo), Niobiyum (Nb) gibi elementlerin titanyum ile karıştırılması sonucunda elde edilen alaşım titanyum alaşımı olarak bilinir. Titanyumun kapsamlı ve tercih edilmesini sağlayan güçlü özellikleri düşük yoğunluk (4,5 g/cm3), yüksek spesifik dayanım, kırılma tokluğu, yorulma dayanımı, çatlak yayılımına karşı direnç, düşük sıcaklıkta yüksek tokluk ve mükemmel korozyon direncidir (Subaşı, 2012).

Titanyuma ilave edilen alaşım elementleri α ve β dengeleyicileri olarak iki ana gruba ayrılır. A dengeleyicisi olarak bilinen Al, Sn, Ga ve Zr gibi elementler yüksek sıcaklıklarda iyi performans gösterirler. Faz dönüşüm sıcaklığını azaltan V, Mo, Nb, Ta ve Cr gibi alaşım elementleri, β dengeleyicisi olarak bilinirler. Genellikle β dengeleyici elementleri oldukça gevrek bir yapı sağlarlar. Bunların yanı sıra mekanik dayanımı, kimyasal kararlılığı, kalıplanabilirliği ve/veya tane incelmesini geliştirmek için titanyum bazlı alaşımlara sıklıkla Fe, Cu, Ni, Si ve B alaşım elementleri ilave edilmektedir (Subaşı, 2012).

Titanyum ve alaşımları, diş ya da ortopedik implant alanında 1960'lı yıllardan itibaren kullanılmaya başlanan ve kullanımı günümüze kadar hızla artan malzeme grubunu oluşturmaktadır. 1969'da titanyum diş implantlar üzerindeki ilk bulguların yayınlanması, implant uygulamaları alanında yeni bir çağın başlangıcı sayılmaktadır. O tarihten bu güne kadar bu uygulama devam etmekte ve sadece titanyum implantın şekli ve yüzey özelliklerinin değiştirilmesi yönünde çalışmalar yapılmaktadırSon zamanlarda, biyomalzemelerle sert doku arasındaki gerilim iletimi ve biyomalzemelerin kemikle birleşimi konularının önemi artmaktadır. Kemikle biyomalzeme arasında gerilim iletiminin yetersizliği kemik birleşimini meydana getirmektedir. Genel olarak, metalik biyomalzemelerin sertliği kemiğe göre daha fazladır. Biyomedikal uygulamalarda kullanılan metalik biyomalzemelerden Ti-6Al-4V ELI, paslanmaz çelikten ve Co-Cr tipi alaşımlardan daha yumuşaktır. Ancak, Ti-6Al-4V ELI kemikten daha serttir. Bundan dolayı, Amerika Birleşik Devletlerinde düşük sertliğe sahip titanyum alaşımlarının araştırılması ve geliştirilmesi üzerine çalışılmaktadır (Subaşı, 2012).

Sac metallerde presleme ile yapılan işlemlerde delme/kesme, bükme ve derin çekme olmak üzere üç teknik uygulanmaktadır. Derin çekme işlemi diğer pres tekniklerine göre daha karmaşık bir yöntem olup çekme işleminde en çok karşılaşılan kusurlar buruşma ve yırtılmadır. Hedeflenen ürün özelliklerini elde etmek için ürün kalitesini etkileyen malzeme değişkenleri (anizotropi katsyısı (r), pekleşme üsseli (n) vb.) ve işlem değişkenleri (zımba hızı, zımba ve kalıp yuvarlatma yarıçapı, baskı plakası kuvveti vb.) üzerinde çalışmalar yapılmaktadır. Yırtılma ve buruşmanın değerlendirilmesi ve sac malzemenin şekillendirilebilme sınırının belirlenmesi için kullanılan tekniklerden birisi de Şekillendirme Sınır Diyagramıdır. ŞSD üretim işleminde oluşabilecek kusurları tespit etmek ve optimizasyonun yanı sıra kalıp tasarımında avantaj sağlayan önemli bir araç olarak kullanılmaktadır (Koçar, 2013).

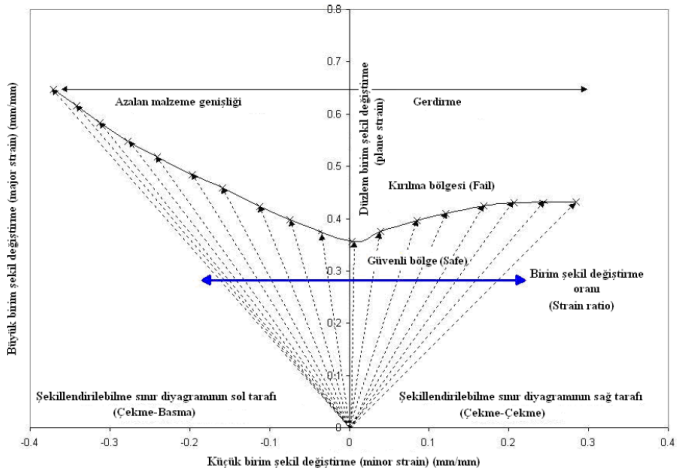
Son 50 yılda ŞSD'yi etkileyen parametrelerin belirlenmesi ve ŞSD'nin elde edilmesiyle ilgili bir çok araştırma yapılmıştır. Yapılan çalışmalar ŞSD'nin malzeme şekillendirme tahmininde önemli bir araç olduğunu ortaya koymuştur. Bununla beraber 1990'lı yıllarda Sonlu Elemanlar Metodunun (SEM) gelişmesiyle ŞSD'nın önemi daha da artmıştır. Çünkü SEM'de çözümleme için kullanılan değerlere yönelik tek eksenli çekme testi yetersiz kalmaktadır. Bunun sebebi derin çekme işleminde gerdirerek şekillendirme, bükme ve çekme işlemlerinin hepsinin bir arada bir arada olmasıdır. ŞSD'nin elde edilmesi, derin çekme işlemini daha iyi ifade ettiği için, bu diyagram verileri SEM'de daha gerçekçi sonuçlar vermektedir (Koçar, 2013).

Sac metallerde oluşabilecek üretim hatalarının kontrol edilmesi için yararlı bir teknik olan Şekillendirme Sınır Diyagramı (ŞSD), ilk olarak Keeler ve Goodwin tarafından ileri sürüldü (Lamminen, 2005).

Materyal ve Metod

Sac metal malzemelerin şekillendirilebilirliğinin sınırları genel olarak boyun vermenin (necking) başladığı noktaya göre tayin edilmektedir. Her ne kadar boyun verme noktasından sonra malzeme hemen kırılmasa bile davranışları tahmin edilemeyeceğinden dolayı boyun vermenin tespit edildiği birim sekil değiştirme değerleri sınır değer olarak kabul edilmektedir. Malzemenin farklı sekil değiştirme durumlarında şekillendirme sınırlarını büyük (major) ve küçük (minor) birim sekil değiştirme (strain) oranları cinsinden ifade eden diyagram "Şekillendirme Sınır Diyagramı (SSD)" olarak isimlendirilir (Uysal, 2005).

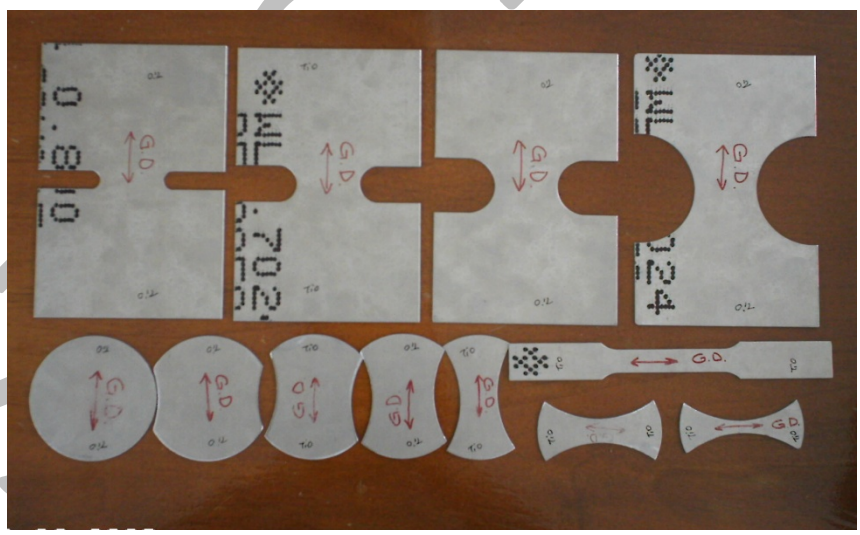
Bu diyagram basit çekme deneyinden başlayarak, düzlem birim sekil değiştirme ve iki eksenli gerdirme hallerinin hepsini kapsar. Şekillendirme sınır diyagramı çok yaygın olarak metallerin şekillendirilebilirliğini değerlendirmede ve sekil verme esnasında ortaya çıkan problemlerin analizi ve çözümlerinde yaygın olarak kullanılırlar. Bir malzemenin şekillendirme sınır diyagramı farklı geometrilerde hazırlanmış sac metal numunelerin üzerlerine özel gridler uygulanarak ve bu gridlerin sekil değiştirmeden sonraki ölçüleri analiz edilerek elde edilir (Uysal 2005). Farklı test yöntemleriyle, farklı farklı yükler altında sac malzemede meydana gelebilecek uzama durumları bir diyagram üzerinde gösterildiğinde Şekil 1'de görülen ŞSD elde edilir.



Şekil 1. Şekillendirme sınır diyagramı (Uysal, 2005).

Şekillendirme Sınır Diyagramlarının deneysel değerlendirilmesi oldukça fazla zaman almakta ve pahalı ekipman gerektirmektedir. Deneysel çalışmalar ancak başarılı sayısal simülasyonlar ile azaltılabilecektir (Pepelnjak 2007).

Üç farklı şekillendirme şartlarını ortaya koyabilmek için üç farklı deney numunesi lazer kesim ile elde edilmiştir. Su jeti ile kesme işleminde malzemede daha az deformasyonlar görülebilmektedir. Erichsen deney numunesi ile derin çekme ve gererek şekillendirme şartları, çentikli çekme deneyi numunesi ile düzlem uzama şartları ve çekme deneyi numunesi ile de derin çekme şartları oluşturularak sac malzemenin ŞSD'sinin elde edilmesi planlanmıştır. Bu numuneler Şekil 2'de görülmektedir.



Şekil 2. Çentikli deney numunesi, Erichsen deney numunesi ve çekme deneyi numunesi [Anket, 2011].

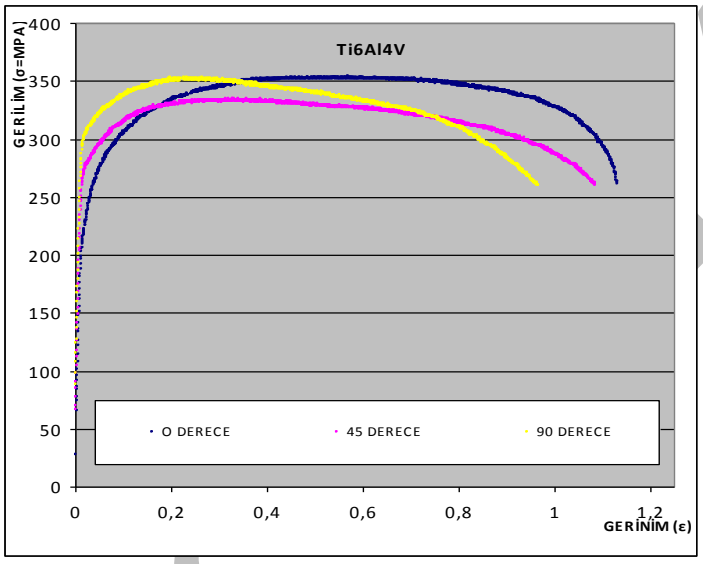
Deney örnekleri 0,8 mm kalınlıktaki Ti6Al4V sac malzemeden hadde yönüne göre üç farklı doğrultuda ve en az üç seri olacak şekilde kesilmiştir. Örnekler üzerindeki şekil değiştirme miktarlarını görebilmek için, hazırlanan D0=5 mm'lik daireler elektrokimyasal olarak sac malzemeye dağlama yapılarak oluşturulmuş, dağlama işleminden sonra oksidasyonu önlemek için malzeme nötralit çözeltiye alınmıştır.

Erichsen deney numunesi, Erichsen test makinesinde baskı yastığı-kalıp arasına yerleştirilerek 1 mm/s hızda şekil değiştirmeye tabii tutulmuş, çatlak oluşumunda şekil değiştirme işlemi durdurulmuştur. Şekillendirme esnasında uygulanan baskı yastığı kuvveti önemli olup, düşük baskı yastığı kuvvetlerinde sac

malzemenin kalıp içerisine çekildiği görülmüştür. Çentikli çekme numunesi çekme deneyi makinesinde serbest çekme hızında şekil değiştirmeye tabii tutulmuş, şekil değiştirme işlemi malzemede kopma gerçekleşinceye kadar devam etmiştir. Çekme çubuğu ise çekme deneyi makinesinde 3 mm/s hızla şekil değiştirme işlemine tabii tutulmuştur.

Bulgular ve Tartışma

Çekme deneyi cihazında, 3 mm/dk şekil değiştirme hızıyla gerçekleştirilen çekme testinden elde edilen parçalarının, yük (kN) ve uzama (mm) değerleri alınmıştır. Bu değerler mühendislik gerilmesi ve mühendislik birim uzaması değerlerine dönüştürülmüş, test edilen örneklerin mühendislik gerilme-mühendislik birim uzama eğrileri çıkartılmıştır.



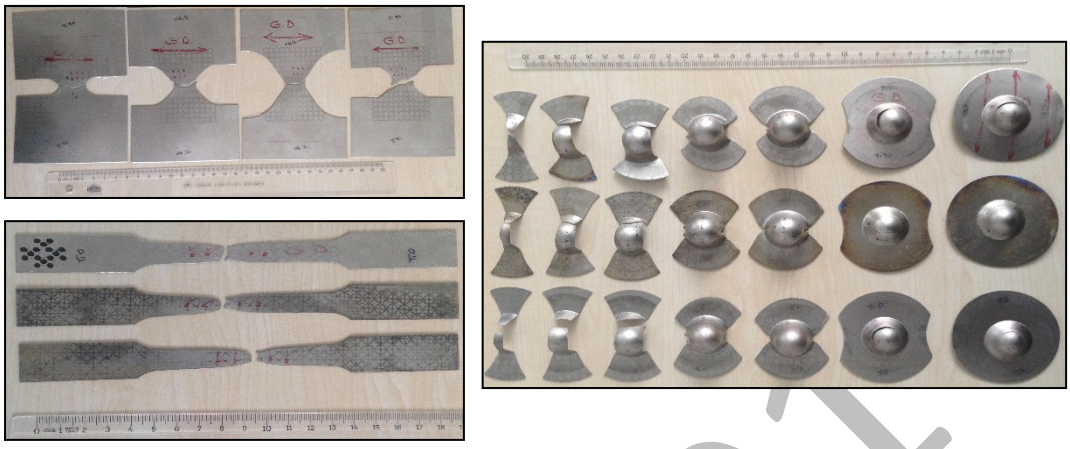
Şekil 3. Ti6Al4V sac malzemenin mühendislik gerilme-mühendislik birim uzama diyagramları.

Şekil 3'te görüldüğü gibi, Ti6Al4V sac malzeme 275 MPa seviyesinde akma noktası ve 350 MPa seviyesinde çekme dayanımı sergilemiştir. Çekme deneyi eğrisi sünek malzeme eğrisine benzemektedir. Akma noktasına kadar gerilme artışına bağlı olarak belirgin bir uzama değeri hemen hemen hiç görülmemektedir. Akma noktası ile çekme dayanımı noktası arasında aşırı bir fark bulunmamaktadır. ε=1,2 noktasında malzeme kopmuştur. Çekme deneyi sonucunda elde edilen uzama ve kopma şekilleri Şekil 4'te görülmektedir. 0 derece hadde yönünde gevrek kırılma, 45 ve 90 derece hadde yönünde daha sünek kırılma gözlenmiştir.

Tablo 1. Deneylerde kullanılan Ti6Al4Vörneklerin mekanik özellikleri (t=0,8 mm).

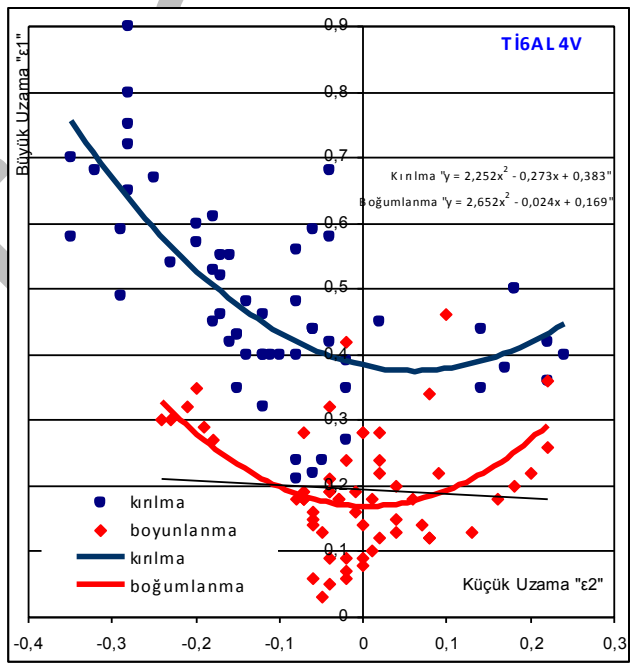
Özellik	Değer	Özellik	Değer
σAK (MPa)	275	Dikine Anizotropi " $\overline{R}$ "	2,476
σÇ (MPa)	350	Düzlemsel Anizotropi "ΔR"	-0,024
Şekil Değiştirme Sertleşmesi Üssü	0,11	"$_n\overline{R}$ "	-0,059
Mukavemet Katsayısı "K" (MPa)	509		

Ti6Al4V deney örneğine ait deneysel çalışma sonucu elde edilen mekanik özellikler Tablo 1'de, Çekme makinesinde ve Erichsen makinesinde test sonucunda deforme olmuş örnekler Şekil 4'te görülmektedir.



Şekil 4. Ti6Al4V sac malzemenin çekme makinesinde ve Erichsen makinesinde deformasyonu sonrası durum.

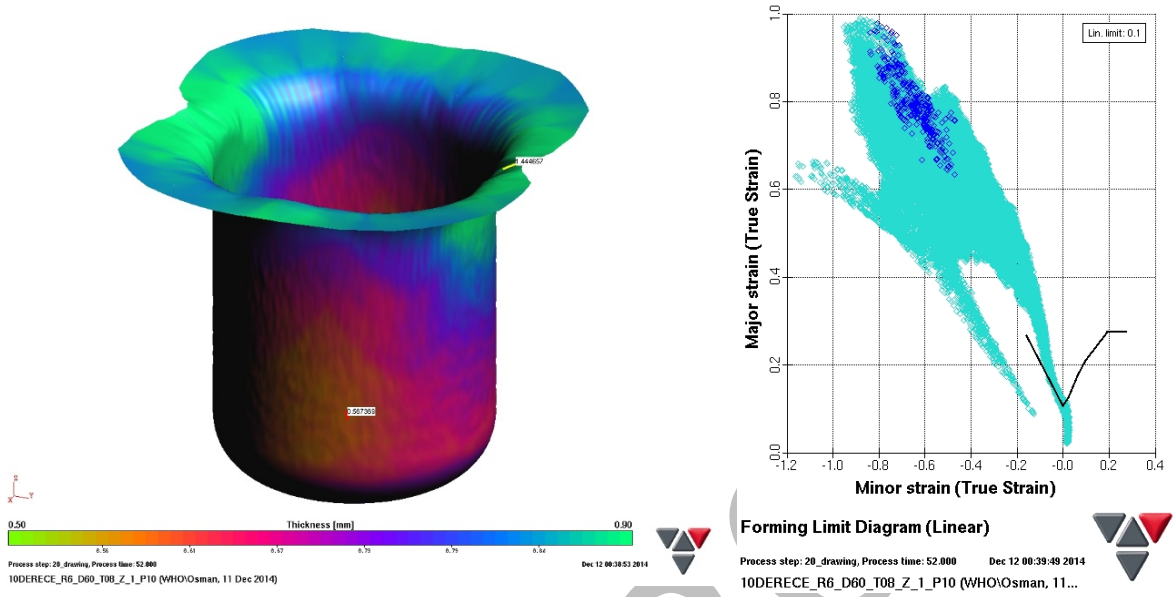
Numuneler üzerindeki dareler ölçülerek Şekil 5'teki diyagram elde edilmiştir. Kırılmaya en yakın tam dairelerden kırılma (fracture) ve ikinci sıradaki en yakın tam dairelerden boğumlanma (necking) eğrileri çıkartılmıştır. Ölçümlerden elde edilen bilgilere göre ŞSD'nda; çekme deneyi örneğinden alınan ölçülerin derin çekerek şekillendirme bölgesini (tension-compression), çentikli deney örneğinden alınan ölçülerin düzlem uzama (Plane Strain) bölgesini ve Erichsen deney örneğinden alınan ölçülerin derin çekerek şekillendirme ve gerdirerek şekillendirme bölgesini oluşturduğu tespit edilmiştir.



Şekil 5. Ti6Al4V deney örneği için kırılma ve boğumlanma eğrileri.

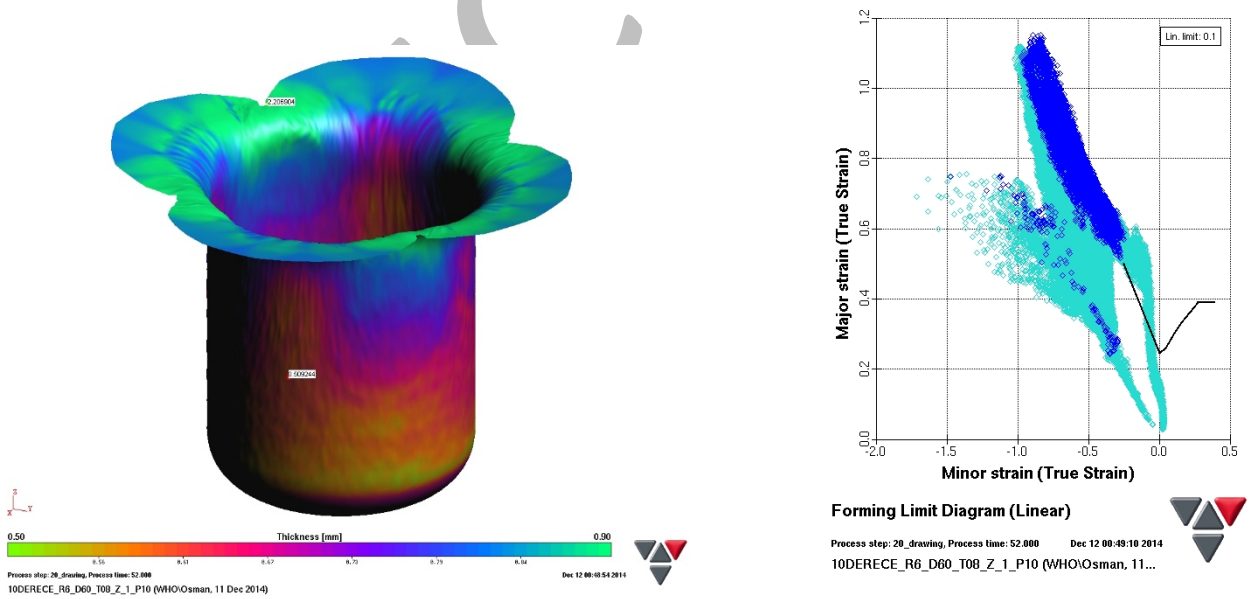
Sac malzeme yüzeyinde meydana gelen şekil değişimlerinin analizi SEY'e dayalı olarak AUTOFORM paket programıyla gerçekleştirilmiştir. Analiz programları explicit ve implicit yöntemle çözüm yapmaktadır. AUTOFORM implicit yöntemle çözüm yapan, tamamen sac şekillendirmeye yönelmiş bir yazılımdır. İmplicit

yöntemde her zaman basamağında denklem yeniden çözülür. AUTOFORM analiz programı kabuk eleman kullandığı için sac kalınlığı arttıkça gerçek analizlerden uzaklaşma ihtimali vardır (Gurupotomasyon, 2014). AUTOFORM'da, geometriye ve uzama değerlerine göre değişen "refinement level" üçgen mesh kullanılmaktadır.



Şekil 6. Ti6Al4V verilerinin test edilmesi.

Ti6Al4V malzemenin elde edilen mekanik özellikleri ve şekillendirme sınır diyagramı verileri AUTOFORM analiz programına malzeme olarak tanımlanmıştır. Tanımlama neticesinde prototip bir hidromekanik derin çekme işlemine tabii tutulmuş ve başarılı sonuç elde edilmiştir. Şekil 6'da prototip malzeme ve bu malzemeye ait Şekillendirme Sınır Diyagramı görülmektedir.



Şekil 7. DC04 sac malzemenin verilerinin test edilmesi.

Ti6Al4V şartlarında programın kütüphanesinde bulunun DC04 otomotiv sacının prototip denemesi ve şekillendirme sınır diyagramındaki uzama durumları Şekil 7'de görülmektedir. Ti6Al4V malzemede daha fazla uzama olmasına rağmen daha az kalınlık değişimi olmuştur. Söz konusu malzemenin kopmadan gerçekleştirilebilecek deformasyon miktarı DC04 sacına göre daha fazladır.

Sonuçlar

Ti6Al4V havacılık ve biyomedikal sacının mekanik özelliklerinin ve ŞSD'nın tespit edilmesi amacıyla Çekme Testi ve Erichsen Testi yapılmış, çekme testinde akma mukavameti 275 MPa, çekme dayanımı 350 MPa olarak bulunmuştur. Şekil değiştirme sertleşmesi üssü 0,11 olarak elde edilmiş olup şekil değiştirme sertleşmesi üssünün yüksek olması deney örneğinin kopma uzamasının yüksek olacağını ifade etmektedir.

Dikine anizotropi 2,476, düzlemsel anizotropi -0,024 olarak elde edilmiş olup dikine anizotropinin büyük olması, deney örneğinin kalınlık yönünde incelmeye direncinin büyük olacağını, düzlemsel anizotropinin "0"dan farklı olması ise şekillendirilecek üründe kulak oluşacağını ifade etmektedir. ŞSD'ndan, deney örneğinin, -0,28 küçük uzama değeri için 0,90 büyük uzama, 0,24 küçük uzama değeri için 0,40 büyük uzama sergilediği görülmüştür. Bu durum, deney örneğinin derin çekme özelliklerinin, gerdirilebilirlik özelliklerine göre daha iyi olduğunu göstermektedir. Kırılma eğrisi ile boğumlanma eğrisi arasındaki fark % 18 olarak ölçülmüştür. Aradaki farkın büyük olması deney örneğinin kırılmadan daha fazla derin çekilebileceğini göstermektedir.

Deneylerden elde edilen sonuçların sonlu elemanlar yöntemi ile analizinde başarılı şekillendirme mümkün olmuştur. Dikine anizotropiden de görüleceği gibi malzemede incelme daha az olmuştur. Ayrıca malzemede istenmeyen bir durum olan kulak oluşumları analiz neticesinde oluşmuştur.

Elde edilen veriler ile Ti6Al4V sac malzeme ile ilgili olarak üretim prosesleri öncesinde analizler yapılarak deneme-yanılma süreçleri en aza indirilerek zaman ve malzeme tasarrufu sağlanabilecektir.

Teşekkürler

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Toxic heavy metal chromium remediation by processed low cost adsorbent-Green coconut shell

Seema Tharannum , Krishna Murthy V , Nandini.V , Shruthi.P.T

University of Biskra, Alegeria
Email : o.kraa@mselab.org

Abstract: In recent years industrialization, consequent urbanization and increasing population, has lead to pollution of basic amenities of life air, water and soil. The major pollutants from the industrial complexes are effluents with heavy metals. Chromium is a highly toxic element and major pollutant present in the environment. Chromium (III) and (VI) are mainly found in chrome plating, dyes and pigments, leather tanning, and wood preserving. Chromium (VI) is mobile and easily soluble into cells of an organism. There are many methods like ion exchange, ultra filtration, reverse osmosis etc by which chromium (VI) can be removed but they are quiet expensive and have many other disadvantages. In our present study, natural products considered to be wastes were used as adsorbents because of its high availability and low-cost. Low cost adsorbent used was Green coconut shell in a processed form in order to compare the efficiency. This study, reports the efficiency of low cost biosorbents in remediation of chromium (VI). It is seen that the biosorbents, green coconut shell has showed high biosorption capacity as it reduced 50% of 100mg/L concentration of chromium in a span of 24 hrs. The obtained results showed that incubation time and size of adsorbent affected the uptake capacity of biosorbent. As the time increased the percentage of adsorption increased till 264 hours. Smaller the size more efficient is the adsorption capacity. Hence, low cost biosorbents can be potential agents of bioremediation of heavy metals which are toxic to all life forms especially to humans.

Keywords : Biomass, Waste, Biosorption, Effluent, Industrial, Heavy metals, Toxic

Introduction

In the wake of industrialization, consequent urbanization and increasing population, the basic amenities of life i.e. air, water and soil are being polluted continuously. Industrial complexes have become the focus of environmental pollution. The major pollutants from the industrial complexes are effluents with heavy metals. Chromium, a highly toxic element is a major pollutant present in the environment, are mainly found in chrome plating, dyes and pigments, leather tanning, and wood preserving (Anyakora et al., 2011). Chromium (Cr) is a heavy metal that can exist in six valence states, 0, II, III, IV, V and VI, which represent the number of bonds an atom is capable of making. Trivalent (Cr-III) and hexavalent (Cr-VI) are the most common chromium species found environmentally. Trivalent is the most stable form and its compounds are often insoluble in water. Hexavalent Chromium is the second most stable form, and the most toxic. Many of its compounds are soluble. Most chromium VI in environment is due to anthropogenic activities. Occupational exposure is via inhalation. Cr (III) is poorly absorbed, whereas Cr (VI) is readily absorbed.. Exposure to chromium leads to nasal irritation, nasal ulcers, and perforation of nasal septum and hypersensitivity reactions and chronic holes of the skin (Holmes et al., 2008). World Health Organization and Indian Standard Institution has the desirable limit for Cr (VI) in drinking water is 0.05mg/L and With reference to Central pollution control board, the allowable chromium concentration in effluents is 2.0-5.0 mg/L. The techniques conventionally used for removal of heavy metals from contaminated sites include: reverse osmosis, electro dialysis, ultra filtration, ion-exchange, chemical precipitation, phytoremediation, etc. Each of these methods has its own merits and demerits (Hima et al., 2007) the methods suggested are being time consuming and needs expertise. Bioremediation is a process of removal of toxic metals using living organisms. Bioaccumulation is the widely used bioremediation technique which involves the accumulation of heavy metals in the organism. Though the technique is widely used, has its own pros and cons. Biosorption is a physicochemical process that occurs naturally in certain biomass which allows it to passively concentrate and bind contaminants onto its cellular structure. The most frequently studied biosorbents are Bacteria, Fungi and Algae. But more recently, the search for new cost effective biosorbents has directed attention and natural sorbents which can effectively remove toxic metals (Senthilkumar et al., 2000). A successful biosorption process requires preparation of good biosorbent. The process starts with selecting various types of biomass. Pretreatment and immobilization are done to increase the efficiency of the metal uptake. The adsorbed metal is removed by desorption process and the biosorbent can be reused for further treatments (Hima et al.,2007). In our study, biomass of Green coconut shell considered as waste and disposed to the environment without any further usage, was used as adsorbent because of its high availability and low-cost.

Materials and Method

Sampling

The adsorbent Green coconut shell waste was collected from coconut vendors , sun dried for 2 days and was blended in a mixer. The blended powder was sieve separated on the basis of particle size of 719 microns and 250 microns and pre treated with 0.1 M NaOH for 3 hours and then washed with distilled water to remove the traces of NaOH(Rosa et al.,2010).The sample was filtered and then dried at 50°c in Hot air oven .

Estimation of Chromium (VI)

Chromium estimation was carried out by spectrophotometric method using Diphenylcarbazide (APHA 2005). Chromium (VI) was determined colorimetrically by reaction with diphenylcarbazide in acid solution. A pink colour complex was formed, absorbance was read at 540nm. Chromium standard of 100mg/L was prepared using potassium di chromate. Optical density of known standard samples was recorded and Graph of absorption versus amount of chromium (µg) was plotted.

Batch Studies

The batch studies were carried in 250ml conical flasks at Room Temperature (RT) by shaking at an interval of two hours. 0.5g of biosorbent Green coconut shell waste was mixed with 100ml of standard chromium solution(100mg/L) in 250ml conical flask. After a known contact period of 24, 48, 72, 96 hours (h), 0.5ml of solution was collected from conical flask and centrifuged at 6000rpm for 5 minutes at 4°c. The supernatant thus collected was estimated for chromium by DPC method (Shankar Congeevaram., 2006).

Adsorption studies were conducted in triplicates.

Column Studies

A borosilicate column (21cm X 2.2cm) was filled with adsorbent Green coconut shell waste corresponding to 3cm bed heights. The adsorbent was initially heated with distilled water to 80°C to remove the lipids. The bed was then filled with 10ml of chromium solution (100mg/L). After a known contact period of 24, 48, 72, 96 hours (h), 0.5ml of solution was collected and estimated for chromium by DPC method The amount of chromium before and after adsorption was determined by DPC method.

Results and Discussion

Sampling

The Green coconut shell samples of different sized particles obtained by sieve method were collected processed and stored at room temperature for analysis.

Estimation of Chromium(VI)

The hexavalent chromium was determined calorimetrically by reaction with diphenylcarbazide in acid solution. Absorbance at 540nm was found to increase as the as the chromium concentration increases. The results are as plotted in Figure 1.

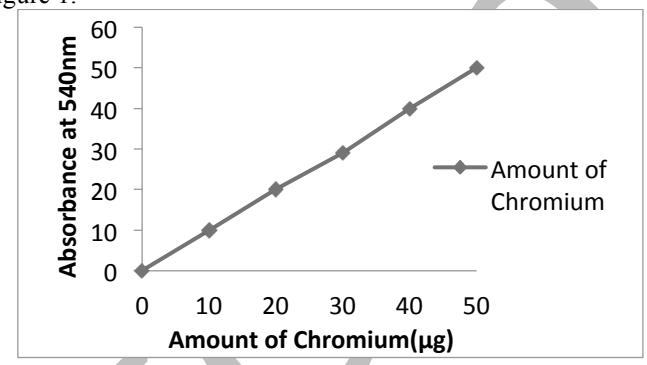

Figure1: Standard Chromium curve by DPC method.

Batch Studies

The amount of chromium decreased from day 1 to day 8. Sample of particle size 719 microns was found to adsorb 90mg of chromium from the solution, whereas, that of particle size 250 microns was found to remove chromium completely from the solution on day 8. Comparisons of amount of chromium in the solution with both the particle sizes are as depicted in Figure 2 (2a and 2b)

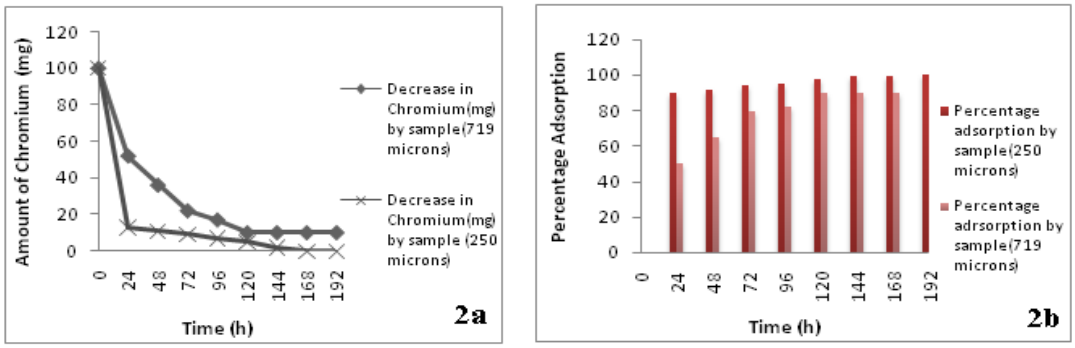

Figure 2: Effect of Particle size on Adsorption in Batch studies 2a: Chromium removal capacity of green coconut shell. 2b: Percentage adsorption of green coconut shell

Column Studies

The amount of chromium was found to reduce gradually and total amount of chromium was to be absorbed in 30h. Sample of particle size 250 microns was found to adsorb chromium completely in a short contact time(42h), whereas, the same of particle size 719 microns showed 100% adsorption by the end of 48h. percentage adsorption by sample of both particle sizes are compared in Figure 3 (3a and 3b).

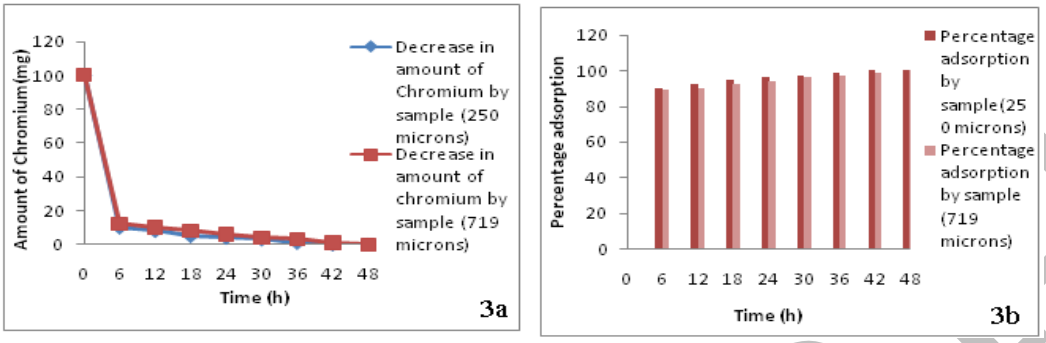

Figure 3: Effect of Particle size on Adsorption in column studies 3a: Chromium removal capacity of green coconut shell. 3b: Percentage adsorption of green coconut shell

SEM and EDS Analysis

Scanning electron microscope evaluated the morphological characteristics of coconut. The micrographs of coconut shell powder before metal uptake and the respective EDS (Energy Dispersive Spectroscopy) analyses are presented in Fig 4a and 5 respectively. Fig 4b and 6 show the same for coconut shell after chromium uptake.

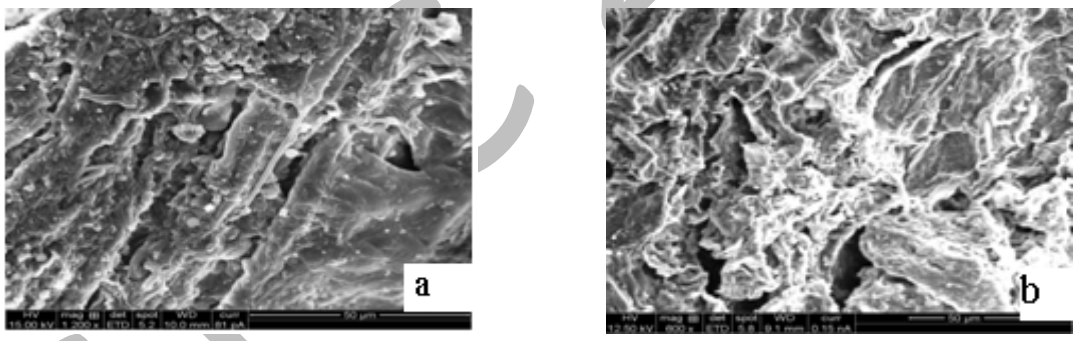

Figure 4: Scanning electron micrograph of coconut shell a) Before and b)after Cr biosorption.

Figure 4 a shows a quite irregular and porous material. This surface characteristic would be substantiating the high adsorption observed for particles of larger size, through mass transport inside the sorbent. Figure 4 b shows no significant difference between the surface of particles loaded with metal ions and the particles that does not suffer the biosorption process .

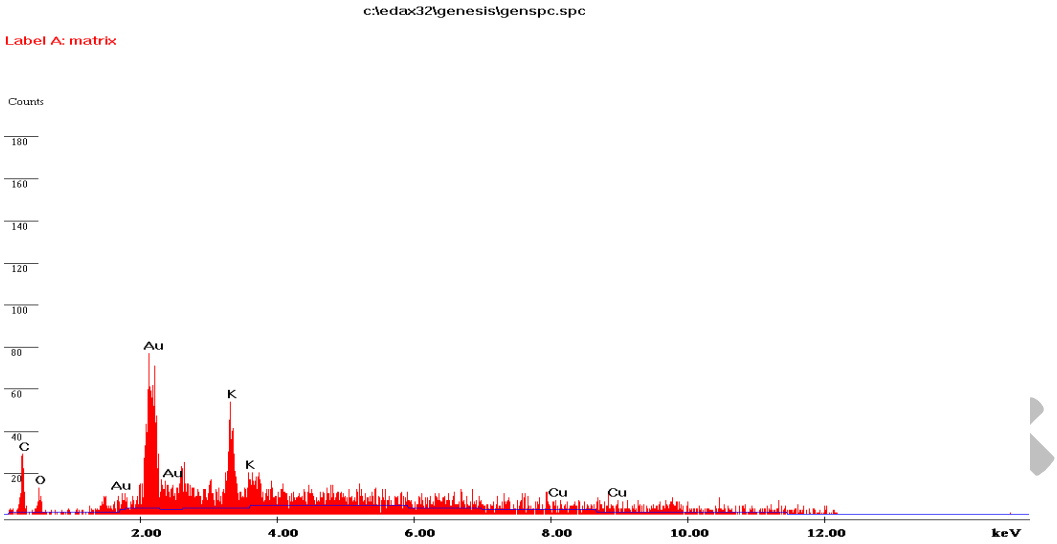

Figure 5: EDS diffractogram of micrographs of coconut shell before Cr uptake.

The EDS analysis presented in Figure 5 shows the presence of Cu, K, O and C as natural species on the coconut shell, as already expected. The presence of these elements could influence on the adsorption mechanism thought ionic exchange interactions.

The EDS analysis in the particle loaded with chromium presented in Figure 6, shows the presence of chromium bands, and the absence of Ca, K, Na, O and Mg bands. This could be indicative of ionic exchange mechanism involvement between these elements and Cr on the surface of particles. The band of Au appears in the EDS, a time that the metalizing of the samples was carried through with this element.

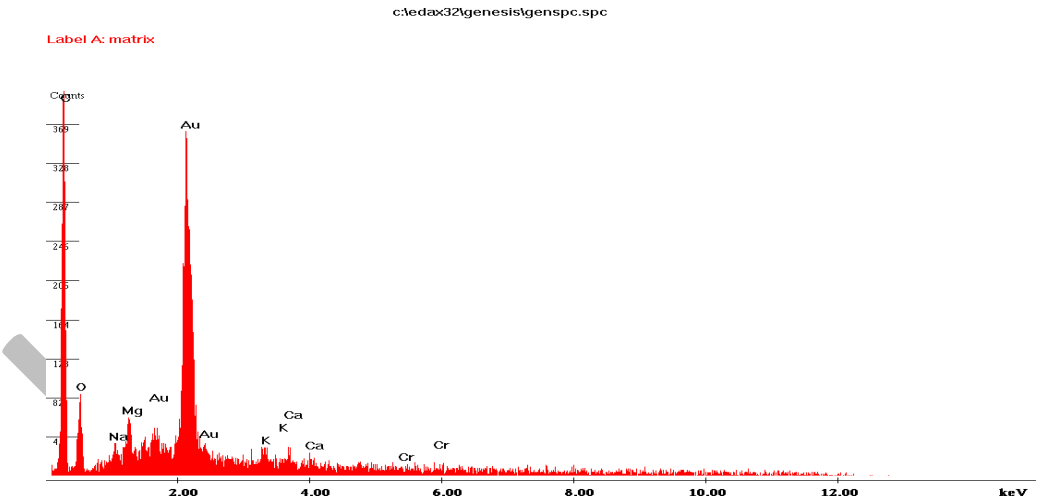

Figure 6:EDS diffractogram of micrographs of coconut shell after Cr biosorption.

Conclusions

The study establishes the role of low cost adsorbent like green coconut shell in biosorption, accumulation

and remediation of chromium (VI). Heavy metals can be toxic to all the life forms especially to humans due to their strong affinity to form complexes with the constituents of cell membrane, causing impairment of their functions and loss of integrity. However, low cost adsorbents can be potential agents for bioremediation of heavy metal pollution.

The study when conducted in batch revealed that capacity of green coconut shell to biosorb the heavy metal chromium (VI). Sample G showed to absorb 50% of chromium with an incubation of 24h and 90% adsorption in 144hrs.

The results obtained showed that incubation time affected the uptake capacity of biosorbent. As the time increased the percentage of adsorption increased till 264 hours. Another important parameter was the influence of the particle size (719 and 250 microns) used to uptake chromium. It showed increase in chromium adsorption with decrease of particle size of biomass. Later, a column study was performed in which Sample G and was found to adsorb maximum amount of chromium. So finally, green coconut shell powder of 250 microns showed better results than 719 microns. The analyses accomplished by MEV-EDS proved the presence of chromium in the biomass particles i.e green coconut shell powder after biosorption. The micrographs obtained show a quite irregular and porous material. This surface characteristic would be substantiating the high adsorption observed for particles of larger size, through mass transport inside the sorbent.

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Trends in Human Development Index of European Union

Serpil Aktaş, Derya Karagöz

Department of Statistics, Hacettepe University, Beytepe, Ankara, Turkey
spxl@hacettepe.edu.tr, deryacal@hacettepe.edu.tr

Abstract: The Human Development Index is a measure of development index calculated from life expectancy, literacy, education and standards of living. In this paper, Human Development Index data of European Union are collected for periods 1980-2013, and analyzed using Generalized Estimating Equations to investigate whether there is a trend through the years. Generalized Estimating Equations method is often employed to analyze longitudinal and other correlated response data does not require any multivariate distribution assumption.

Key Words: Human Development Index, Generalized Estimating Equations, European Union

Introduction

Longitudinal studies involve repeated observations of the same items over long periods of time and, often arise in psychology, sosiology, education, medical sciences to analyze developmental trends across time (Diggle et. al. 1994 ;Diggle et. al. 2002; Twisk, 2002). Variable for each subject observed repeatedly over time cause dependency structure between variables. Correlated data are particularly very common in educational and more generally in social science researches. Longitudinal studies also allow researches to reveal the short from long-term phenomena, such as poverty, infant mortality rate, economic development ect. Ignoring the dependency of the observations will overestimate the standard errors of the the time-dependent predictors. This means that we also ignore the between-subject variability. Repeated measure ANOVA is used for longitudinal studies because of simplicity, but it has some limitations. For instance, it assumes categorical predictors; does not take the time-dependent covariates into account; assumes that subjects are measured at the same and equally spaced time intervals and it requires restrictive assumptions about the correlation structure. Hence, Generalized Linear Model approach to longitudinal studies has been growing in recent years. Generalized Estimation Equatios (GEE) methodology were developed by Liang and Zeger (1986); Zeger and Liang (1986) as the extension of the Generalized Linear Models (GLM) (McCullagh and Nelder,1989) for the data in longitudinal form.

In this paper, it is aimed to model the Human Development Index (HDI) data of the European Union (EU) countries via GEE. HDI has become an important alternative measure of development. The HDI data are collected between the 2005-2010 periods, and analyzed using GEE to investigate whether there is the trend through the years.

The simple model can be written as

$$\mathrm{HDI}=\beta_0 + \beta_1 \mathrm{TIME} + \mathrm{CORR} + \mathrm{ERROR}. \qquad (1)$$

Where, the intercept β_0 and the slope β_1 are unknown parameters. Time is treated as a continuous variable and measured in years. The aim is test the trend over years.

Generalized Estimating Equations

The idea of GEE was first introduced by Liang and Zeger (1986); Zeger and Liang (1986). GEE methodology fits a model to repeated categorical responses, that could be correlated and clustered responses. The advantages of GEE can be also summarized as: It does not require a multivariate distribution; estimates of model parameters are valid even if misspecification of the covariance structure; it is preferred to Maximum Likelihood (ML) because of its computational simplicity. In recent years, GEE has been a popular alternative to maximum likelihood.

Let Y_{ij} be the jth outcome for the ith subject, where we assume that observations on different subjects are independent; the association between outcomes is observed on the same subject. Y_i denotes a response vector for each subject j and Y is the vector of measurement off all units.

$$Y_i = (Y_{i1}, Y_{i2}, \dots, Y_{in}),\ i = 1,\dots, N;\ j = 1,\dots, n_i$$

Marginal response is defined as $\mu_i = E(Y_i)$. Linear combination of the covariates are $g(\mu_i)=X_i\beta$. Where , X_i is a $n_i \times p$ matrix of covariates ; β is a $p \times 1$ vector of unknown regression coefficients and $g(\cdot)$ is the link function.

For unknown parameter vector β , Equation (2) is given as

$$U(\beta) = \sum_{i=1}^{N} \frac{\partial \mu_i}{\partial \beta} V_i^{-1}(Y_i - \mu_i) = 0 \qquad (2)$$

where, V_i is the $n_i x n_i$ variance covariance matrix, $V_i = A_i^{\frac{1}{2}} R_i(\alpha) A_i^{\frac{1}{2}} / \square$. A_i is a diagonal matrix with elements Var (Y_{ij}) and $R_i(\alpha)$ is referred as working correlation matrix (Liang and Zeger, 1986; Zeger and Liang, 1986). $\square$ is the over-dispersion parameter. Working correlation matrix choices are: Independent, Exchangeable, Autoregressive , M-dependent and Unstructured. But, the advantage of GEE is that it is fairly robust against a misspecification of correlation matrix (Hin and Wang, 2009).

Solution the Equation (2) gives the parameter estimates. In the GEE procedure, ordinary linear regression analysis is firstly performed, assuming the observations within subjects are independent. Then, residuals are calculated from the ordinary model and a working correlation matrix is estimated from these residuals. Then the regression coefficients are estimated, correcting for the correlation.

Human Development Index

HDI is an aggregated measure of development index calculated from life expectancy, literacy, education and standards of living (UNDP, 2011). Until 2010, the HDI had been defined as a simple arithmetic average of normalized indices in the dimensions of health, education and income:

$$\text{HDI} = \frac{1}{3}\left(H_{\text{health}} + H_{\text{education}} + H_{\text{living standards}}\right). \qquad (3)$$

Each of these indices are normalized indicators of achievements for each dimensions and based on life expectancy (LE) , GDP per capita (GDP), literacy (LIT) and the gross enrolment ratio (GER).

Where, the subindices:

$$H_{health} = \frac{(LE - LE_{min})}{(LE_{max} - LE_{min})} \quad (4)$$

$$H_{education} = \frac{1}{3}\left(\frac{GER - GER_{min}}{GER_{max} - GER_{min}}\right) + \frac{2}{3}\left(\frac{LIT - LIT_{min}}{LIT_{max} - LIT_{min}}\right) \quad (5)$$

$$H_{living\ standards} = \frac{(\ln(GDP) - \ln(GDP_{min}))}{(\ln(GDP_{max}) - \ln(GDP_{min}))} \quad (6)$$

Hence, the indices are normalized using given upper and lower bounds which were defined in the 2009 report. The 2010 Human Development Report presented some changes in the HDI as

$$HDI = \sqrt[3]{H_{health} \cdot H_{education} \cdot H_{living\ standards}} \quad (7)$$

Life expectancy still represents the health dimension, while Gross National Income (GNI) replaces GDP as the measure for living standards. Mean years of schooling (MYS) and expected years of schooling (EYS) now are the new indicators of the education dimension.

$$H_{health} = \frac{(LE - LE_{min})}{(LE_{max} - LE_{min})} \quad (8)$$

$$H_{education} = \left(\frac{MYS - MYS_{min}}{MYS_{max} - MYS_{min}}\right)\left(\frac{EYS - EYS_{min}}{EYS_{max} - EYS_{min}}\right) \quad (9)$$

$$H_{living\ standards} = \frac{(\ln(GNI) - \ln(GNI_{min}))}{(\ln(GNI_{max}) - \ln(GNI_{min}))}$$

(10)

The HDI enables to researchers to detect the changes in development levels over time and to compare development levels in other countries. The value of HDI vary between 0 and 1. The interpretation of HDI can be made as:

HDI ≥ 0.800 is high development,

HDI 0.500—0.799 is medium development,

HDI < 0.500 is low development

(UNDP, 2011). High HDI means more prosperity and achievement on the developmental factors.

Analysis of HDI data for the Member Counties of European Union

United Nations Development Program has been calculating HDI for the member countries. This paper's goal is to asses the changes HDI for the member countries of EU over nine years . The human development indices of the countries were obtained from a Human Development Report (Table 1). Data set was downloaded from the United Nations Development Program web page (http://hdr.undp.org/en/data).

Recall the member states of the European Union: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom. These countries are included in the analysis.

Table 1: Human Development Index trends, 1980-2013.

		Human Development Index (HDI)								
	Country	**1980**	**1990**	**2000**	**2005**	**2008**	**2010**	**2011**	**2012**	**2013**
1	Netherlands	0,783	0.826	0.874	0.888	0.901	0.904	0.914	0.915	0.915
2	Germany	0.739	0.782	0.854	0.887	0.902	0.904	0.908	0.911	0.911
3	Denmark	0.781	0.806	0.859	0.891	0.896	0.898	0.899	0.900	0.900
4	Ireland	0.734	0.775	0.862	0.890	0.902	0.899	0.900	0.901	0.899
5	Sweden	0.776	0.807	0.889	0.887	0.891	0.895	0.896	0.897	0.898
6	United Kingdom	0.735	0.768	0.863	0.888	0.890	0.895	0.891	0.890	0.892
7	France	0.722	0.779	0.848	0.867	0.875	0.879	0.882	0.884	0.884
8	Austria	0.736	0.786	0.835	0.851	0.868	0.877	0.879	0.880	0.881
9	Belgium	0.753	0.805	0.873	0.865	0.873	0.877	0.880	0.880	0.881
10	Luxembourg	0.729	0.786	0.866	0.876	0.882	0.881	0.881	0.880	0.881
11	Finland	0.752	0.792	0.841	0.869	0.878	0.877	0.879	0.879	0.879
12	Slovenia	.	0.769	0.821	0.855	0.871	0.873	0.874	0.874	0.874
13	Italy	0.718	0.763	0.825	0.858	0.868	0.869	0.872	0.872	0.872
14	Spain	0.702	0.755	0.826	0.844	0.857	0.864	0.868	0.869	0.869
15	Czech Republic	.	0.762	0.806	0.845	0.856	0.858	0.861	0.861	0.861
16	Greece	0.713	0.749	0.798	0.853	0.858	0.856	0.854	0.854	0.853
17	Cyprus	0.661	0.726	0.800	0.828	0.844	0.848	0.850	0.848	0.845
18	Estonia	.	0.730	0.776	0.821	0.832	0.830	0.836	0.839	0.840
19	Lithuania	.	0.737	0.757	0.806	0.827	0.829	0.828	0.831	0.834
20	Poland	0.687	0.714	0.784	0.803	0.817	0.826	0.830	0.833	0.834
21	Slovakia	.	0.747	0.776	0.803	0.824	0.826	0.827	0.829	0.830
22	Malta	0.704	0.730	0.770	0.801	0.809	0.821	0.823	0.827	0.829
23	Portugal	0.643	0.708	0.780	0.790	0.805	0.816	0.819	0.822	0.822
24	Hungary	0.696	0.701	0.774	0.805	0.814	0.817	0.817	0.817	0.818
25	Croatia	.	0.689	0.748	0.781	0.801	0.806	0.812	0.812	0.812
26	Latvia	.	0.710	0.729	0.786	0.813	0.809	0.804	0.808	0.810
27	Romania	0.685	0.703	0.706	0.750	0.781	0.779	0.782	0.782	0.785
28	Bulgaria	0.658	0.696	0.714	0.749	0.766	0.773	0.774	0.776	0.777

Descriptive statistics for HDIs are given in Table 2. From Table 2, it can be seen that the very high human development group over nine years corresponds to Netherland, Germany, Denmark, Ireland, Sweden, United Kingdom Belgium and Luxembourg.

Table 2: Descriptive statistics by country

Country	N	Minimum	Maximum	Mean	Std. Deviation
Austria	9	0.7360	0.8810	0.8437	0.0509
Belgium	9	0.7530	0.8810	0.8541	0.0448
Bulgaria	9	0.6580	0.7770	0.7426	0.0432
Croatia	8	0.6890	0.8120	0.7826	0.0438
Cyprus	9	0.6610	0.8500	0.8056	0.0674
Czech Republic	8	0.7620	0.8610	0.8388	0.0362
Denmark	9	0.7810	0.9000	0.8700	0.0457
Estonia	8	0.7300	0.8400	0.8130	0.0395
Finland	9	0.7520	0.8790	0.8496	0.0467
France	9	0.7220	0.8840	0.8467	0.0575
Germany	9	0.7390	0.9110	0.8664	0.0636
Greece	9	0.7130	0.8580	0.8209	0.0550
Hungary	9	0.6960	0.8180	0.7843	0.0506
Ireland	9	0.7340	0.9020	0.8624	0.0633
Italy	9	0.7180	0.8720	0.8352	0.0568
Latvia	8	0.7100	0.8130	0.7836	0.0407
Lithuania	8	0.7370	0.8340	0.8061	0.0378
Luxembourg	9	0.7290	0.8820	0.8513	0.0553
Malta	9	0.7040	0.8290	0.7904	0.0458
Netherlands	9	0.7830	0.9150	0.8800	0.0462
Poland	9	0.6870	0.8340	0.7920	0.0547
Portugal	9	0.6430	0.8220	0.7783	0.0622
Romania	9	0.6850	0.7850	0.7503	0.0410
Slovakia	9	0.7470	0.8300	0.7180	0.2708
Slovenia	8	0.7690	0.8740	0.8514	0.0380
Spain	9	0.7020	0.8690	0.8282	0.0598
Sweden	9	0.7760	0.8980	0.8707	0.0457
United Kingdom	9	0.7350	0.8950	0.8569	0.0610

Figures (1-28) below show trends in HDI values of EU countries separately, during the period 1990 to 2013. It can be clearly seen that the HDIs increased considerably for the years from 1990 to 2013 for all countries. Some countries 2004 there has been a steady increase such as Netherland, Germany, France and Austria.

Cyprus is the only country where it was observed a downward trend slightly in recent years. The highest level of progression in HDI is observed in for instance, for Portugal and Germany. They strongly move up through

2000's. The lowest HDI values are for Bulgaria and Romania with overall means 0.7426 and 0,7850, respectively. A consistent increase draw the attention particularly in Spain, Chezh Rebublic, France and Austria.

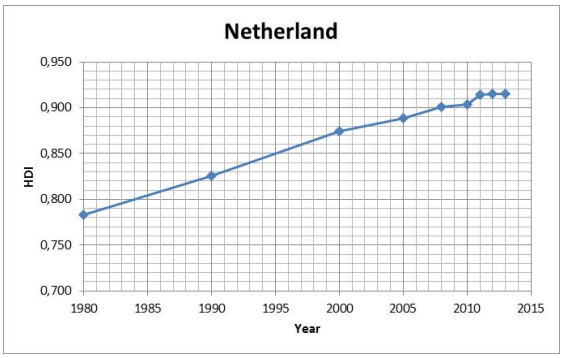

Figure 1: Human Development Index of Netherland, 1980-2013

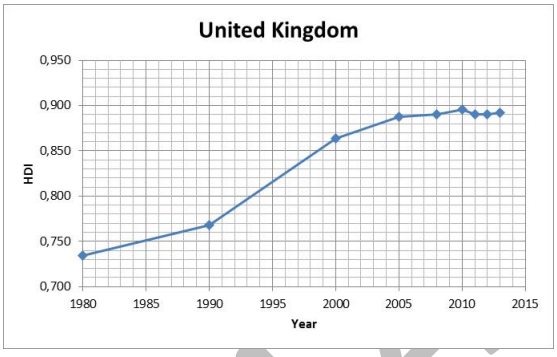

Figure 2: Human Development Index of United Kingdom, 1980-2013

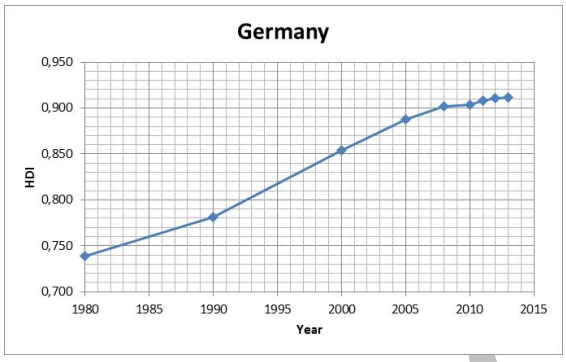

Figure 3: Human Development Index of Germany, 1980-2013

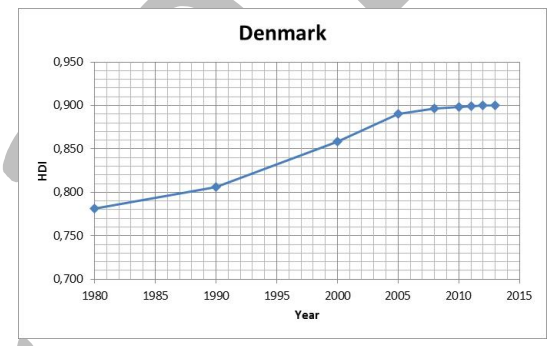

Figure 4: Human Development Index of Denmark, 1980-2013

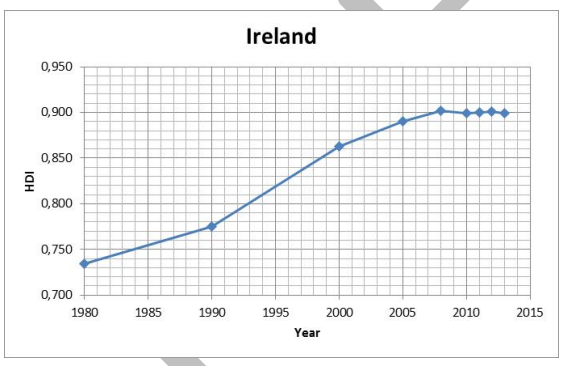

Figure 5: Human Development Index of Ireland, 1980-2013

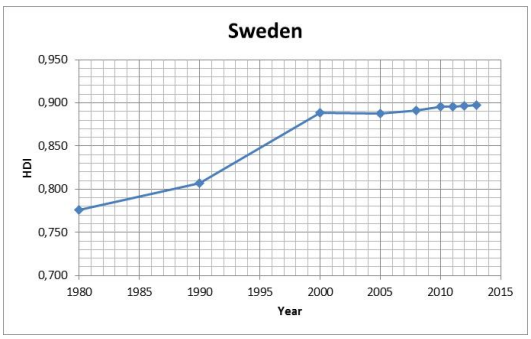

Figure 6: Human Development Index of Sweden, 1980-2013

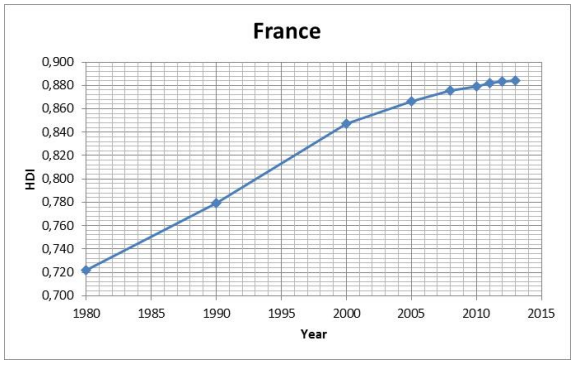

Figure 7: Human Development Index of France, 1980-2013

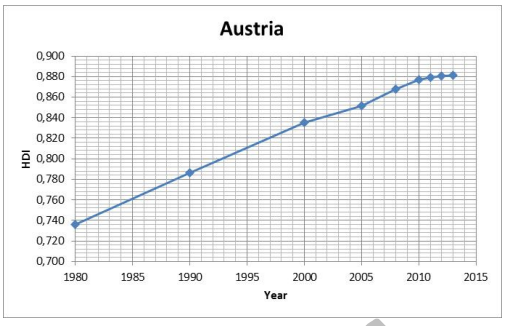

Figure 8: Human Development Index of Austria, 1980-2013

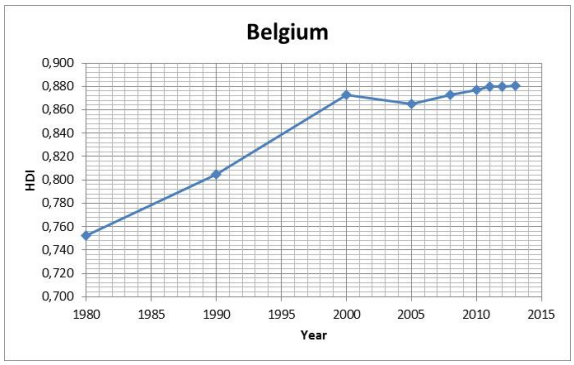

Figure 9: Human Development Index of Belgium, 1980-2013

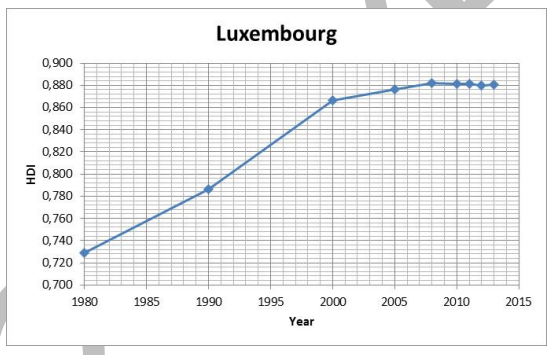

Figure 10: Human Development Index of Luxembourg, 1980-2013

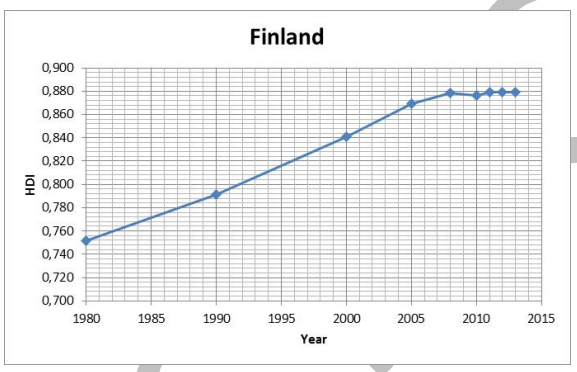

Figure 11: Human Development Index of Finland, 1980-2013

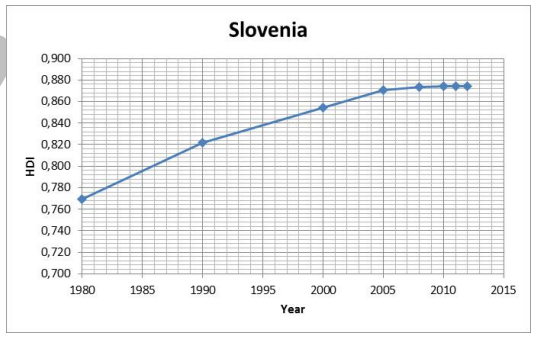

Figure 12: Human Development Index of Slovenia, 1980-2013

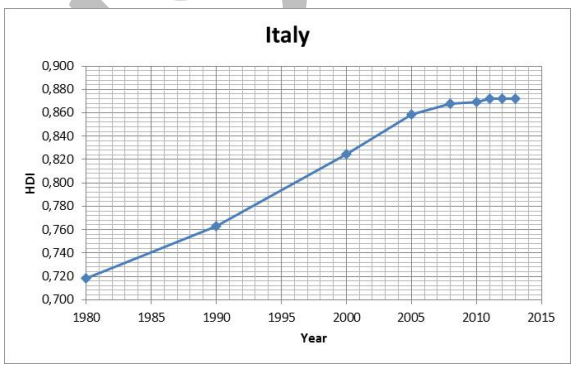

Figure 13: Human Development Index of Italy, 1980-2013

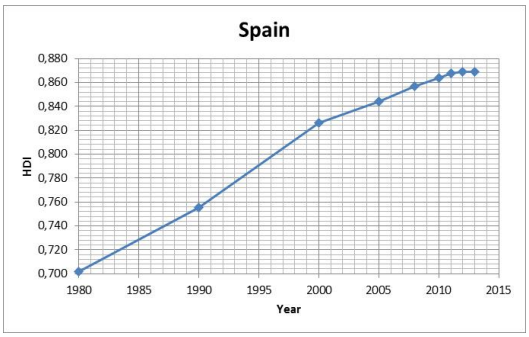

Figure 14: Human Development Index of Spain, 1980-2013

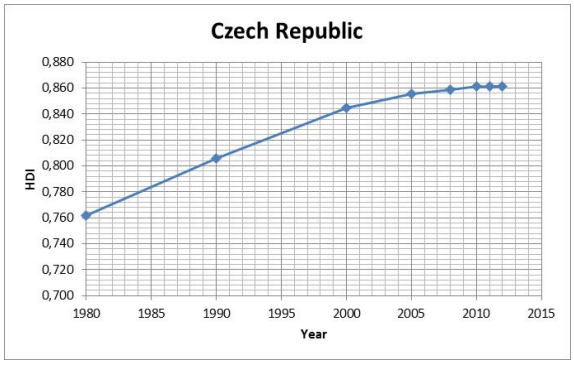

Figure 15: Human Development Index of Czech Rep., 1980-2013 1980-2013

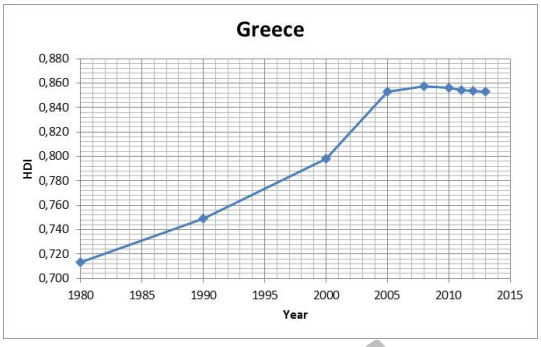

Figure 16: Human Development Index of Greece,

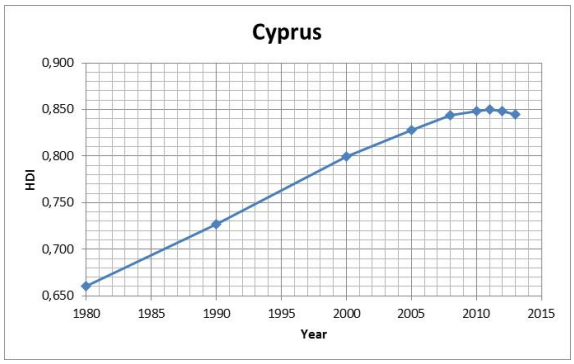

Figure 17: Human Development Index of Cyprus, 1980-2013

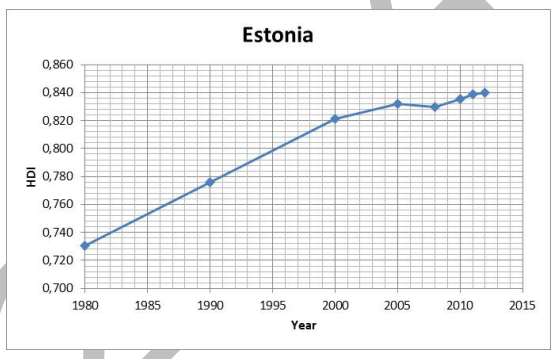

Figure 18: Human Development Index of Estonia, 1980-2013

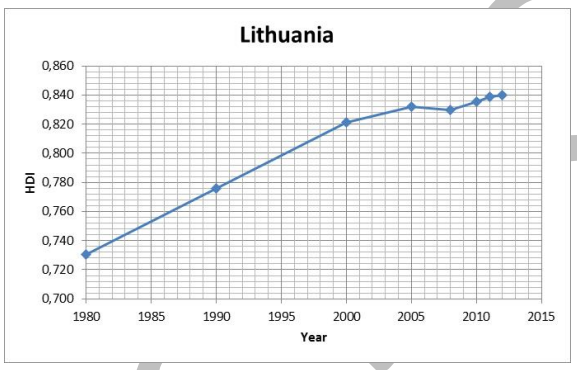

Figure 19: Human Development Index of Lithuania, 1980-2013

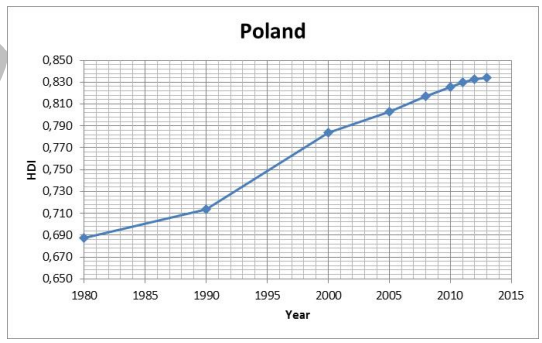

Figure 20: Human Development Index of Poland, 1980-2013

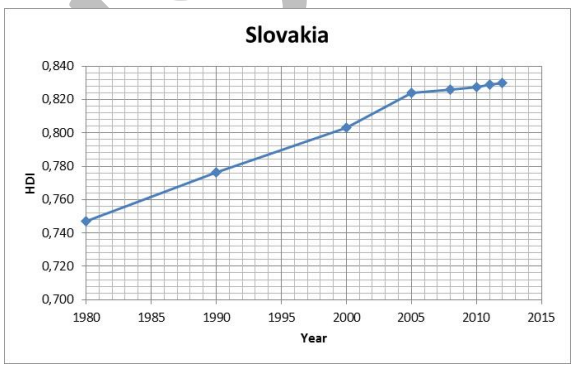

Figure 21: Human Development Index of Slovakia, 1980-2013

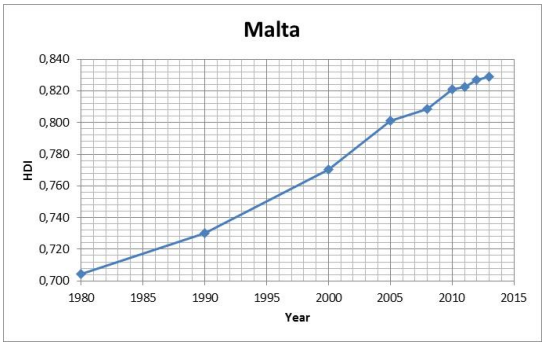

Figure 22: Human Development Index of Malta, 1980-2013

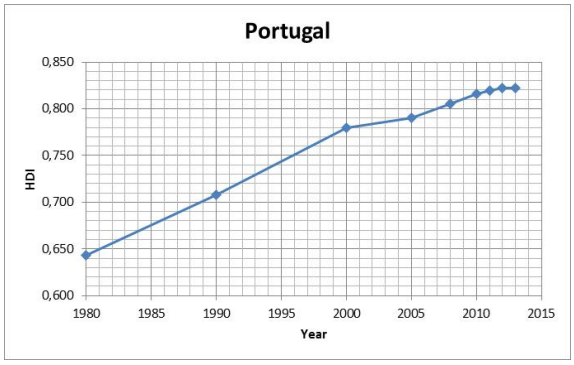

Figure 23: Human Development Index of Portugal, 1980-2013

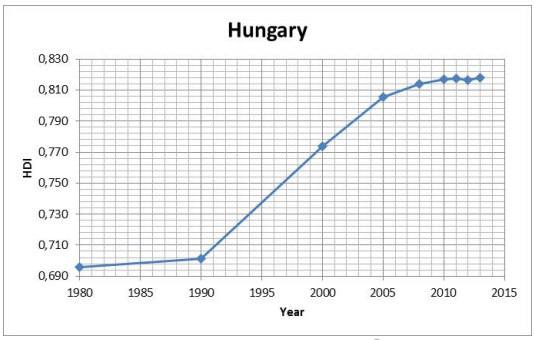

Figure 24: Human Development Index of Hungary, 1980-2013

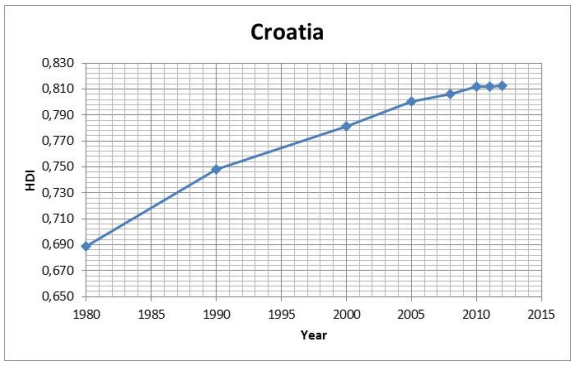

Figure 25: Human Development Index of Croatia, 1980-2013

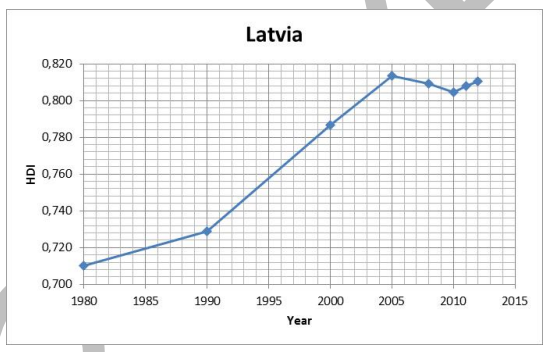

Figure 26: Human Development Index of Latvia, 1980-2013

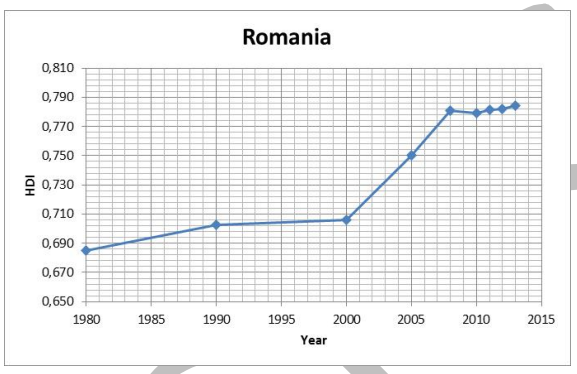

Figure 27: Human Development Index of Romania, 1980-2013

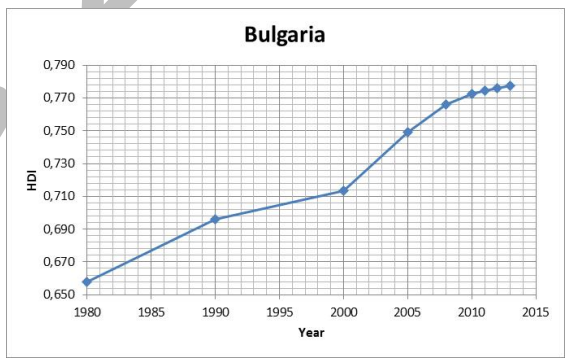

Figure 28: Human Development Index of Bulgaria, 1980-2013

The overall means by years along with their standard errors and 95% confidence interval are given in Table 2 and Figure 29 shows the trend by year. HDI has a steady upward trend after 2008. A sharp increase from 1980 to 2000 and a gradual increase after 2000 can be seen in Figure 3. For all countries except Cyprus, the HDI is the highest in 2013, even though the mean HDI for 2012 seems to equal with the HDI for 2013. Romania started to move up in 2000's. Latvia reached the peak in 2005. Long-term progress can be usefully assessed relative to other countries.

Table 3: Overall means by year

YEAR	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1980	0.719	0.009	0.702	0.737

1990	0.760	0.009	0.742	0.778
2000	0.821	0.011	0.798	0.844
2005	0.845	0.010	0.824	0.865
2008	0.856	0.009	0.837	0.875
2010	0.860	0.009	0.842	0.878
2011	0.862	0.009	0.844	0.880
2012	0.863	0.009	0.845	0.881
2013	0.863	0.009	0.845	0.881

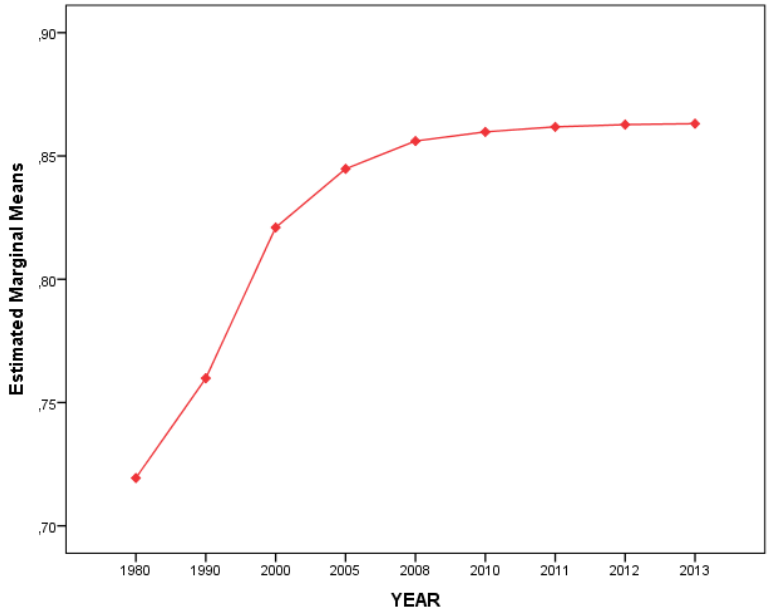

Figure 29: Marginal means of HDI by year

IBM SPSS 20 was used for the analysis. Generalized Linear Model menu includes techniques of Generalized Linear Models and Generalized Estimating Equations. Table 3 summaries the result of GEE analyses with an unstructures correlation structure. Test of model effects evaluates each of the model variables with the appropriate degrees of freedom. Intercept and year are statistically significant (P<0.01).

Table 4: Test of model effects

	Type III		
Source	Wald Chi-Square	df	Sig.
Intercept	1095.364	1	0.000
Year	37.905	1	0.000

Table 5 includes the regression coefficients for each of the variables along with standard errors, p-values and 95% confidence intervals for the coefficients and Exp(B). The coefficient for year is 0.024 .The model in Equation (1) can be represented by $\hat{Y}$= 0.705 + 0.024 Year.

This means that the expected change in HDI for a one-unit change in time is 0.024. In other words, the beta parameter can be interpreted as: 1-unit increase in year is associated with a 0.024 increase in HDI and a significant positive beta coefficient here would mean the change in year has changes in HDI correspondingly.

Table 5: Parameter estimates for GEE

Parameter	Beta	Std. Error	95% Wald Confidence Interval		Hypothesis Test			Exp(B)	95% Wald Confidence Interval for Exp(B)	
			Lower	Upper	Wald Chi-Square	df	Sig.		Lower	Upper
Intercept	0.705	0.0213	0.663	0.747	1095.364	1	0.000	2.024	1.941	2.110
Year	0.024	0.0039	0.016	0.032	37.905	1	0.000	1.024	1.016	1.032
(Scale)	0.005									

Working correlation matrix across all nine time periods under unstractured covariance matrix assumption is given below (Table 6). A working correlation structure is a correlation matrix for repeated or clustered measurements from each individual. An unstructured working correlation matrix has no explicit pattern. In the GEE method, if the working correlation matrix is correctly specified, the parameter estimates become more reliable.

Table 6: Working correlation matrix

Measurement	Measurement								
	1	2	3	4	5	6	7	8	9
1	1	0.271	0.197	0.158	0.195	0.351	0.525	0.694	0.915
2	0.271	1	0.358	0.315	0.289	0.266	0.249	0.226	0.200
3	0.197	0.358	1	0.661	0.530	0.372	0.209	0.034	-0.134
4	0.158	0.315	0.661	1	0.504	0.348	0.189	0.022	-0.174
5	0.195	0.289	0.530	0.504	1	0.343	0.252	0.152	-0.053
6	0.351	0.266	0.372	0.348	0.343	1	0.343	0.342	0.189
7	0.525	0.249	0.209	0.189	0.252	0.343	1	0.548	0.462
8	0.694	0.226	0.034	0.022	0.152	0.342	0.548	1	0.742
9	0.915	0.200	-0.134	-0.174	-0.053	0.189	0.462	0.742	1

Conclusions

GEEs provide a practical method with good statistical properties to model data that exhibit association but cannot be modeled as multivariate normal. Ordinary linear regression ignores the correlation between subjects but GEE takes into account the dependency of observations by specifying a working correlation structure. The main advantage of GEEs resides in the robust estimation of parameters' standard errors, even when the correlation structure is misspecified.Therefore using GEE would be considered a better alternative for clustered data and outperforms the classical regression. It could be presumably misleading to compare the HDI rankings with those of previously published reports, because the calculation method has changed. United Nations Development Programe data ensure as much cross-country comparability as possible.

However a progress in the HDI can be observed for all countries. During the period between 1980 and 2013, countries experienced different degrees of progress in terms of their HDIs.

Results also suggest that changes in HDI over years are statistically significant. A significant positive coefficient for time would mean the change in year has changes in HDI correspondingly.

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Türk Hava Yollarının Uluslararası Hava Yolu Şirketleri İle Verimliliklerinin Veri Zarflama Tekniği İle Karşılaştırılması

Utku Dülger, Furkan Yener, Bayram Topal

Sakarya Üniversitesi, Endüstri Mühendisliği Bölümü Türkiye
utkudulger@gmail.com
fyener@sakarya.edu.tr
btopal@sakarya.edu.tr

Özet : Bu çalışmada Türk Hava Yolları A.O.Ş'nin uluslararası yolcu taşımacılığı yapan, dünyanın farklı noktalarında varlık gösteren hava yolu şirketlerine göre verimliliğinin kıyaslanması amaçlanmıştır. Bu verimlilik kıyaslamasının uygulamasında, son yıllarda verimlilik kıyaslamalarında sıklıkla kullanılan Veri Zarflama Analizi tekniği kullanılmıştır. Çalışmada ilk olarak Veri Zarflama Analizi'nin kavramları açıklanmış ve Veri Zarflama Analizi Modellerine değinilmiştir. Uygulamada ise dünyanın farklı merkezlerinde faaliyet gösteren hava yolu şirketlerine göre verimlilik kıyaslamasının yapılmıştır. Böylece Türk Hava Yolları A.O.Ş'nin dünyanın önde gelen, birbirinden farklı özellik ve ölçekteki hava yolu şirketlerine göre verimlilik düzeyinin tespit edilmesi hedeflenmiştir. CCR ve BCC modelleri kullanılarak hava yolu şirketlerinin görece toplam etkinlikleri, görece teknik etkinlikleri ve görece ölçek etkinlikleri hesaplanmış, etkin ve etkin olmayan şirketler belirlenmiş ve Türk Hava Yolları A.O.Ş'nin mevcut verimlilik durumunu iyileştirmesi için yapılması gerekenler belirtilmiştir.

Anahtar Kelimeler: Veri Zarflama Analizi, Türk Hava Yolları, Verimlilik

Comparing the Efficiency of Turkish Airlines with Other International Airline Companies via Data Envelopment Analysis

Abstract : In this paper, we used Data Envelopment Analysis to compare the efficiency of Turkish Airlines Company with other airline companies which exist in different countries and makes international passenger transportation. The paper first explains the concept of the Data Envelopment Analysis and Data Envelopment Analysis Models. In the application section, we compared the efficiency of Turkish Airlines Company with the airline companies from different continents which have different scales and characteristics. Relative efficiency of airline companies are analised by using input and output oriented BCC and CCR models and the potential improvements for Turkish Airlines Company to be an efficient unit are defined on the end of the study.

Keywords : Data Envelopment Analysis, International Airlines, Efficiency

Giriş

Verimlilik kavramı en geniş anlamıyla, üretim sürecinin çıktılarının bu çıktılara ulaşabilmek için gereken kaynaklara(girdi) oranı şeklinde ifade edilmektedir. İşletmelerin belirli bir zaman içerisindeki performanslarının değerlendirilmesinin bir yolu, kullandığı girdileri çıktılara dönüştürürken ne kadar rasyonel davrandığının incelenmesidir. (Kayalıdere,K., Kargın,S., 2004)

Performans ölçümü ve yönetimi kamu ya da özel tüm organizasyonlar için vazgeçilemez bir unsurdur. Çünkü "sonuç ölçülemezse başarı/başarısızlık durumu değerlendirilemez, başarı değerlendirilemezse ödüllendirilemez, başarı ödüllendirilemezse muhtemelen başarısızlık ödüllendiriliyor demektir, başarısızlık tanımlanamazsa düzeltilemez" (Yıldırım,İ.E, 2010).

Her sistemin kendine özgü amaçları vardır. Sistem faaliyetlerinin istenen amaçlara ulaşıp ulaşmadığını anlamak için, performans ölçülerinin hesaplanması gerekir. Sistem performanslarının ölçülmesinde kullanılan yöntemlerden birisi de, etkinlik analizidir. Etkinlik analizinde, mal ve hizmet (çıktı) üretirken sistemlerin kaynaklarını (girdilerini) ne kadar etkin ve verimli kullandıkları belirlenmektedir (Özden,H.Ü., 2008).

Etkinlik analizi için kullanılan ölçüm yöntemlerin biri olan Veri Zarflama Analizi, kâr amacı olan veya olmayan işletmeler ve kuruluşların (karar birimlerinin) göreli etkinliğini ölçmeye yarayan parametresiz ve doğrusal programlama tabanlı bir yöntemdir. Bu yaklaşımda, farklı karar birimlerinin farklı üretim fonksiyonları olabileceği dikkate alınmaktadır.(Özcan,G.,Behdioğlu,S., 2009)

Bu çalışmada THY'nin uluslararası hava yolları şirketleriyle karşılaştırmalı verimlilik analizi yapılmıştır. THY 20 Mayıs 1933 yılında Milli Savunma Bakanlığı'na bağlı "Hava Yolları Devlet İşletmesi" adı ile kurulmuştur. 2011 yılı itibarıyla THY'nin uçak sayısı 179'a, koltuk sayısı 33.007'ye, yolcu sayısı 32.621.641'e, ulaşmıştır. (THY Vizyon ve Değerler, 2011)

Veri Zarflama Analizi

Veri Zarflama Analizi ilk olarak 1978 yılında Charnes, Cooper ve Rhodes tarafından ortaya atılan VZA, çok sayıda girdi ve çok sayıda çıktının sınır analizi olarak tanımlanabilen bir doğrusal programlama sürecidir. Süreç, girdi ve çıktılar üzerinde herhangi bir önsel ağırlık belirlenmesini gerektirmeden, etkin ve etkin olmayan karar birimlerinin belirlenmesini amaçlar.(Yıldırım,İ.E, 2010)

VZA yöntemindeki modeller yardımıyla, sistemlerin; "toplam etkinlik", "teknik etkinlik" ve "ölçek etkinlik" değerleri hesaplanabilmektedir. Sisteme ilişkin girdi bileşiminin en uygun biçimde kullanılarak mümkün olan en çok çıktının üretilmesindeki başarı "teknik etkinlik", uygun ölçekte üretim yapmadaki başarı da "ölçek etkinliği" olarak tanımlanmaktadır. Teknik etkinlik ile ölçek etkinliğin çarpımı ile hesaplanan etkinlik de "toplam etkinlik" olarak adlandırılmaktadır. VZA'da etkinlik ölçümü, üretim fonksiyonunun (üretim sınırı, etkinlik sınırı da denir) bilindiği varsayımı altında yapılmakta ve sistemlerin etkinliği, üretim sınırı ile karşılaştırılmak suretiyle, göreli olarak ölçülmektedir. (Özden,H.Ü., 2008).

VZA'nin kullanılabilmesi için gerekli Karar Verme Birimi (KVB) sayısı, analizde kullanılan girdi ve çıktı değişkenlerinin sayılarına bağlıdır. Bu konuda 1990 yılında Vassiloglou ve Giokas; uygulamada güvenilir sonuçlar elde edilebilmesi için, KVB sayısının (n), girdi (m) ve çıktı (s) sayısının en az üç katı olması gerektiğini yani n=3(m+s) kuralına uyulmasını önermişlerdir (Özden,H.Ü., 2008).

Massachusetts Institute of Technology (MIT) tarafından hazırlanan Global Airline Industry Program-Airline Data Project adlı çalışmada belirtilen, hava yolu şirketlerini kıyaslamayı mümkün kılan, standartlaştırılabilen veri türleri şöyledir; (MIT, 2012)

Arz Edilen Koltuk-Mil Başına Maliyet(Cost per Available Seat-Mile) : (Hava yolu şirketinin tüm giderleri / Arz edilen koltuk-mil) formülüyle hesaplanır. Arz edilen her koltu-mil'in birim maliyetini ifade eder.

Arz Edilen Koltuk-Mil Başına Yakıt Maliyeti (Fuel Cost per Available Seat-Mile): (Hava yolu şirketinin yakıt giderleri / Arz edilen koltuk-mil) formülüyle hesaplanır. Arz edilen her koltuk-mil başına harcanan yakıt masrafını ifade eder.)

Doluluk Oranı (Load Factor): Belirli bir zaman dilimi içerisinde, hava yolu şirketinin arz etmiş olduğu koltuk-millerin ne kadarında yolcu taşındığıdır. % olarak ifade edilir. Operasyon Gelirleri (Operation Revenue): Toplam hava yolu operasyonlarından elde edilen gelirdir. Çizelgelenmiş ve çizelgelenmemiş hizmetleri kapsar. Gelir kaynakları, yolcu, kargo ve fazla bagaj ve diğer ulaşımla alakalı gelirler de içine alır.

Arz Edilen Koltuk-Mil Başına Gelir (Revenue per Available Seat-Mile): (Hava yolu şirketinin toplam geliri / Arz Edilen Koltuk-Mil) oranıyla hesaplanır. Şirketin arz edilen koltuk-mil başına elde ettiği geliri

ifade eder.

Arz Edilen Koltuk-Mil Başına Toplam Gelir (Total Revenue per Available Seat-Mile): (Toplam Operasyon Geliri / Arz Edilen Koltuk-Mil) oranı ile hesaplanır.)

M.Coli, E.Nissi, A.Rapposelli tarafından yapılan çalışmada iki adet girdi ve bir adet çıktı kullanılmıştır.(M.Coli,E. Nessi,A, Rapposelli, 2011) Çalışmada girdiler, toplam koltuk sayısı ve toplam değişken operasyon giderleri, çıktı ise, çizelgelenen saatlerde taşınan yolcu gelirleri olarak alınmıştır. Özel bir çıktı çeşidi olarak da rötarlı uçuşların sayısını kullanmışlardır. Joe Zhu (Zhu Joe, 2011) tarafından yapılan çalışmada Arz Edilen Koltuk-Mil Başına Maliyet, Arz edilen koltuk başına verilen yevmiye, maaş ve yararlar, arz edilen koltuk-mil başına yakıt maliyeti, yakıt ücreti ve kullanılan yakıt galonu sayısı girdi değişkenleri olarak alınmıştır. Çıktı değişkenleri olarak doluluk oranı, filo büyüklüğü, yolcu-mil geliri ve yolcu geliri idi. Filo büyüklüğü, havayolu şirketinin filosundaki uçak sayısı olarak ifade edilir. Büyük filolar müşteriye satılacak koltuk sayısı bakımından avantaj sağlarken bakım masraflarının daha yüksek olması dezavantaja sebep olmaktadır. Bu yüzden havayolu şirketleri karşılaştırmalarında genellikle kullanılmaz. Seockjin Hong ve arz edilen ton-km, operasyon giderleri ve uçuş dışı varlık değerleri kullanılmıştır. Çıktı olarak yolcu-mil gelirleri ve yolcu-dışı gelirler kullanılmıştır. Fethi, Jackson ve Weyman-Jones (Hong, S. and Zhang, A., 2010) tarafından yapılan çalışmada ise girdi değişkeni olarak arz edilen ton-kilometre ve uçuş dışı varlıklar, çıktı değişkenleri olarak da kilometre başı yolcu geliri ve yolcu dışı gelirler dikkate alınmıştır.

Çalışmada kullanılacak girdi ve çıktılar literatür araştırması baz alınarak belirlenmiştir.(Hong, S. and Zhang, A., 2010) Yaptığımız çalışmada, seçilen değişkenlerin şirketlerin ölçeklerinden olabildiğince az etkilenmesini sağlamaya özen gösterilmiştir. Lovell, faydalı girdi ve çıktılar konusu üzerinde yapmış olduğu çalışmada faydalı olabilecek bütün girdi ve çıktıların değerlendirmeye alınması fikrini ileri sürmüştür. Ancak birbiri arasında yüksek korelâsyona sahip olan girdi veya çıktıların analiz sonucunu etkilemediği tezini ileri sürerek hesaplama dışı bırakılabileceğini savunmuştur.(Ateş,A.,Esmer,S., 2011) Bu yüzden toplam yakıt maliyeti, kullanılan yakıt galonu sayısı, çalışan sayısı, taşınan yolcu sayısı ve filo büyüklüğü gibi şirketlerin ölçeklerine göre büyük değişiklikler gösteren veriler yerine standardize edilebilen Arz Edilen Koltuk-Mil Başına Maliyet(AEKMBM), Arz Edilen Koltuk-Mil Başına Yakıt Maliyeti(AEKMBYM), Doluluk Oranı(DO) ve Arz Edilen Koltuk-Mil Başına Gelir(AEKMBG) gibi girdi ve çıktı değişkenleri tercih edilmiştir. Daha önce de belirtildiği gibi girdi ve çıktı değişkenlerinin toplam sayısının, KVB'lerin sayısının 1/3'ünü geçmemesine dikkat edilmiştir. Arz Edilen Koltuk-Mil Başına Yakıt Maliyeti ve Arz Edilen Koltuk-Mil Başına Maliyet değişkenlerini girdi değişkenleri olarak kullanılmış olup, Arz Edilen Koltuk-Mil Başına Maliyet değerini hesaplarken, genel maliyetlerden yakıt maliyetleri çıkarılarak işlemler yapılmıştır.

Uygulama ve Yorumlar

Uygulamamızda Türk Hava Yolları A.O.Ş'nin 2010 yılı verimliliği, dünyanın farklı bölgelerinde hizmet veren 14 şirket ile kıyaslanmış ve Tablo2'de gösterilen sonuçlara ulaşılmıştır. Değerlendirilmeye alınan hava yolu şirketlerinin potansiyel iyileştirme değerleri de Tablo 3'de gösterilmiştir. Türk Hava Yolları A.O.Ş, dünyanın farklı merkezlerinde varlık gösteren hava yolu şirketleri ile verimlilik kıyaslamasına tabi tutulurken Tablo1'deki veriler kullanılmıştır. Uygulamadaki tüm birimler kilometreden mil'e, ve tüm para birimleri 2010 yılı ortalama kur değerlerine göre Amerikan Doları'na çevrilmiştir. Şirketler hakkındaki tüm veriler, şirketlerin yayımladıkları resmi yıllık raporlarından alınmıştır.

Bu aşamada, Türk Hava Yolları A.O.Ş ve 14 farklı hava yolu şirketinin Tablo 1'de gösterilen veriler ile veri zarflama analizi yapılmıştır. Bu analiz sonucunda Tablo 2'de görülen görece etkinlik değerleri hesaplanmıştır. Girdi ve çıktı yönelimli CCR modellerinden elde edilen bilgilere göre, değerlendirilmeye alınan 15 şirketten 3 tanesinin (AirFrance,Lufthansa,Ryan Air) görece toplam etkin olduğu, 12 şirketin ise görece toplam etkin olmadığı anlaşılmıştı

Tablo 1. Dünyanın Farklı Merkezlerinde Faaliyet Gösteren Hava Yolu Şirketleri ve Türk Hava Yolları Şirketinin Girdi ve Çıktı değerleri

	Arz Edilen Koltuk-Mil Başına Maliyet (cent)	Arz Edilen Koltuk-Mil Başına Yakıt Maliyeti(cent)	Doluluk Oranı (%)	Arz Edilen Koltuk-Mil Başına Gelir (cent)

EasyJet	8.1	2.9	87	11.7
AirFrance	3.18	4.02	80.7	17.85
Lufthansa	4.57	4.67	79.3	24.7
AirLingus	10.42	3.11	76.1	14.21
Singapore Airlines	12.9	6.8	78.5	21.6
Emirates Group	7.7	4	68.9	13.7
China Eastern	9.3	4.3	70	14.7
Ryan Air	6.2	2.2	73	10
THY	10.62	3.4	73.7	10.94
American	10.72	3.6	82	12.11
Continental	10.97	3.1	84	11.73
Delta	10.81	3.8	84	12.39
Allegiant	5.06	4	90	9.27
JetBlue	6.79	3.1	81	10.4
SouthWest	7.77	3.5	79	12.26

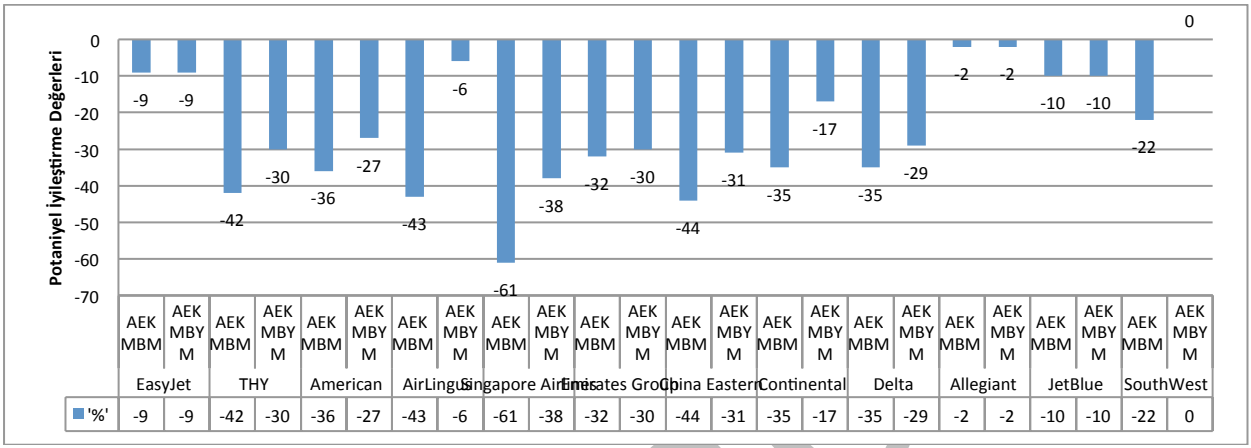
Tablo 2. Görece Toplam Etkinlik, Görece Teknik Etkinlik ve Ölçek Etkinlik Değerler

No	Hava Yolu Şirketi	CCR Modeli		BCC Modeli				Ölçek Etkinlik	
		CCR Girdi ve Çıktı		BCC Girdi Yönelimli		BCC Çıktı Yönelimli			
		Görece Toplam Etkinlik (%)	Referans Kümesi	Görece Teknik Etkinlik (%)	Referans Kümesi	Görece Teknik Etkinlik (%)	Referans Kümesi	Girdi Yönelimli (%)	Çıktı Yönelimli (%)
1	Air France	100	-	100	-	100	-	100	100
2	Lufthansa	100	-	100	-	100	-	100	100
3	Ryan Air	100	-	100	-	100	-	100	100
4	Allegiant	97,2	1,3	100	-	100	-	97,2	97,2
5	Easy Jet	90,9	1,3	100	-	100	-	90,9	90,9
6	Airlingush	93,8	2,3	94,8	2,3,5	96,6	2,3,5	98,94	97,1
7	JetBlue	89,7	1,3	92,8	1,2,3,5	95,2	1,3,4,5	96,66	94,22
8	Continental	82,8	2,3	90,7	2,3,5	96,7	2,4,5	91,29	85,63
9	SouthWest	77,3	1,2,3	80,1	1,2,4,5	91,4	2,4,5	96,5	84,57
10	American	72,7	2,3	78	2,3,5	94,3	2,4,5	93,21	77,09
11	Delta	70,4	2,3	76,7	2,3,5	96,4	2,4,5	91,79	73,03
12	Emirates Group	69,5	2,3	72	1,2,3	81,6	2,4,5	96,53	85,17
13	THY	69,4	2,3	69,6	2,3,5	85	2,4,5	99,71	81,65
14	China Eastern	68,6	2,3	69,5	2,3	83,2	2,4,5	98,71	82,45
15	Singapore Airlines	61,1	2,3	61,3	2,3,5	96,9	2,4	99,67	63,05

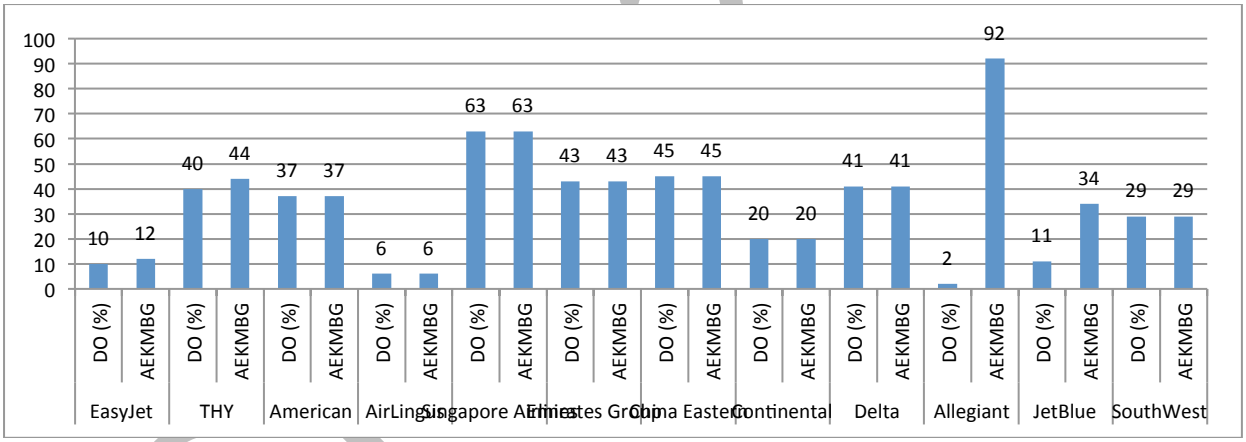
En düşük görece toplam etkinlik değerine sahip olan şirket 61,10% ile Singapore Airlines şirketidir. THY'nin görece toplam etkinlik değeri 69,40%'dir ve bu değerle THY, toplam göreli etkinlik derecesi sıralamasında 13. sıradadır. THY'nin referans kümesinde de Lufthansa ve Ryan Air şirketlerinin bulunduğu görülebilir. Yani THY, görece verimli şirketler arasına girebilmek için Lufthansa veya Ryan Air şirketlerinin girdi ve çıktı değerlerini hedef alırsa en kısa yoldan görece verimli şirketler arasında yerini alabilir. Girdi yönelimli BCC modeline göre AirFrance, Lufthansa, Ryan Air, Allegiant ve EasyJet şirketleri görece teknik etkin olarak saptanmıştır. THY'nin görece teknik etkinlik değerleri ise, girdi yönelimli yaklaşıma göre 69.6%, çıktı yönelimli yaklaşıma göre 85.0% olarak hesaplanmıştır. Şirketlerin referans kümelerinin yaklaşımlara göre değişimi de Tablo 2'den incelenebilir. Allegiant ve EasyJet şirketleri görece teknik etkin olarak hesaplanmıştır. Bu iki şirketin görece ölçek etkinlik değerlerinin düşük oluşu, görece toplam etkinlik oranlarının da düşük olmasına sebebiyet vermiştir. Türk Hava Yolları A.O.Ş'nin girdi yönelimli görece ölçek etkinlik değeri 99,71%, girdi yönelimli BCC Modeline göre ise görece teknik etkinliği 69.60% olarak hesaplanmıştır. Türk Hava Yolları A.O.Ş'nin görece genel verimliliğinin düşük olmasının sebebinin teknik etkisizlikten kaynaklandığı görülebilmektedir.

Şirketlerin potansiyel iyileştirme değerlerini hesaplamak için girdi yaklaşımlı ve çıktı yaklaşımlı CCR modeli kullanılmıştır. Görece etkin olmayan hava yolu şirketlerinin, görece etkin olabilmek için yapmaları

gereken potansiyel iyileştirme değerleri Şekil1 ve Şekil2'de gösterilmiştir. Potansiyel iyileştirme değerleri, görece etkin olmayan şirketlerin görece etkin olabilmeleri için girdilerinde yapmaları önerilen yüzdesel azalmaları ve çıktılarında yapılmaları gereken yüzdesel artışları ifade etmektedir. Şekil1 ve Şekil2'deki tüm şirketler için potansiyel iyileştirme değerleri aynı şekilde yorumlanabilir. THY'nin bu veri gurubu içerisinde görece etkin bir şirket olması için yapması gereken değişiklikler şöyledir; Arz Edilen Koltuk-Mil Başına Maliyet değerini 16% azaltmalı, Doluluk Oranı 40% arttırılmalı, Arz Edilen Koltuk-Mil Başına Gelir değerini 44% arttırmalı. Eğer bu artışlar sağlanabilirse, THY şirketi, referans kümesinde bulunan şirketler gibi toplam etkin hale gelecektir.



Şekil 1: Şirketlere göre potansiyel iyileştirme değerleri. (CCR Girdi Yönelimli Modele Göre)



Şekil 2: Şirketlere göre potansiyel iyileştirme değerleri. (CCR Çıktı Yönelimli Modele Göre)

Sonuçlar

Havayolu şirketlerinin amacı, tıpkı diğer kar amaçlı işletmeler gibi, en az girdiyle en fazla çıktıyı elde etmektedir. Bu çalışmada Türk Hava Yolları A.O.Ş'nin dünyanın farklı bölgelerinde varlık gösteren ve uluslararası taşımacılık yapan şirketlere göre verimliliği Veri Zarflama Analizi ile sorgulanmıştır. Verimlilikler ölçülürken girdi olarak arz edilen koltuk-mil başına düşen maliyet ve arz edilen koltuk-mil başına yakıt maliyeti, çıktı olarak da yıllık doluluk oranı ve arz edilen koltuk-mil başına gelir değerleri ele alınmıştır.

Türkiye'nin enerjide dışa bağımlılığı birçok akademik çalışmanın konusunu oluşturmakla birlikte günümüzde bilinen bir sorundur. Türk Hava Yolları A.O.Ş'nin dünyanın farklı bölgelerinde varlık gösteren ve uluslararası yolcu taşımacılığı yapan şirketlerle kıyaslamalı olarak verimliliğinin analiz edildiği bu çalışmada elde edilen sonuçlara göre, verimliliği düşük çıkan şirketlerin yakıt maliyetlerinin yüksek olduğu tespit edilmiştir. Türk Hava Yolları A.O.Ş'nin görece toplam etkinsizliğindeki en önemli faktörün görece teknik

etkinsizlik olduğu anlaşılmıştır. Türk Hava Yolları A.O.Ş'nin yakıt maliyetinin, görece verimli olan rakiplerinden daha yüksek olması verimlilik değerlerinin düşük çıkmasına neden olmuştur. Ancak Türk Hava Yolları'nın girdi yönelimli ölçek etkinlik değerine baktığımızda %99.71'lik skor ile ölçeğine uygun hizmet verdiği görülebilir.

Bu çalışmada Türk Hava Yolları A.O.Ş'nin rakip firmalara göre verimsiz olduğu yönler bölgesel nedenlerle bağlantılar kurularak açıklanmıştır. Uluslararası taşımacılık yapan şirketler arasında görece toplam verimli bir şirket olabilmesi için yapılması gereken değişiklikler belirtilmiştir.

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Türkiye Taşkömürü Kurumunda Faaliyet Tabanlı Maliyetleme Uygulaması

Yrd. Doç. Dr. Halim Akbulut

Bülent Ecevit Üniversitesi İ.İ.B.F.

Yrd. Doç. Dr. Mehmet Pekkaya

Bülent Ecevit Üniversitesi İ.İ.B.F.

Dr. Hakan Vargün

Bülent Ecevit Üniversitesi D.M.Y.O.

Cumhur Açıkgöz

Bülent Ecevit Üniversitesi S.B.E.

Özet: Artan rekabet ve değişen üretim yapısı sonucu geleneksel maliyet sistemleri yeterli olmamaktadır. Bu çalışmada, modern maliyet sistemlerinden biri olan faaliyet tabanlı maliyetleme (FTM) sisteminin bir kömür işletmesinde uygulanabilirliğini araştırmak amaçlanmıştır. Bu kapsamda seçilen işletme üzerine örnek olay çalışması yapılmıştır. Araştırmadan çıkan sonuçlar şu şekildedir: Öncelikle uygulama yapılan işletmede hesaplanan mamul maliyetlerine satış ve pazarlama ile genel yönetim giderleri maliyet payı dahil edilmemesi nedeniyle mamul maliyetleri geleneksel maliyetleme sisteminde FTM sistemine göre daha düşük çıkmıştır. Bunun en önemli nedeni ülkemizde uygulanan muhasebe sisteminde faaliyet giderleri o üretim dönemine ait olsa bile üretim dışı bir gider olarak değerlendirilmekte ve stok hesapları yerine sonuç hesaplarına aktarılmaktadır.

Anahtar Kelimeler: Faaliyet Tabanlı Maliyetleme Sistemi, Maliyet Yönetimi, Kömür İşletmeleri

Giriş

Teknolojide meydana gelen son yıllardaki hızlı gelişmeler, üretim teknolojilerinde de kendisini göstermekte ve yeni üretim sistemlerini ortaya çıkarmaktadır. Bu yeni üretim sistemleri belirgin olarak otomasyona dayanmaktadır. Geleneksel maliyetleme sistemlerinin bu yeni üretim ortamları için uygun olmadığı kabul edilmektedir. Bunun başlıca sebepleri, üretilen mamul çeşitlerinin hızla artması bunun sonucunda tasarım giderlerinin ve satış sonrası hizmet giderlerinin de önemli ölçüde artması, genel üretim giderlerinin toplam maliyetler içindeki oranının artması buna karşılık direkt işçilik maliyetlerinin ise oransal anlamda azalma göstermesidir.

İşletmelerin amacı olan kara ulaşmada belirleyici olan iki temel faktör maliyet ve satış fiyatıdır. Satış fiyatı rekabet ortamında bir mal veya hizmeti sunan firmalar tarafından belirlenir. Bunun yanında maliyetler ise ilgili işletmenin kısmen kontrolündedir. Bu kontrolün sağlıklı bir şekilde yerine getirilmesinde geleneksel maliyet sistemlerinin çok başarılı olamadıkları kabul edilmektedir. Bu konuda modern maliyet sistemlerinden biri kabul edilen ve kullanımı gittikçe yaygınlaşan Faaliyet Tabanlı Maliyetleme (FTM) sistemi önerilmektedir.

Hem ürün maliyetlemesinde geleneksel maliyet yöntemlerine göre daha doğru sonuçlar veren hem de yöneticilerin karar alma sürecinde kullanabilecekleri daha kapsamlı ve rasyonel bilgiler üreten FTM yöntemi geliştirilmiştir. Bu çalışmanın amacı, örnek olay yaklaşımıyla bir kömür işletmesinde FTM sisteminin

uygulanabilirliğini incelemektir. Bu anlamda, Türkiye'de faaliyet gösteren bir maden işletmesinde örnek olay incelemesi yapılmıştır.

Faaliyet Tabanlı Maliyet (FTM) Sistemi

İşletmelerin faaliyetlerini yürüttükleri çevrede yıllar boyunca meydana gelen değişimler neticesinde rekabet artmış, müşterilerin kalite, verimlilik, esneklik, yenilik ve sürekli gelişim gibi yeni talepleri gündeme gelmiş ve böylece geleneksel maliyetleme sistemlerinin dayandığı temel varsayım olan bir ürünün uzun dönemli üretilebileceği olgusu ortadan kalkmıştır (Durer vd., 2009:107).

FTM sistemi işletmenin mamul üretim sürecinde kullandığı kaynakların maliyetini hesaplar(Cooper & Kaplan, 1992:1). FTM faaliyetlerin, kaynakların ve maliyet objelerinin maliyet ve performanslarını ölçmek için kullanılan bir toplam kalite yönetim aracıdır (Ashford, 2011:3). FTM Sistemi, faaliyetlerin, kaynakların ve maliyet sürücülerinin maliyet ve performanslarını ölçme yöntemidir. FTM, faaliyetlerin kaynak kullanımlarını esas alarak kaynak maliyetlerini faaliyetlere yükleyen, maliyet sürücülerinin faaliyet kullanımlarını esas alarak da faaliyet maliyetlerini maliyet taşıyıcılarına yükleyen bir sistemdir (Bengü, 2005:188)

FTM Sistemi, mamullerin işletmenin kaynaklarını faaliyet bazında tükettiği, dolayısıyla endirekt giderlerin faaliyet bazında sınıflandırılması gerektiği anlayışı ile hareket eden ve mamul ile endirekt giderler arasında sadece üretim hacmine bağlı olmaksızın çeşitli seviyelerde doğrusal ilişki kuran bir maliyet ve yönetim anlayışı olarak tanımlanabilir (Dumanoğlu, 2005:106).

FTM sisteminin başlıca amaçları aşağıdaki gibidir (Alkan, 2005:41):
- Katma değer yaratmayan faaliyetlere ait maliyetleri elimine etmek ya da en düşük düzeye indirmek,
- Katma değeri yüksek faaliyetlerin basitleştirilmesinde, etkin bilgi akışı sağlamak,
- Problemlerin temel nedenlerinin saptanmasını ve bu etkenlerin düzeltilmesini sağlamak,
- Maliyet dağıtımından kaynaklanan yanlışlıkları ortadan kaldırmak,
- Yöneticilerin alacakları kararlarda doğru maliyet bilgileri sağlayabilmek.

FTM sisteminde kullanılan temel kavramları kaynak, faaliyet, faaliyet merkezi, maliyet havuzu ve maliyet etkeni olarak sıralamak mümkündür (Unutkan, 2010:90). Söz konusu kavramları kısaca açıklamakta yarar bulunmaktadır. Kaynak kavramı, faaliyetleri gerçekleştirebilmek için gerekli olan harcamalardır. Faaliyet kavramı, mamül veya hizmetlerin üretilmesi ve satılması amacıyla gerçekleştirilen birtakım işlemlerdir. Faaliyet merkezi kavramı, birbirine benzer işleyişe sahip olan veya kaynak tüketiminde aynı maliyet dağıtım anlayışına sahip olan faaliyetlerin bir araya toplandığı merkezlerdir. Maliyet havuzu kavramı, faaliyetler tarafından tüketilen kaynakların toplam tutarının faaliyetler bazında izlenmesi amacıyla kullanılmaktadır (Unutkan, 2010:91). Maliyet havuzları birbirine benzeyen faaliyetlerin maliyetlerini bünyesinde barındırdığı için bu maliyet havuzları homojen niteliktedir. Dolayısıyla her bir faaliyete ilişkin maliyet havuzunda biriktirilen maliyetlerin mamül veya hizmetlere aktarılmasında tek bir maliyet etkeni yeterli olmaktadır (Bekçi ve Negiz, 2011:122). Maliyet etkeni kavramı, kaynak maliyetlerinin faaliyetlere ve faaliyetler bazında maliyet havuzlarında biriktirilen maliyetlerin de mamül veya hizmetlere yüklenmesinde kullanılan dağıtım anahtarlarıdır.

FTM Sistemini Geleneksel Maliyetleme Sisteminden Ayıran Özellikler

FTM sistemi ile geleneksel maliyetleme sistemleri arasındaki en önemli farklılık, sadece üretim maliyetlerinde değil aynı zamanda diğer faaliyet maliyetlerinin ele alınış biçiminde de ortaya çıkmaktadır (Karacan ve Aslanoğlu, 2005:7). Geleneksel maliyetleme sisteminde sadece üretim ile ilişkili olan maliyetler direkt ve endirekt olarak sınıflandırılmaktadır. Direkt maliyetler üretimi gerçekleştirilen mamül veya hizmetlere direkt yüklenebilirken dolaylı giderler ise birtakım dağıtım ölçüleri aracılığıyla mamül veya hizmetlere yüklenmektedir. Bu açıdan geleneksel maliyetleme sisteminde genellikle üretim ortamında oluşan maliyetler öncelikle üretim merkezlerine dağıtılmakta daha sonra üretim merkezlerinde biriktirilen maliyetler hacim tabanlı ölçütler aracılığıyla mamül veya hizmetlere yüklenmektedir.

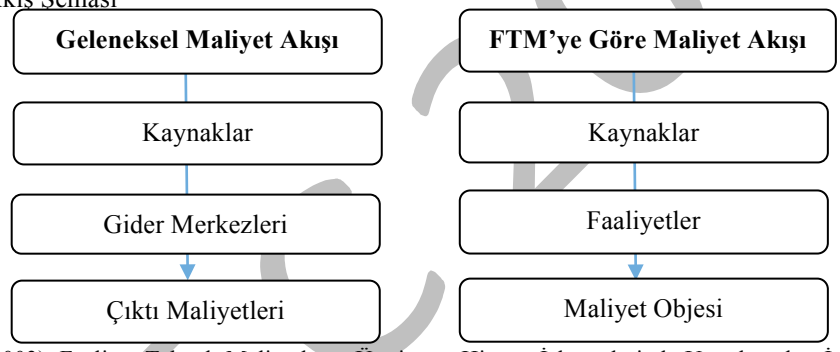
Geleneksel maliyetleme sisteminin bir diğer özelliği üretilen mamül veya hizmet maliyetlerinin hesaplanmasında sadece üretim ortamında ortaya çıkan maliyetleri dikkate alıyor olmasıdır. Diğer bir ifadeyle geleneksel maliyetleme sisteminde genel yönetim giderleri ile pazarlama, satış ve dağıtım giderleri gibi faaliyet giderleri üretim maliyetleri hesaplanırken bir maliyet unsuru olarak dikkate alınmamakta ve direkt olarak dönem gideri olarak değerlendirilmektedir.

Geleneksel maliyetleme sisteminin ürettiği bilgilerin yönetimin ihtiyaçlarını karşılamada yetersiz kalması, üretim sürecini tam ve doğru bir şekilde yansıtmaması, etkin bir performans değerlendirme yapılmasına izin vermemesi, sağladığı bilgilerin çok genel olması, kaynak tüketimini doğru olarak ölçememesi, bilgi sağlamada çok geç kalması, sağladığı bilgilerin güvenilir olmaması, fazla stokları teşvik edici olması, gerçekçi olmayan maliyet dağıtımları yapması ve geleceğe yönelik üretim planlama için gerekli bilgiler sağlayamaması söz konusu sistemin en önemli eksiklikleri arasında yer almaktadır (Edward ve Heard, 1984:46, akt:Çabuk, 2003:112-113).

FTM sistemi, faaliyetlerin kaynakları tüketmeleri açısından geleneksel maliyetleme sisteminden kaynaklanan eksikliklerin veya yanlışlıkların ortadan kaldırılmasına temel teşkil eden bir sistemdir. FTM sisteminin üretim çıktılarına ilişkin maliyetlerin hesaplanmasına temel katkısı, üretim maliyetlerinin oluşumuna neden olan faaliyet veya faaliyetler dizisi ile bu faaliyet veya faaliyet dizilerinin ortaya çıkmasına neden olan üretim çıktıları arasındaki bağlantıyı sağlamaktır (Karacan ve Aslanoğlu, 2005:5).

FTM sistemi geleneksel maliyetleme sisteminin aksine mamül veya hizmet maliyetlerinin hesaplanmasında faaliyetlere odaklanmaktadır. Bu ileri maliyetleme sisteminde mamül ve hizmet maliyetlerinin belirlenmesinde sadece üretim sürecinde ortaya çıkan maliyetler dikkate alınmamakta aynı zamanda üretim dışı faaliyet giderleri de dikkate alınmaktadır. Bu açıdan faaliyet giderleri sonuç hesaplarına üretime ilişkin bir maliyet unsuru olarak alınmaktadır. FTM sisteminde maliyetler faaliyet veya faaliyetler dizisine göre izlenebildiği için hangi faaliyetin ne kadar maliyeti ortaya çıkardığı analiz edilebilmektedir. Geleneksel maliyetleme ve FTM sisteminin maliyet akış sürecini Şekil 1'de göstermek mümkündür.

Şekil 1: Maliyet Akış Şeması



Kaynak: Öker, F. (2003). Faaliyet Tabanlı Maliyetleme Üretim ve Hizmet İşletmelerinde Uygulamalar. İstanbul: Literatür Yayınları, s.33.

Şekil 1'de görüleceği üzere geleneksel maliyetleme sisteminde maliyet akışı önce kaynaklardan esas ve yardımcı üretim merkezlerine aktarılmakta ve bu merkezlerde toplanan maliyetler çıktı maliyetlerine dönüşmektedir. Oysa FTM sisteminde kaynak maliyetleri önce bu kaynakları tüketen faaliyetlere yüklenmekte ve faaliyetlerde toplanan giderler ise çeşitli maliyet etkenleri aracılığıyla maliyet nesnelerine aktarılmaktadır.

FTM Sisteminin Yapısı

Bir işletmede FTM sistemi amacına uygun, en düşük maliyetle, basit ve anlaşılabilir şekilde kurulmalıdır. Bu anlamda belirlenen faaliyetler arasında uyum olmalıdır. Spesifik faaliyetlerden ziyade daha makro büyüklükteki faaliyetlerin seçimine dikkat edilmelidir. Önemsiz görülen faaliyetlerin bir araya getirilmesi ile gereksiz çalışmaların önüne geçilmesi gerekmektedir. Ayrıca sistemin başarılı sonuçlar vermesi açısından doğru veri akışının sağlanması büyük önem taşımaktadır (Bengü ve Arslan, 2009:60).

FTM sisteminin aşamalarını aşağıdaki gibi sıralamak mümkündür (Bekçi ve Negiz, 2011:122).

A1. Faaliyetlerin belirlenmesi: Faaliyetler, bir üretim ortamında mamül veya hizmetin üretimine başlanmasından söz konusu mamül veya hizmetin müşterilere sunumuna kadar uzanan süreçte ortaya çıkmaktadır. Bu süreçte yer alan tüm faaliyetlerin belirlenmesi, tanımlanması ve kategorize edilmesi oldukça önemlidir. Faaliyetlerin belirlenmesi sürecinde bazı önemli hususlara dikkat edilmesi gerekmektedir. Söz konusu hususları aşağıdaki gibi özetlemek mümkündür (Doğan, 1996:151-153, akt: Alkan, 2005:46).

1. Belirlenecek faaliyetler sistemin amacına uygun olarak ayrıntılandırılmalı,

2. Makro faaliyetler seçilmeli,
3. Önem düzeyi düşük olan faaliyetler bir faaliyet grubunda toplanmalı,
4. Faaliyetler açık bir şekilde tanımlanmalı.

A2. Faaliyet merkezlerinin belirlenmesi: Faaliyetlerin belirlenmesinin ardından sistem tasarımının ikinci aşaması faaliyet merkezlerinin belirlenmesidir. Faaliyet merkezlerini aşağıdaki gibi dört temel kategoride açıklamak mümkündür (Erdoğan ve Saban, 2014:541-542).

1. Mamul birim düzeyindeki faaliyetler: Bu tür faaliyetler mamül veya hizmet üretimi gerçekleştirilirken sürekli ortaya çıkan faaliyetlerdir. Bu faaliyetler gerçekleştirilirken kaynak maliyetleri üretilen birim sayısı ile doğrudan ilişkilidir.

2. Parti düzeyindeki faaliyetler: Bu tür faaliyetler, üretimi gerçekleştirilen parti sayısına göre ortaya çıkmaktadır. Bu faaliyetlere ilişkin maliyetler her parti için değişkenlik göstermekte ancak partiler içerisindeki üretilen mamül veya hizmetler için sabit niteliktedir.

3. Mamul düzeyindeki faaliyetler: Bu tür faaliyetler birden çok farklı özelliğe sahip mamül veya hizmetin üretilmesi için gerekli olan faaliyetler olarak karşımıza çıkmaktadır.

4. Fabrika düzeyindeki faaliyetler: Üretimin istenen düzeyde olabilmesi amacıyla gerçekleştirilen faaliyetlerdir. Bu faaliyetlere ilişkin maliyetler çeşitli dağıtım ölçülerine göre mamül veya hizmetlerle ilişkilendirilmektedir.

A3. Maliyet etkenlerinin belirlenmesi: Maliyet etkenleri, faaliyetler tarafından tüketilen kaynakların miktarı ve onun parasal tutarı açısından bir doğrulama aracıdır. Diğer bir deyişle maliyet etkenleri, kaynak maliyetlerinin faaliyetlere ve faaliyetlerde biriktirilen maliyetlerinde mamül veya hizmetlere yüklenmesinde nedensellik ilişkisi kurmaktadır (Alkan, 2005:47).

A4. Maliyetlerin faaliyet merkezlerine aktarılması: Kaynak maliyetlerinin faaliyetlere yüklenmesinde birtakım maliyet etkenlerinin belirlenmesi gerekmektedir. Bu maliyet etkenlerinin seçilmesinde kaynak ve faaliyet arasındaki neden-sonuç ilişkisi dikkate alınmalıdır. Kaynak maliyetlerinin her bir faaliyete aktarılması sonucunda her bir faaliyet merkezinin maliyeti doğru bir şekilde hesaplanmaktadır.

A5. Maliyetlerin mamullere yüklenmesi: Faaliyet merkezleri için uygun maliyet etkenlerinin belirlenmesinin ardından üretilen her bir mamül veya hizmet grubu için birtakım maliyet etkenlerinin belirlenmesi ve söz konusu faaliyet maliyetlerinin mamül veya hizmet gruplarına aktarılması gerekmektedir (Öker, 2003:51).

Bir Kömür İşletmesi Üzerine Bir Uygulama

Uygulama, taşkömürü madenciliği alanında faaliyetlerini sürdüren TTK'nın sadece bir müessesi üzerinedir. Taşkömürü üretimi büyük ölçüde insan gücüne dayalı emek-yoğun bir şekilde gerçekleştirilmektedir. Bu şartlarda Kömür İşletmesinin 2014 yılı içinde gerçekleştirdiği satılabilir kömür üretim miktarı 325.953'tondur. Üretilen koklaşabilir nitelikteki tüvanan kömürler lauvarda yıkanmakta ve kömürün yıkanmasından sonra elde edilen A, B ve C cinsi kömürler piyasaya arz edilerek satışları yapılmaktadır. Söz konusu işletmede 2014 yılı içinde üretimi yapılan 325.953 ton kömürün 316.258 tonunu satmıştır. İşletme bu faaliyetlerini işçi ve memur olmak üzere toplam 2.159 çalışanıyla gerçekleştirmiştir. Kömür işletmesinin 2014 faaliyet dönemine ilişkin faaliyet giderlerini Tablo 1'de göstermek mümkündür.

Tablo 1: Kömür İşletmesi 31.12.2014 Faaliyet Dönemine Ait Faaliyet Giderleri

Endirekt Giderler	Toplam (□)
Endirekt Madde ve Malzeme Giderleri	10.579.544,50
Endirekt İşçilik Giderleri	95.241.972,23
Memur Ücret Giderleri	2.730.167,52
Elektrik Giderleri	8.283.665,10
Amortisman Giderleri	12.939.254,15
Dışardan Sağ. Fay. Ve Hiz. Giderleri	6.773.255,79
Satış ve Pazarlama Giderleri	3.601.849,02
Genel Yönetim Giderleri	23.242.952,58
TOPLAM	**163.392.660,89**

Birinci Aşama: Faaliyetlerin Belirlenmesi

Bu aşamada uygulama yapılan işletmeye yönelik olarak faaliyetler belirlenecektir. Uygulama yapılan işletmede çok sayıda faaliyet yerine getirilmekte olup çalışmanın çerçevesi açısından yeterli sayıda faaliyet belirlenmiştir. Söz konusu faaliyetlerin belirlenmesinde işletme yönetimi ile görüşülmüş ve alınan bilgiler doğrultusunda faaliyetler sınıflandırılmıştır. Söz konusu faaliyetleri Tablo 2'de göstermek mümkündür.

Tablo 2: Kömür İşletmesinde Belirlenen Faaliyetler

Faaliyet No	Faaliyet Adı
1	Ocak 1 Faaliyeti
2	Ocak 2 Faaliyeti
3	Ocak 3 Faaliyeti
4	Ocak 4 Faaliyeti

Faaliyet No	Faaliyet Adı
5	Ocak 5 Faaliyeti
6	Ocak 6 Faaliyeti
7	Satış ve Pazarlama Faaliyeti
8	İşletme Yönetimi Faaliyeti

Tablo 2'de görüldüğü üzere kömür üretim işletmesinde sekiz adet faaliyet belirlenmiştir. Ocak 1-6 faaliyetleri kömür madenine ulaşılması, kömürün parçalanması ve çıkarılması ile ilgili olarak üretim faaliyetlerini kapsamaktadır. Satış ve pazarlama faaliyeti, kullanılabilir hale getirilmiş olunan kömür madeninin satışı ve dağıtılması ile ilgili faaliyetleri kapsamaktadır. Son olarak işletme yönetimi faaliyeti ise, işletmenin misyonuna uygun şekilde faaliyetlerini sürdürebilmesi amacıyla idari açıdan gerekli olan tüm faaliyetleri kapsamaktadır.

İkinci Aşama: Maliyet Etkenlerinin Belirlenmesi

Bu aşamada 2014 üretim dönemine ait olan tüm faaliyet giderlerinin bir önceki aşamada işletmeye yönelik olarak belirlenen faaliyetlere yüklenebilmesi amacıyla çeşitli maliyet etkenlerinin belirlenmesi gerekmektedir. Bu amaçla daha önce hakkında bilgi verdiğimiz faaliyet giderlerinin faaliyetlere yüklenebilmesi amacıyla işletme ortamında belirlenen en uygun maliyet etkenlerine ilişkin bilgileri Tablo 3'de göstermek mümkündür.

Tablo 3: Maliyet Etkenlerinin Belirlenmesi

Endirekt Giderler	Maliyet Etkenleri
Endirekt Madde ve Malzeme Giderleri	Maden Direği Sayısı (adet)
Endirekt İşçilik Giderleri	Çalışan Sayısı (işçi)
Memur Ücret Giderleri	Çalışan Sayısı (memur)
Elektrik Giderleri	Elektrik Kullanımı (kWh)
Amortisman Giderleri	Makine Kullanım Oranı (%)
Dışardan Sağ. Fay. Ve Hiz. Giderleri	Kullanımı Oranı (%)
Satış ve Pazarlama Giderleri	Kullanım Oranı (%)
Genel Yönetim Giderleri	Kullanım Oranı(%)

Tablo 3'de endirekt madde ve malzeme giderlerinin faaliyetlere yüklenmesinde maliyet etkeni olarak maden direği sayısı, işçi ve memur ücret giderlerinin faaliyetlere yüklenmesinde maliyet etkeni olarak çalışan sayısı, elektrik giderlerinin faaliyetlere yüklenmesinde maliyet etkeni olarak elektrik kullanımı, amortisman giderlerinin faaliyetlere yüklenmesinde maliyet etkeni olarak makine kullanım oranları, dışarıdan sağlanan fayda ve hizmet giderlerinin faaliyetlere yüklenmesinde maliyet etkeni olarak kullanım oranı, satış ve pazarlama giderlerinin faaliyetlere yüklenmesinde maliyet etkeni olarak kullanım oranı, genel yönetim giderlerinin faaliyetlere yüklenmesinde maliyet etkeni olarak kullanım oranı dikkate alınmıştır. Maliyet etkenlerine ilişkin gerekli tanımlamayı yaptıktan sonra söz konusu etkenlere ilişkin sayısal bilgileri de ayrıntılı olarak göstermekte yarar bulunmaktadır. Faaliyetlere göre maliyet etkenlerinin kullanımı Tablo 4'de gösterilmektedir.

Tablo 4: Faaliyetler Bazında Maliyet Etkenlerine İlişkin Veriler

Faaliyetler	Maden Direği Kullanımı (Adet)	Çalışan İşçi Sayısı (Kişi)	Çalışan Memur Sayısı (Kişi)	Elektrik Kullanımı (Kwh)	Makine Kullanım Oranı (%)	Eşit Oranlama (%)
Ocak 1	34.495	345	2	8.694.338,62	16,50	16,66
Ocak 2	30.020	317	2	7.579.854,72	16,50	16,66
Ocak 3	21.813	322	0	7.977.192,58	16,50	16,66
Ocak 4	28.287	290	0	8.839.706,42	16,50	16,66
Ocak 5	33.462	307	1	7.638.001,83	16,50	16,66
Ocak 6	41.382	327	3	6.533.208,66	16,50	16,70
Satış ve Pazarl.	0	0	0	0,00	0,00	0,00
İşletme Yönetimi	0	32	213	1.593.429,17	1,00	0,00
Toplam	**189.909**	**1.939**	**220**	**45.855.732,00**	**100,00**	**100,00**

Üçüncü Aşama: Faaliyet Maliyetlerinin Belirlenmesi

Uygulamanın bu aşamasında bir önceki aşamada belirlenen maliyet etkenleri aracılığıyla endirekt nitelikteki maliyetlerin belirlenen faaliyetlere yüklenmesi sağlanacaktır.

Tablo 5'te endirekt madde ve malzeme giderlerinin faaliyetlere yüklenmesinde maliyet etkeni olarak maden direği sayısı dikkate alınmıştır. Faaliyet merkezlerindeki maliyetlerin toplamı 10.579.544,50 TL'dir. Yapılmakta olan faaliyetler için kullanılan maden direği toplamı 189.909 adettir. İlgili giderler, faaliyet merkezlerinde kullanılan maden direği sayıları dikkate alınarak dağıtılmıştır.

Tablo 5: Endirekt Madde ve Malzeme Giderlerinin Faaliyetlere Dağıtılması

Faaliyetler	Maden Direği Kul.	Birim Gider Ölçütü	Toplam (□)
Ocak 1	34.495	55,71	1.921.664,52
Ocak 2	30.020	55,71	1.672.369,01
Ocak 3	21.813	55,71	1.215.169,39
Ocak 4	28.287	55,71	1.575.826,19
Ocak 5	33.462	55,71	1.864.117,65
Ocak 6	41.832	55,71	2.330.397,75
Satış ve Paz.	0	55,71	0,00
İşl. Yönetimi	0	55,71	0,00
Toplam	**189.909**		**10.579.544,50**

Not: Birim Gider Ölçütü = 10.579.544,50 / 189.909,00 = 55,71

Tablo 6'da endirekt işçilik giderlerinin faaliyetlere yüklenmesinde maliyet etkeni olarak çalışan işçi sayısı dikkate alınmıştır. Faaliyet merkezlerindeki maliyetlerin toplamı 95.241.972,23 TL'dir. Yapılmakta olan faaliyetler için çalışan işçi sayısı toplamı 1.939 kişidir. İlgili giderler, faaliyet merkezlerinde çalışan işçi sayıları dikkate alınarak dağıtılmıştır.

Tablo 6: Endirekt İşçilik Giderlerinin Faaliyetlere Dağıtılması

Faaliyetler	Çalışan İşçi Sayısı	Birim Gider Ölçütü	Toplam (□)
Ocak 1	345	49.119,12	16.957.618,79
Ocak 2	317	49.119,12	15.553.903,35
Ocak 3	322	49.119,12	15.798.467,53
Ocak 4	290	49.119,12	14.253.577,56
Ocak 5	307	49.119,12	15.070.700,55
Ocak 6	327	49.119,12	16.051.543,70
Satış ve Paz.	0	49.119,12	0,00
İşl. Yönetimi	32	49.119,12	1.556.160,75
Toplam	**1.939**		**95.241.972,23**

Not: Birim Gider Ölçütü = 95.241.972,23 / 1.939,00 = 49.119,12

Tablo 7'de memur ücret giderlerinin faaliyetlere yüklenmesinde maliyet etkeni olarak çalışan memur sayısı dikkate alınmıştır. Faaliyet merkezlerindeki maliyetlerin toplamı 2.730.167,52 TL'dir. Yapılmakta olan faaliyetler için çalışan memur sayısı toplamı 220 kişidir. İlgili giderler, faaliyet merkezlerinde çalışan memur sayıları dikkate alınarak dağıtılmıştır.

Tablo 7: Memur Ücret Giderlerinin Faaliyetlere Dağıtılması

Faaliyetler	Çalışan Memur Sayısı	Birim Gider Ölçütü	Toplam (□)
Ocak 1	2	12.409,83	19.257,17
Ocak 2	2	12.409,83	19.034,78
Ocak 3	0	12.409,83	0,00
Ocak 4	0	12.409,83	0,00
Ocak 5	1	12.409,83	12.409,83
Ocak 6	3	12.409,83	35.798,87
Satış ve Paz.	0	12.409,83	0,00
İşl. Yönetimi	213	12.409,83	2.643.666,86
Toplam	**220**		**2.730.167,52**

Not: Birim Gider Ölçütü = 2.730.167,52 / 220,00 = 12.409,83

Tablo 8'e bakıldığında elektrik giderlerinin faaliyetlere yüklenmesinde maliyet etkeni olarak tüketilen elektrik (kWh) dikkate alınmıştır. Faaliyet merkezlerindeki maliyetlerin toplamı 8.283.665,10 TL'dir. Yapılmakta olan faaliyetler için tüketilen elektrik miktarı 45.855.732,00 kWh'dır. İlgili giderler, faaliyet merkezlerinde tüketilen elektrik miktarları dikkate alınarak dağıtılmıştır.

Tablo 8: Elektrik Giderlerinin Faaliyetlere Dağıtılması

Faaliyetler	Elektrik Kullanımı (kWh)	Birim Gider Ölçütü	Toplam (□)
Ocak 1	8.694.338,62	0,17	1.474.156,39
Ocak 2	7.579.854,72	0,17	1.285.191,63
Ocak 3	7.977.192,58	0,17	1.352.561,70
Ocak 4	8.839.706,42	0,17	1.498.804,02
Ocak 5	7.638.001,83	0,17	1.295.050,68
Ocak 6	6.533.208,66	0,17	1.107.729,03
Satış ve Paz.	0,00	0,17	0,00
İşl. Yönetimi	1.593.429,17	0,17	270.171,65
Toplam	**45.855.732,00**		**8.283.665,10**

Not: Birim Gider Ölçütü = 8.283.665,10 / 45.855.732,00 = 0,17

Tablo 9'a bakıldığında dışarıdan sağlanan fayda ve hizmet giderlerinin faaliyetlere yüklenmesinde maliyet etkeni olarak kullanım oranları (%) dikkate alınmıştır. Faaliyet merkezlerindeki maliyetlerin toplamı 6.773.255,79 TL'dir. İlgili giderler, faaliyet merkezlerindeki kullanım oranları dikkate alınarak dağıtılmıştır.

Tablo 9: Dışardan Sağlanan Fayda ve Hizmet Giderlerinin Faaliyetlere Dağıtılması

Faaliyetler	Kullanım Oranları (%)	Birim Gider Ölçütü	Toplam (□)
Ocak 1	16,66	67.732,56	1.128.424,41
Ocak 2	16,66	67.732,56	1.128.424,41
Ocak 3	16,66	67.732,56	1.128.424,41
Ocak 4	16,66	67.732,56	1.128.424,41
Ocak 5	16,66	67.732,56	1.128.424,41
Ocak 6	16,70	67.732,56	1.131.133,72
Satış ve Paz.	0,00	67.732,56	0,00
İşl. Yönetimi	0,00	67.732,56	0,00
Toplam	**100,00**		**6.773.255,79**

Not: Birim Gider Ölçütü = 6.773.255,79 / 100,00 = 67.732,56

Tablo 10'a bakıldığında amortisman giderlerinin faaliyetlere yüklenmesinde maliyet etkeni olarak makine kullanım oranları (%) dikkate alınmıştır. Faaliyet merkezlerindeki maliyetlerin toplamı 12.939.254,15 TL'dir. İlgili giderler, faaliyet merkezlerindeki makine kullanım oranları dikkate alınarak dağıtılmıştır.

Tablo 10: Amortisman Giderlerinin Faaliyetlere Dağıtılması

Faaliyetler	Makine Kullanım Oranı (%)	Birim Gider Ölçütü	Toplam (□)
Ocak 1	16,50	129.392,54	2.134.976,93
Ocak 2	16,50	129.392,54	2.134.976,93
Ocak 3	16,50	129.392,54	2.134.976,93
Ocak 4	16,50	129.392,54	2.134.976,93
Ocak 5	16,50	129.392,54	2.134.976,93
Ocak 6	16,50	129.392,54	2.134.976,93
Satış ve Paz.	0,00	129.392,54	0,00
İşl. Yönetimi	0,00	129.392,54	129.392,54
Toplam	**100,00**		**12.939.254,15**

Not: Birim Gider Ölçütü = 12.939.254,15 / 100,00 = 129.392,54

Tablo 11'de ise faaliyetlerin tükettiği oranda birinci aşama maliyet yüklemesi yapılmış ve faaliyet merkezlerinin toplam maliyetleri tabloda gösterilmiştir.

Tablo 11: Toplam Faaliyet Maliyetlerinin Belirlenmesi (□)

Faaliyetler	Malzeme Giderleri	İşçi Giderleri	Memur Ücretleri	Elektrik Giderleri	Dış.Sağ.Fay.Ve Hizmet Gid.	Amortisman Giderleri	Paz. Ve Satış Gid.	İşl. Yön. Giderleri	Toplam
Ocak 1	1.921.664,52	16.957.618,79	19.257,17	1.474.156,39	1.128.424,41	2.134.976,93	0,00	0,00	**23.636.098,21**
Ocak 2	1.672.369,01	15.553.903,35	19.034,78	1.285.191,63	1.128.424,41	2.134.976,93	0,00	0,00	**21.793.900,12**
Ocak 3	1.215.169,39	15.798.467,53	0,00	1.352.561,70	1.128.424,41	2.134.976,93	0,00	0,00	**21.629.599,97**
Ocak 4	1.575.826,19	14.253.577,56	0,00	1.498.804,02	1.128.424,41	2.134.976,93	0,00	0,00	**20.591.609,12**
Ocak 5	1.864.117,65	15.070.700,55	12.409,83	1.295.050,68	1.128.424,41	2.134.976,93	0,00	0,00	**21.505.680,07**
Ocak 6	2.330.397,75	16.051.543,70	35.798,87	1.107.729,03	1.131.133,72	2.134.976,93	0,00	0,00	**22.791.580,00**
Satış Ve Paz.	0,00	0,00	0,00	0,00	0,00	0,00	3.601.849,02	0,00	**3.601.849,02**
İşletme Yönetimi	0,00	1.556.160,75	2.643.666,86	270.171,65	0,00	129.392,54	0,00	23.242.952,58	**27.842.344,38**
Toplam	**10.579.544,50**	**95.241.972,23**	**2.730.167,52**	**8.283.665,10**	**6.773.255,79**	**12.939.254,15**	**3.601.849,02**	**23.242.952,58**	**163.392.660,89**

Dördüncü Aşama: Faaliyet Etkenlerinin Belirlenmesi

Faaliyet maliyetlerinin belirlenmesinin ardından uygulamanın bu aşamasında faaliyet maliyetlerinin mamullere yüklenmesi için birtakım maliyet etkenlerine ihtiyaç duyulmaktadır. Bu bakımdan kömür işletmesinde sürdürülen faaliyetlere ilişkin maliyet etkenlerini Tablo 12'deki gibi göstermek mümkündür.

Tablo 12: Kömür İşletmesi Faaliyetlerine İlişkin Etmenler

Faaliyetler	Faaliyet Etkenleri
Ocak 1	Üretilen Ton
Ocak 2	Üretilen Ton
Ocak 3	Üretilen Ton
Ocak 4	Üretilen Ton
Ocak 5	Üretilen Ton
Ocak 6	Üretilen Ton
Satış ve Pazarlama	Satılan Ton
İşletme Yönetimi	Satılan Ton

Tablo 12'ye baktığımızda Ocak 1-6 faaliyetlerine ilişkin toplam faaliyet maliyetlerin mamullere dağıtılmasında maliyet etkeni olarak üretilen ton miktarı, satış ve pazarlama ile işletme yönetimi faaliyetlerinde biriktirilen toplam maliyetlerin mamullere dağıtılmasında maliyet etkeni olarak satışı yapılan ton miktarı dikkate alınacaktır. Bu bakış açısı ile mamuller bazında faaliyet etkenlerine ilişkin sayısal verileri Tablo 13'deki gibi göstermek mümkündür.

Tablo 13: Mamuller Bazında Faaliyet Etkenlerine İlişkin Veriler

Faaliyetler	A Mamulü	B Mamulü	C Mamulü	Toplam Üretim	Toplam Satılan
Ocak 1	92.810	19.742	213.401	325.953	-
Ocak 2	92.810	19.742	213.401	325.953	-
Ocak 3	92.810	19.742	213.401	325.953	-
Ocak 4	92.810	19.742	213.401	325.953	-
Ocak 5	92.810	19.742	213.401	325.953	-
Ocak 6	92.810	19.742	213.401	325.953	-
Sat.ve Paz.	92.810	19.742	213.401	-	316.258
İşl. Yön.	92.810	19.742	213.401	-	316.258

Beşinci Aşama: Mamul Maliyetlerinin Belirlenmesi

Uygulamanın son aşaması olan bu aşamada dördüncü aşamada belirlenen faaliyet etkenleri kullanılarak toplam faaliyet maliyetleri üretilen mamullere dağıtılabilir.

Tablo 14'e bakıldığında Ocak 1 faaliyet merkezindeki maliyetlerin toplamı 23.636.098,21 TL'dir ve dağıtımda kullanılacak maliyet etkeni ise üretilen tondur. Üretimi yapılan A,B ve C mamulleri için toplam üretim miktarı 325.923 ton'dur. Ocak 2 faaliyet merkezindeki maliyetlerin toplamı 21.793.900,12 TL'dir ve dağıtımda kullanılacak maliyet etkeni ise üretilen tondur. Üretimi yapılan A,B ve C mamulleri için toplam üretim miktarı 325.923 ton'dur. Ocak 3 faaliyet merkezindeki maliyetlerin toplamı 21.629.599,97 TL'dir ve dağıtımda kullanılacak maliyet etkeni ise üretilen tondur. Üretimi yapılan A,B ve C mamulleri için toplam üretim miktarı 325.923 ton'dur. Ocak 4 faaliyet merkezindeki maliyetlerin toplamı 20.591.609,12 TL'dir ve dağıtımda kullanılacak maliyet etkeni ise üretilen tondur. Üretimi yapılan A, B ve C mamulleri için toplam üretim miktarı 325.923 ton'dur. Ocak 5 faaliyet merkezindeki maliyetlerin toplamı 21.505.680,07 TL'dir ve dağıtımda kullanılacak maliyet etkeni ise üretilen tondur. Üretimi yapılan A,B ve C mamulleri için toplam üretim miktarı 325.923 ton'dur. Ocak 6 faaliyet merkezindeki maliyetlerin toplamı 22.791.580,00 TL'dir ve dağıtımda kullanılacak maliyet etkeni ise üretilen tondur. Üretimi yapılan A,B ve C mamulleri için toplam üretim miktarı 325.923 ton'dur. Bu faaliyet merkezi için maliyet etkeni hesaplaması tablodaki gibidir.

Tablo 14: Ocaklardaki Faaliyet Giderlerinin Mamullere Dağıtılması

Birim	Mamuller	Üretilen Ton	Birim Gider Ölçütü (BGÖ)	Toplam (□)	BGÖ'nün Hesaplanması
Ocak 1	A Mamulü	92.810,00	72,51	6.730.007,93	23.636.098,21 / 325.953 = 72,51
	B Mamulü	19.742,00	72,51	1.431.567,90	
	C Mamulü	213.401,00	72,51	15.474.522,39	
	Toplam	**325.953,00**		**23.636.098,21**	
Ocak 2	A Mamulü	92.810,00	66,86	6.205.470,94	21.793.900,12 / 325.953 = 66,86
	B Mamulü	19.742,00	66,86	1.319.991,46	
	C Mamulü	213.401,00	66,86	14.268.437,72	
	Toplam	**325.953,00**		**21.793.900,12**	
Ocak 3	A Mamulü	92.810,00	66,36	6.158.689,05	21.629.599,97 / 325.953 = 66,36
	B Mamulü	19.742,00	66,36	1.310.040,29	
	C Mamulü	213.401,00	66,36	14.160.870,63	
	Toplam	**325.953,00**		**21.629.599,97**	
Ocak 4	A Mamulü	92.810,00	63,17	5.863.137,45	20.591.609,12 / 325.953 = 63,17
	B Mamulü	19.742,00	63,17	1.247.172,28	
	C Mamulü	213.401,00	63,17	13.481.299,38	
	Toplam	**325.953,00**		**20.591.609,12**	
Ocak 5	A Mamulü	92.810,00	65,98	6.123.404,81	21.505.680,07 / 325.953 = 65,98
	B Mamulü	19.742,00	65,98	1.302.534,83	
	C Mamulü	213.401,00	65,98	14.079.740,43	
	Toplam	**325.953,00**		**21.505.680,07**	
Ocak 6	A Mamulü	92.810,00	69,92	6.489.544,63	22.791.580,00 / 325.953 = 69,92
	B Mamulü	19.742,00	69,92	1.380.417,95	
	C Mamulü	213.401,00	69,92	14.921.580,00	
	Toplam	**325.953,00**		**22.791.580,00**	

Tablo 15'e bakıldığında Satış ve Pazarlama faaliyet merkezindeki maliyetlerin toplamı 3.601.849,02 TL'dir ve dağıtımda kullanılacak maliyet etkeni ise satılan tondur. Üretimi yapılan A,B ve C mamulleri için toplam satış miktarı 316.258 ton'dur. İşletme Yönetimi faaliyet merkezindeki maliyetlerin toplamı 27.842.344,38 TL'dir ve dağıtımda kullanılacak maliyet etkeni ise satılan tondur. Üretimi yapılan A,B ve C mamulleri için toplam satış miktarı 316.258 ton'dur.

Tablo 15: Satış - Pazarlama ve Yönetim Birimlerdeki Faaliyet Giderlerinin Mamullere Dağıtılması

Birim	Mamuller	Satılan Ton	Birim Gider Ölçütü (BGÖ)	Toplam (□)	BGÖ'nün Hesaplanması
Satış ve Pazarlama	A Mamulü	92.810,00	11,39	1.057.009,17	3.601.849,02 / 316.258 = 11,39
	B Mamulü	14.118,00	11,39	160.789,31	
	C Mamulü	209.330,00	11,39	2.384.050,54	
	Toplam	**316.258,00**		**3.601.849,02**	
İşletme Yönetimi	A Mamulü	92.810,00	88,04	8.170.696,02	27.842.344,38 / 316.258 = 88,04
	B Mamulü	14.118,00	88,04	1.242.903,64	
	C Mamulü	209.330,00	88,04	18.428.744,73	
	Toplam	**316.258,00**		**27.842.344,38**	

Tablo 16'ya bakıldığında ise mamullerin tükettiği oranda ikinci aşama maliyet yüklemesi yapılmış ve mamul maliyetlerinin toplam maliyetleri gösterilmiştir.

Tablo 16: Mamul Maliyetlerinin Toplu Gösterimi (□)

Mamul Maliyetlerinin Toplu Gösterimi				
Faaliyetler	**A Mamulü**	**B Mamulü**	**C Mamulü**	**Toplam**
Ocak 1	6.730.007,93	1.431.567,90	15.474.522,39	**23.636.098,21**
Ocak 2	6.205.470,94	1.319.991,46	14.268.437,72	**21.793.900,12**
Ocak 3	6.158.689,05	1.310.040,29	14.160.870,63	**21.629.599,27**
Ocak 4	5.863.137,45	1.247.172,28	13.481.299,38	**20.591.609,12**
Ocak 5	6.123.404,81	1.302.534,83	14.079.740,43	**21.505.680,07**
Ocak 6	6.489.544,63	1.380.417,95	14.921.617,42	**22.791.580,00**
Sat.ve Paz.	1.057.009,17	160.789,31	2.384.050,54	**3.601.849,02**
İş. Yön.	8.170.696,02	1.242.903,64	18.428.744,73	**27.842.344,38**
Toplam	**46.797.960,01**	**9.395.417,65**	**107.199.283,23**	**163.392.660,89**

- FTMS'ne Göre Hesaplanan Mamullere Ait Toplam Maliyetlerin Gösterimi

FTMS'ne göre hesaplanan mamul maliyetlerini toplu olarak gösterimini Tablo 17'deki gibi göstermek mümkündür. Tablo 17'de görüleceği üzere FTM sistemine göre hesaplanan mamul maliyetlerinde maliyet payı en fazla olan mamulün C mamulü olduğunu ve en az maliyet payına sahip olan mamulün B mamulü olduğunu görülebilir. Buna göre maliyet payına en fazla sahip mamulden en az maliyet payına sahip olan mamulleri C, A ve B olarak sıralamak mümkündür. Maliyet payları açısından toplam maliyetin %29'u A mamulüne, %6'sı B mamulüne ve %65'i ise C mamulüne aittir.

Tablo 17: FTMS'ne Göre Hesaplanan Mamullere Ait Toplam Maliyetler (□)

Maliyetler	**A Mamulü**	**B Mamulü**	**C Mamulü**	**Toplam**
Direkt	3.365.814,89	715.956,44	7.739.125,78	**11.820.897,11**
Endirekt	46.797.960,01	9.395.417,65	107.199.283,23	**163.392.660,89**
Toplam	**50.163.774,90**	**10.111.374,10**	**114.938.409,01**	**175.213.558,00**

- Geleneksel Maliyetleme Sistemine Göre Hesaplanan Mamullere Ait Toplam Maliyetlerin Gösterimi

Geleneksel maliyetleme sistemine göre hesaplanan mamul maliyetleri her iki maliyetleme sistemine göre mamul maliyetlerinin analizinde kolaylık sağlayacaktır. Bu doğrultuda kömür işletmesinden alınan bilgilere göre işletmenin geleneksel maliyetleme sistemine göre hesapladığı mamul maliyetlerini Tablo 18'deki gibi göstermek mümkündür.

Tablo 18: Geleneksel Maliyetleme Sistemine Göre Hesaplanan Mamullere Ait Toplam Maliyetler (□)

Maliyetler	**A Mamulü**	**B Mamulü**	**C Mamulü**	**Toplam**
Direkt	3.365.814,89	715.956,44	7.739.125,78	**11.820.897,11**
Endirekt	38.351.544,55	8.157.916,09	88.182.932,43	**134.692.393,07**
Toplam	**41.717.359,44**	**8.873.872,53**	**95.922.058,21**	**146.513.290,18**

Tablo 18'de görüleceği üzere geleneksel maliyetleme sistemine göre hesaplanan mamul maliyetlerinde maliyet payı en fazla olan mamulün C mamulü olduğunu ve en az maliyet payına sahip olan mamulün B mamulü olduğunu görülür. Buna göre maliyet payına en fazla sahip mamulden en az maliyet payına sahip olan mamulleri C, A ve B olarak sıralamak mümkündür.

Sonuç

Günümüz işletmecilik anlayışında yaşanan değişimler, maliyetlerin daha doğru ölçülmesi ve daha fazla maliyet kontrolünün sağlanmasına yönelik çabaları da arttırmıştır. İşletmelerde maliyet odaklı üretim yönetimi tekniklerinin kullanılması ve sürekli iyileştirme bağlamında süreç kalitesine odaklanılması maliyetlerin bir sistem çerçevesinde ele alınmasına yol açmıştır. FTM sistemi ile maliyetlerin daha doğru hesaplanması ve üretilen bilgi ile yöneticilere alacakları kararlarda ışık tutması söz konusu sistemi günümüzde ön plana çıkarmıştır. FTM sistemi üretim işletmelerinde faaliyetlerin ve dolayısıyla faaliyet maliyetlerinin daha iyi şekilde okunmasına imkân vermektedir. Bu amaçla bu çalışmada FTM sistemi bir kömür işletmesinde uygulanmış ve elde edilen sonuçlar çerçevesinde her iki maliyetleme sistemi arasında farklılıklar olduğu belirlenmiştir. Öncelikle uygulama yapılan işletmede hesaplanan mamul maliyetlerine satış ve pazarlama ile genel yönetim

giderleri maliyet payı dahil edilmemesi nedeniyle mamul maliyetleri geleneksel maliyetleme sisteminde FTM sistemine göre daha düşük çıkmıştır. Bunun en önemli nedeni ülkemizde uygulanan muhasebe sisteminde faaliyet giderleri o üretim dönemine ait olsa bile üretim dışı bir gider olarak değerlendirilmekte ve stok hesapları yerine sonuç hesaplarına aktarılmaktadır. Oysa FTM sistemine göre hesaplanmış olan mamul maliyet tutarlarının stok hesaplarına alınması ve daha sonra satışı yapılan mamullerin maliyet tutarlarının sonuç hesaplarına aktarılması gerekmektedir.

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Under Graduate teaching and research using Project-Oriented Approach with Matlab Environment

Shaik Mohammed Riyaz Ahmed

Al Jouf University, Saudi Arabia
riyazroq@gmail.com

Abstract : The role of universities cannot be overestimated in the training process of students of under-graduate and post-graduate studies that would eventually shape the world's technological and scientific progress. The past decade has seen many changes in the expectations of students in the field of education. For the students of under-graduate courses the goal has shifted to obtaining theoretical and practical knowledge in their chosen specialization. Some choose to continue their education for a career in post-graduation and then pursue research; others opt to elevate their professional competency, teamwork and leadership skills. Despite different learning expectations, instruction in universities continues to be based on traditional pedagogical methods, such as "face-to-face" studies, or "E-learning" training and communication, which are overwhelmingly teacher-led.

The purpose of this paper is to search for new methods of education that would permit gaining real and practical experience harnessed by seeking examples relevant to the curriculum outside the classroom that also enhance the professional competency of a graduate student, thus evolving into a more student-centric type of learning.

The main emphasis of this paper is the demonstration of the use of software packages and programs to solve problems in Mathematics, Physics and Engineering as a part of enhancing the comprehension of the student's learning curve. The formulation and analysis of complex problem solving techniques such as comprehensive grades of the students in a class in various subjects and application of differential equations has been taken as an example using the fundamental "if"…"Else" statement from MATLAB as an example. The paper consists of the introduction to scientific problem and its complete numerical solution along with a graphical analysis using one of the fourth generation programming languages i.e., MATLAB. The emphasis is on programming rather than problem solving.

Key words: Matlab, if-else statement, Numerical methods, Graphical Analysis, Student's Grades, Differential Equations.

Introduction

In recent years, demands from industrial employers on their professional workers have changed dramatically.

This is readily explained by the fact that the students are currently graduating with good knowledge in fundamental theoretical concepts and computer literacy, but they lack application of the subject in practice, and they do not possess strong teamwork and communication skills.

Many publications evidence that students and employers alike, are calling for significant changes in the delivery of under-graduate education. The critical issues that are reflected in these requests are summarized here (Mills,2003).

Under-graduate curricula are too focused on theoretical concepts in mathematics and Sciences without much practical application being taught. Sufficient integration methodology relating to these topics to industrial practices is not provided. And all the Programs are too content-driven. Current programs do not provide sufficient practical experience to the students. And they also lack communication skills and teamwork experience as such. The faculty too typically lack practical experience, hence they are not able to adequately relate theory to practice or provide practical experience. Therefore, it may be concluded that the existing teaching and learning strategies in under-graduate curricula are outdated. They need to be supplemented with

more student-centric ones.
There exist many ways of resolving this problem, from the radical – redesigning of the under-graduate curricula – to the introduction of project based or project-oriented leaning modules in the framework of traditional curricula.

The article seeks examples from basic mathematical concepts of under-graduate curriculum such as 'students grading' and a 'basic solution of a differential equation' as sources of the project and their complete numerical solution along with a graphical analysis using one of the fourth generation programming languages i.e., MATLAB has been sought. The emphasis on the student was more on conceptual understanding through the application of the project oriented method of problem solving rather than meagrely learning the concept conventionally hearing in the classroom.

The main emphasis of this paper is the demonstration of the use of software packages and programs to solve problems in under-graduate Mathematics course as a part of enhancing the comprehension of the student's learning curve.
The formulation and analysis of complex problem solving techniques such as comprehensive grades of the students in a class in various subjects and application of differential equations were given to the students as the conceptual tools for implementation of the "Project Oriented Learning Method" and use was made of the fundamental "if"…"Else" statement from MATLAB environment.

Problem-based learning (PBL) in under-graduate education

This learning method has been utilized successfully in the classroom. Generally, this is done through "class-room problems" that consist of completing exercises and assignments, or open-end problems, likewise within a particular course. All commence with the identification of the path to elucidating the given problem, which is itself selected by the course context.
Progress in resolving the problem depends solely on the level of knowledge (of the subject) attained by the student. Courses containing "open-end" problems, afford students opportunities to choose autonomously the route to the solution.
There are many examples of successful, optimal usage of PBL as a main component of engineering and under-graduate programs of varying levels. However, there are certain limitations to PBL, explained below (Perrenet,2000,PP.345-358) that discourage recommending PBL as an overall strategy for engineering and undergraduate education:

1. Problems that students encountered during their course cannot always be applied to real-life tasks, which they will certainly counter in their future careers;
2. Much of under-graduate curriculum has a hierarchical knowledge structure. Many topics must be learned in a certain order, because missing essential parts will result in failure to learn later concepts. The problem will be hard for a student to correct, because they probably cannot fully compensate for missed topics, by using only PBL.

It seems therefore that problem-based learning may be a partial answer for resolving the critical issues of engineering and under-graduate education, primarily to demonstrate the applicability of certain concepts in the early stages of an engineering curriculum. However, other active learning, student-centred methods are more appropriate and acceptable for engineering under-graduate education, and these form the basis of project-oriented learning.

Project-oriented learning(POL) in under-graduate education

The term "project" is universally used in under-graduation as a "unit of work". Almost every task undertaken in the academic pursuit by an under-graduate student will be a project. Project-oriented learning may be defined alternately by different education disciplines and levels, which makes it familiar to most students. The advantages of using POL, in comparison with PBL, is listed here (Perrenet,2000,PP.345-358), and involves the following:

1. Project tasks are closer to professional reality;
2. Project work is directed more **to the application of knowledge**, while PBL is more directed to the acquisition of knowledge;
3. POL is usually accompanied by subject courses (e.g. math, physics, software, &c), whereas PBL is

not.

4. Management of time and resources by the students as well as task and role differentiation is very important in POL.
5. Independence of action is greater in project work, than in PBL.

POL may be applied either in particular courses, or through the entire curriculum.
According to Heitmann (Heitmann,1996,PP.121-131) POL involves the use of small projects within specific courses, which is usually combined with traditional, "face-to-face" methods, within a given course.
POL focuses on application and integration of previously acquired knowledge. The students work in small groups where teachers serve as advisors. The beneficial adaptation of the above approach, in several universities suggests its viability, and allows us to formulate recommendations for continuing progress towards the intended project-oriented curriculum, which revolve around continued training for both staff and students, in the skills needed to make learning effective, such as problem-solving, teamwork, as well as continued education for staff in implementation and assessment methodologies.
An overview of the literature did not evoke any examples of the aforementioned recommendations. Therefore, we find it necessary to offer our own approach, which is based on the development of our learning unit (module) in the context of POL. We designed the pedagogical aspects the of course based on this collaborative didactic technique (Martín, 2002,PP.17-29).

Definition and development of the problem

The main characteristics of the Differential Equations(DEs) course incorporated with the POL implementation is presented below:

I. General objectives.

The students must learn the basic concepts of DEs, firstly, through the conventional lectures. Throughout the course, the students understand, build and adapt POL method to enhance their comprehension which makes the learning of the basic concepts a must in order to implement it through a program. They have to assimilate, integrate and apply all these concepts. The desired abilities to develop in the course are: Self-motivation, Analytical capability, team work, honesty, leadership, self-directed learning, creativity, and the capacity to identify and solve problems.

II. **Course contents.**

This basic DE Course syllabus for the students matches with the DE curriculum of the Under-graduate syllabus of the Universities in the Kingdom of Saudi Arabia

III. **Learning Activities.**

In the first part of the course, the basic concepts of DE are covered in weekly lectures. During this period, the students learn and practice the basic concepts. During mid-way of the program, students form teams and start building and implementing the program using MATLAB Environment. Concurrently, advanced topics for syllabus completionare covered in the classroom as per schedule. In the last stage, the students incorporate these techniques in their understanding of the advanced topics and thus achieve their goals successfully.

IV: **Course Project.**

The main focus of the course project was to design and build the application of loops and "if…else" statement in MATLAB. Students grade evaluation has been taken as a prelude example to the actual application to the course related problem of solution of ODEs.

V. **Assessment process.**

A self-assessment method has been conducted through group discussions and presentations by each group and then the best program and its output have been included in this article.

Project Oriented Learning (POL) in the context

A learning-unit is a building-block of a course. Here, we define a learning-unit as a real-world example, an explanatory feature of a course, designed to test knowledge gained in the classroom. It serves as a real- life

project, scaled to the course's topics and form. POL is one of several active learning methods, devised during last decade as a product of research at the under-graduate level. POL considers that student teams will work on a single guiding thread, or project, for an entire course (Espinosa,2004).

Implementation of the POL technique in the current curriculum involved in organizing the Student into teams, and play roles while delegating work amongst themselves, and while delivering feedback to their teams (Noguez,2004,PP.83-88). Overall success in these terms is not easily measurable. Since most of the learning process will take place outside the realm of the classroom, learning has to be assumed whenever there is evidence of its existence through visible actions (Espinosa,2004). Besides, it is hard to prove that students are motivated to learn when the instructor applies POL to their classroom activities. As stated by Johnson (Johnson,2000,P.39)"… changing to a cooperative style is not simple. There is a big difference between putting students into groups to learn… and structuring your teaching so students learn cooperatively...".

The POL technique provided the following advantages as evidenced by Noguez et al :

a) It allows the students to learn problems solving techniques using relevant knowledge independently of the discipline source.
   Example: Here we present an example from Ordinary Differential Equations(ODE) which was solved in the classroom using the conventional 'Euler's method'. The same problem has been given to different teams of students for solving with POL method using MATLAB/SIMULINK Environment

Euler's analytical methods for solving ODEs are presented before moving on to numerical methods. [http://mathworld.wolfram.com**]**

The first-order ordinary differential equation is given as

$$\frac{dy}{dx} = F(x, y), \tag{1}$$

if F(x,y)can be expressed using separation of variables as

$$F(x, y) = X(x)\,Y(y), \tag{2}$$

then the equation can be expressed as

$$\frac{dy}{Y(y)} = X(x)\,dx \tag{3}$$

and the equation can be solved by integrating both sides to obtain

$$\int \frac{dy}{Y(y)} = \int X(x)\,dx. \tag{4}$$

Any first-order ODE of the below form can be solved by finding an integrating factor $\mu = \mu(x)$ such that

$$\frac{dy}{dx} + p(x)\,y = q(x) \tag{5}$$

And this condition enables an explicit way to determine the appropriate μ for arbitrary $p$and q. To accomplish this, take

$$p(x) = \frac{1}{\mu}\frac{d\mu}{dx} \tag{6}$$

in the above equation, from which we recover the original equation ($\diamondsuit$), as required, in the form

$$\frac{1}{y}\frac{dy}{dx} + p(x) = \frac{q(x)}{y}. \tag{7}$$

But we can integrate both sides of (9) to obtain

$$\int p(x)\,dx = \int \frac{d\mu}{\mu} = \ln\mu + c \tag{8}$$

$\mu = e^{\int p(x)\,dx}$.
(9)
Now integrating both sides of (◇) gives

$$\mu y = \int \mu q(x)\,dx + c$$

(10)
(with μ now a known function), which can be solved for y to obtain

$$y = \frac{\int \mu q(x)\,dx + c}{\mu} = \frac{\int e^{\int^x p(x')\,dx'} q(x)\,dx + c}{e^{\int^x p(x')\,dx'}},$$

(11)

where **c** is an arbitrary constant of integration.
Initially the above theoretical concept leading to the n^{th} - order linear ODE with constant coefficients has been explained to the students and they were also equipped with the relevant method for obtaining the solution using MATLAB .

b) As a prelude to this project the students have first been given an assignment outside the curriculum to learn the usage of the 'if-else' statement in MATLAB environment

Prelude Problem: Generate a program using " if, else and elseif statements" to obtain the output for the grade of the students in an examination given the marks scored as the input.

Student Marks	**0-59**	**60-69**	**70-79**	**80-89**	**90-100**
Student Grade	**E**	**D**	**C**	**B**	**A**

Mat lab coding of student marks and Grading using if-else statement :

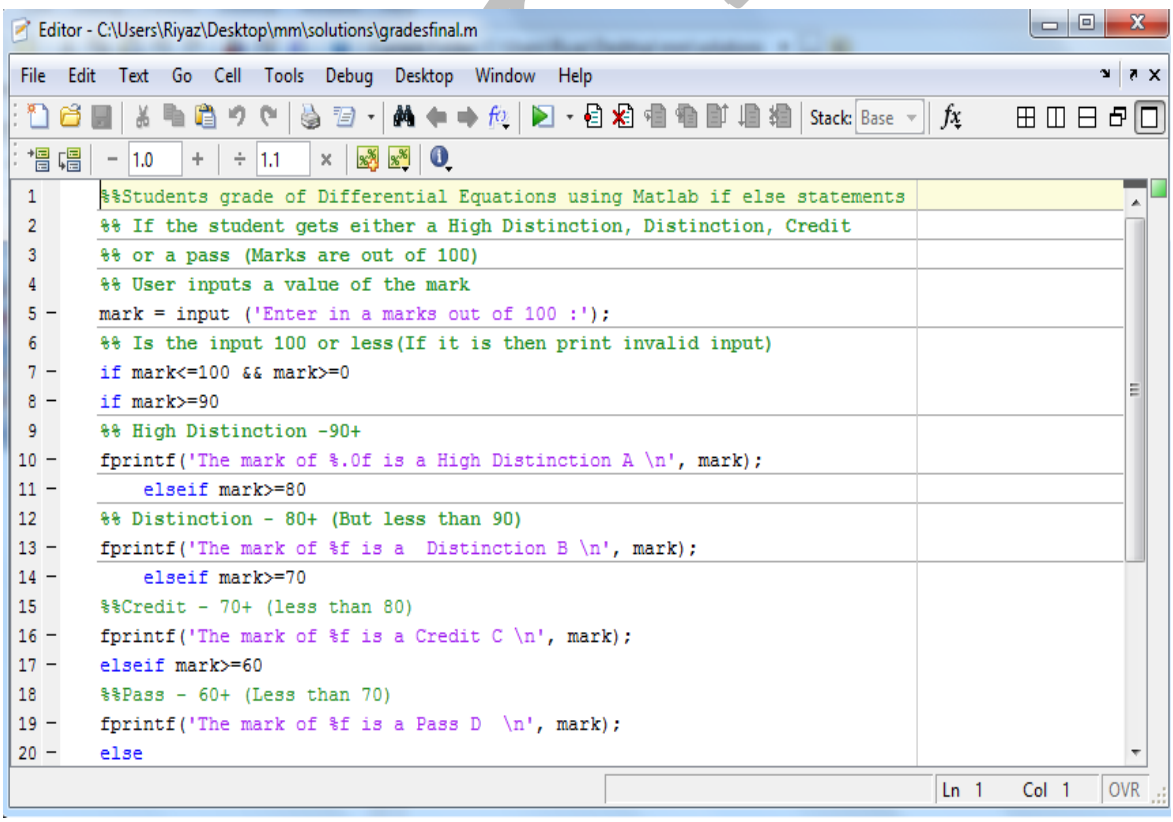

Figure 1: Matlab coding for Students Marks and Grading

Results in Differential Equations :

```
>> gradesfinal
Enter in a marks out of 100 :83
The mark of 83.000000 is a  Distinction B
>> gradesfinal
Enter in a marks out of 100 :66
The mark of 66.000000 is a Pass D
>> gradesfinal
Enter in a marks out of 100 :96
The mark of 96 is a High Distinction A
>> gradesfinal
Enter in a marks out of 100 :85
The mark of 85.000000 is a  Distinction B
>> gradesfinal
Enter in a marks out of 100 :80
The mark of 80.000000 is a  Distinction B
>> gradesfinal
Enter in a marks out of 100 :80
The mark of 80.000000 is a  Distinction B
>> gradesfinal
Enter in a marks out of 100 :80
The mark of 80.000000 is a  Distinction B
>> gradesfinal
Enter in a marks out of 100 :71
The mark of 71.000000 is a Credit C
>> gradesfinal
Enter in a marks out of 100 :80
The mark of 80.000000 is a  Distinction B
>> gradesfinal
Enter in a marks out of 100 :120
Not a valid input marks must be between 0-100 :>>
```

After the successful completion of this project by the students to begin with, different work groups of students have been assigned the problem from the curriculum and a space was provided for presentation of their project and its solution through a group discussion and presentation by each group self-evaluation.

c) The program and solution of the ODE after the self-evaluation process that was unanimously accepted by all the groups of students is presented below.

First Order Equations: $\frac{dy}{dx}(x) = xy$

Code:

```
>>y = dsolve('Dy = y*x','x')
>>y = dsolve(eqn1,'y(1)=1','x')
>>x = linspace(0,1,20);
>>z = eval(vectorize(y));
>>plot(x,z)
```

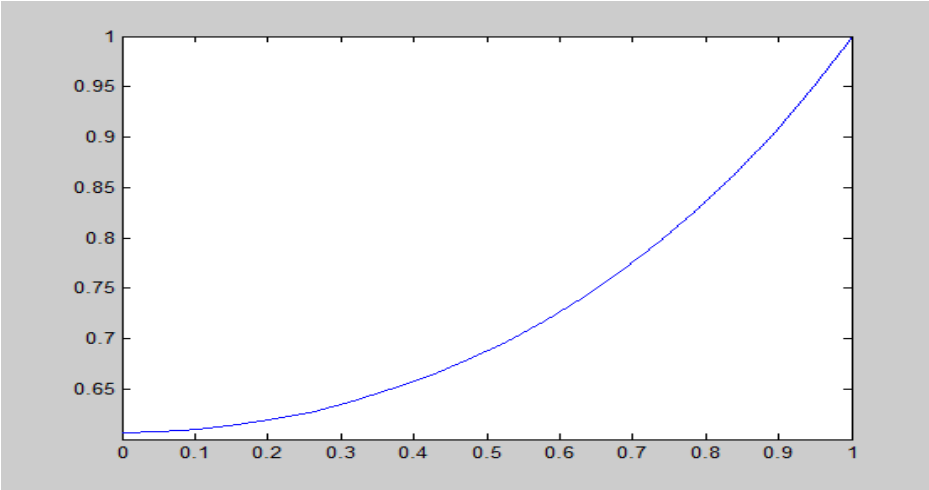

Figure 2: Plot of First Order Differential Equation

Second and Higher Order Equations:

$$\frac{d^2y}{dx^2}(x) + 8y(x) + 2y(x) = \cos(x) \qquad y(0) = 0, \frac{dy}{dx}(0) = 1$$

Code:

```
eqn2 = 'D2y + 8*Dy + 2*y = cos(x)';
inits2 = 'y(0)=0, Dy(0)=1';
y=dsolve(eqn2,inits2,'x')
z = eval(vectorize(y));
plot(x,z)
```

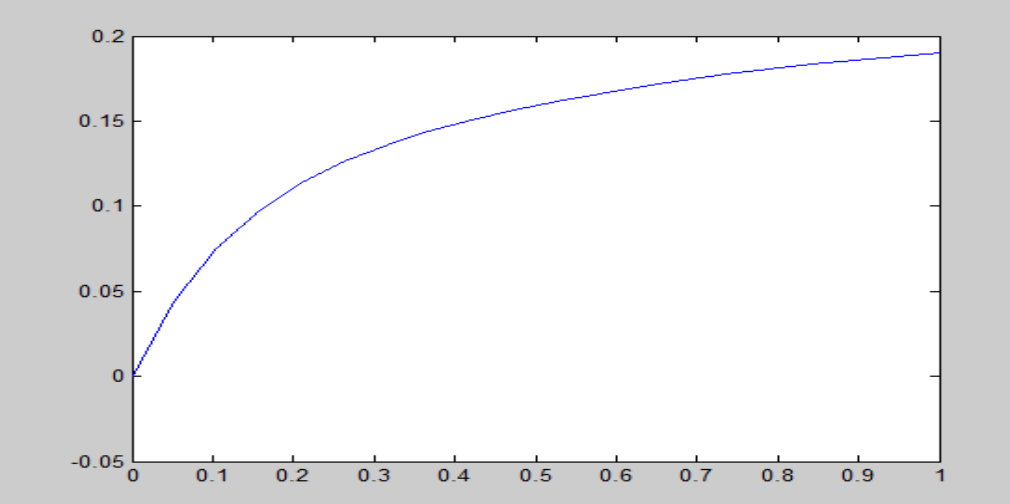

Figure 3: Plot for Second Order Differential Equation

Discussion

The activity was focused on exploring and working for the solution of the above problem leading to the n^{th} - order linear ODE with constant coefficients with an unknown solution.
Activities have been designed in such a way that they can involve several areas of the same discipline or the interaction of different disciplines.
POL method considers in the design the application of interdisciplinary knowledge so the students can appreciate the relationship between different disciplines in the development of a particular project.
The project assignment promotes the search of open solutions so students are free to create new knowledge.

Conclusions

Analysis of the results confirms that using real-world research or practical examples, in the framework of under-graduate courses, that are based on a project-oriented learning approach, may increase not only learning satisfaction for the students, but also boost their motivation at the entry level for the learners to continue their future studies. This could be further developed by the usage of "open-course" technology, which allows more effective, easily-changeable , up to date learning programs.

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User Behavior Tracking Framework

Mohamed Ahmed Abdullah Mohamed

Sudatel Telecom Group, Khartoum, SUDAN

Email:Mohamed.ahmed.abdullah@hotmail.com

Abstract: In normal circumstances the development team create the project by any best practices and then ship the software to the production environment where users start using the application and everybody is happy, usually the developers will never know what is going on with their app in the live environment, and how the users actually using it, Are the users using the app like we expected and planed? Did they use that feature of the app? Or they don't know about it? Witch better this feature or that? What is going to happen if we stop this part? To answer this question and to combat this problems, this work provide software measurement tools, systematic guidance and a conceptual modeling approach to control and improve software development processes. However, due to the high cost associated with collecting the data and difficulties in analyzing it, measurement tools are not widely adopted by software organizations but with this framework things will be easy for everybody with pre-defined mechanisms they will be able to collect the data and analyzing it very easy or at least depending on the problem complexity. In the conventional situations when the developer become skeptical about something usually they deal with user experience consultant or taking some measurements from user experience lab, sometimes they did it by them self but there isn't any systematic and standard way they can do that easily, the aim to make them use the proposed framework to guide them and giving them approach to get the job done.

Key words: UX, User Experience, Behavior, User Behavior Tracking Framework

Introduction

Any developer specially the one those who create the user interfaces is questioning many times about how the user will work with this and how the user are going to interact with that, they are thinking about the user interaction with their product all the time, sometimes the user influence how the interface will look like, especially if the development team working with agile methodology that is working in a user centric design, this influence not coming from an interaction designers, usability professionals or UI designers, there is no chance that the user will be totally right in all the cases (Constantin von Saucken, Ioanna Michailidou, Udo Lindemann, 2013).

There is some application out there has a very fascinating User Interface (UI) but the user can't working on it, specially every day or the user will suffer every day because the UX is not good at all, that's why we are proposing this to help the developer in the side of the UX.

A.Problem statement

Software development is slow, expensive and error prone. This often results in products with a large number of bugs which causes serious problems in usability, reliability, and performance. If any of that happened in the production this is a very bad reputation for the company and a very big loos not just financial but in the company's reputation as well (Korkala M., Abrahamsson P., 2007).

In normal circumstances the development team create the project by any standard and any best practices and then ship the software to the production environment where users start using the application and everybody is happy, usually the developers will never know what is going on with their app in the live environment, and how the users actually using it, is there is anything wrong? Are the users using the app like we expected and planed? Did they use that feature of the app? Or they don't know about it? Witch better this feature or that? What is going to

happen if we stop this part? To answer this question and to combat this problems, software measurement tools provides a systematic, guidance and a conceptual modeling approach to control and improve software development processes. However, due to the high cost associated with collecting the data and difficulties in analyzing it, measurement tools are not widely adopted by software organizations.

B. Objectives

1. To make the developers able to avoid errors and to find the fastest way to develop the new software, also that will provide decision-making value to answer all the previous questions and more, this will reduce the development time and which in turn lowers the development costs. This will also allow the developers to better understand the users and how they interact with the system. Even more, some in-house development can shape and change the user experience because they interact with the application in a daily basis. The data that will be collected will not violate the user's privacy and it will keep track of each individual user's identity.
2. In the conventional situations when the developer become skeptical about something usually they deal with user experience consultant or taking some measurements from user experience lab or sometimes they did it by them self but there isn't any systematic and standard way they can do that easily, the aim to make them use the proposed framework before and after the deployment, before the deployment to make them able to collect data from examples or prototypes had been made just to make things clear for them before creating the real product or they can choose to make the real produce but with different versions and apply the measurement on them then choose the best one, or they can choose to apply the measurements after the deployment to make the developers able to collect real performance data and measurement they make to keep track of users behavior with the system.
3. Due to the high cost associated with collecting the data and difficulties in analyzing it, measurement tools are not widely adopted by software organizations but with this framework things will be very easy for everybody with pre-defined mechanisms they will be able to collect the data and analyzing it very easy or at least depending on the problem complexity.

C. Scope

This research will cover the next questions, what is the right user actions you should collect, how to add new type of user actions and what you shouldn't, how to apply weights to the data, how to send the collected data to the process that is responsible for calculating the measurements, and how to create good reports, charts and dashboards from the collected data

D. Significant

It's a framework because it will change how people interact with the data collection parts in their application, also will change how people think of the "after deployment" stage, working with this framework allow developers to be exposed to a whole new experience, new practices and realize new things about their applications or realize new behavior in their users, even predict this future behaviors if the right tool is applied to collected data, this step is very important to any application lifecycle because the result will dramatically improve how developers think of their application make them learn more, that will change the application UX and save future time, time that was spend of thinking witch is the right approach of doing things you are already know, so the next product will be super-fast in the development stage

Background

A. Current Approaches

All the current researches getting toward the user interest and many ways to guess and proof the algorithm efficiency.

But no one focus on gathering many user behaviors and no one tackle how to measure this behaviors and how to add new user behavior.

By gathering many numbers of user behavior this will give you a very clear insight about what the user is doing (behavior), this will help the algorithms that's supposed to know the user interest, also will help this research by measuring this data and present it in a useful format, it can also answer the developers questions about the user behavior.

B. Define User Experience

(Bevan, 2009) Defining UX as "A set of attributes that bear on the effort needed for use, and on the individual assessment of such use, by a stated or implied set of users. This definition of user interface usability contrasts

with the system perspective of usability defined from an ergonomic point of view in ISO 9241-11 (1998)" "The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use. This wider interpretation of usability was incorporated in the revision of ISO 91261 (2001)" from ISO perspective and collected the challenges that will face the standard measurements.
(Ahmed Seffah, Mohammad Donyaee, Rex B. Kline, 2006) discussed many standards like (ISO 9241, ISO/IEC 9126, IEEE Std.610.12 Metrics for Usability Standards in Computing [MUSiC]) and mention in his research "Most of these various definitions or models do not include all major aspects of usability. They are also not well integrated into current software engineering practices, and they often lack computer tool support, too One consequence of these weaknesses is that perhaps most software developers do not apply correctly any particular model in the evaluation of usability. This is not surprising given that there are few clear guidelines about how various definitions of usability factors, rules, and criteria are related (if at all) and how to select or measure specific aspects of usability for particular computer applications" not just that but this standard measurement is too abstract. (Ahmed Seffah, Mohammad Donyaee, Rex B. Kline, 2006) described 27 usability criteria in there QUIM model but this paper will not tackle them all, this paper all about finding a framework and a basic guide line to handle the user experience measurements issues, although this paper will not tackle all the measurements but most of them.

C.User Interest

In recent years, researches move toward finding user interests by using different techniques, different inputs and with different methodologies.
Trying to predict user behavior and forecasting his next move. Some of them is trying to understand how really user interact with the applications, like where the user is looking while he is searching for answers on the internet.
If you ask some random users to accomplish 3 tasks on the internet while they are doing that you used an eye tracker to see what are they looking at, then you will have much more data to analyze.
That's what they do and they find the users who successfully accomplish the tasks, were just skimming the result page not reading it, but the people who didn't accomplish the tasks were reading the result page and having more time in each page almost the double of the time slower in the same page.
Not just that but also the users who didn't accomplish the tasks were looking all over the place but the successful user were concentrate on a very specific area.
Also the successful users perform fewer number of searches per session and visit smaller number of sites but the not successful users did the exact opposite more searches per session and more documents to read.
So this research find the strategy of the search has a direct association with the time and the effort spent to find info (David F. Nettleton and Cristina Gonzalez-Caro, 2012).
Other researchers said the best way to predict the user behavior is to analyze his history, and use it for the both purposes finding the user interests and predict the future behavior.
They want even to take it further, the are analyzing the data on the fly and make the software is self-adaptive to the user interests, so the system will behave differently for each user, but there main problem with the user identity because is it based in the session or user identity inside the system (user name and password) he can only access it by signing in.
Regardless of this problem they are depending on the user navigation (from web page to another) to generate the user behavior tree, if the user open the page or download it, it means the user has an interest on that page.
Different behavior has different weight if the user just open the page that doesn't mean he is interested in like the user who actually downloaded the page also the weight of opening the page can be different from page to another, if the user open a detail page that's mean he is interested more than the user who just open the main page and leave, by taking all that into account the system can adapt to the user interests (CHEN Yu, YU Yang, ZHANG Wei and SHEN Junyi, 2008).
Some researchers try it differently by creating an algorithm that extract user interest by analyzing the text by using ontology techniques, and taking into account four main user behavior because they reflect the user interest directly, copy, save, print, scrolling and reading.
The main idea depend on, when the user is scrolling he is actually reading, spending time, and he is interested in that subject, but the reading speed will affect the measurement that's why it's important to consider.
The researcher put his hands on many drawbacks in that work, you can't know the actual user interest by this four simple behavior, it will give a vague image on the user interest, huge amount of work for vague not clear image, not a very good deal.
Adding the bookmark behavior with the behaviors that tracked by the algorithm will take much effort and will affect the old data that being collected before adding the new bookmarking behavior.

The weight can't be changed during the execution or depending on the current context, you have to stop everything and change the copy behavior weight from Ex. 1 to 2 and then start again. (Kun Xing, Bofeng zhang, Bo Zhou, Yucong Liu, 2011)
This work (Yongquan Liang, Zhongying Zhao, Qingtian Zeng, 2007) trying to find the user interest via reading behavior by uses the ontology to classify the document, and give a user interest for each topic, also this is the most organize work, this work done by three agents (layers) the monitor agent, classifier agent and profile agent.
The monitor agent is logging what user is doing, the classifier responsible for analyzing the documents by help of word segmentation techniques, the profile agent reads the user behavior from the monitor agent and topic ontology from classifier agent, then generate the behavior table, next adding the weights, at the end we will have the user interest degree to each topic.
But the problem here we can't use this algorithm to any other topic, just the E-learning and the other real close topics, but we can take his advantages like the simplicity, how the work is organized in the layers and the behaviors collecting sub-system (Yongquan Liang, Zhongying Zhao, Qingtian Zeng, 2007).

Methodology

Our proposal is about collecting data from the live environment this data can be huge, and with the huge data there is uncountable number of information that can found, not that only but also this data is all about your actual users so you will be able to understand them well more than anyone else, also the developers will gain very good experience about how to do things to be as easy as possible for their users.
This research propose novel method to solve all the previously mentioned problems, by simply track the user behavior step by step and collect all this data in one place in order to measure it, analyze it and use it for reporting.
One of the outputs from this research is Library that handle the collecting the user behavior and produce collection of reports and developer can customize his own version of those reports, you may be asking yourself right now is it a library of a framework, the technical part is a library but the whole research is a framework.

A. Data Privacy Issue

This paper will handle the data privacy issue, by assuming this framework is just for the desktop applications and in-house development, usually this work is for the developers who want a better UX, Another assumption is there will be check box in the application settings if the user don't won't to be tracked all what he has to do is uncheck that check box.

B. Design

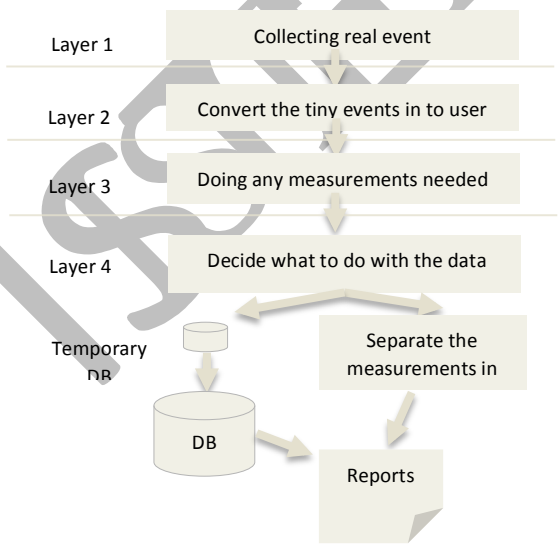

Figure 25: user behavior tracking framework (UBTF) layers

Layer one is responsible for collecting the tiny event that is coming from the device like clicks from mouse, swipes from touch screen or moves from Kinect device.
Layer tow it's responsibility is to convert this tiny event in to user behavior, this user behavior should be defined at the first, the user behavior may be mapped to one or more tiny events, like converting the mouse down and

mouse up events to mouse pressed event, or the right gesture in the Kinect to move right user behavior or tracking the copy or print behaviors.
The importance of this layer will be loud and clear if you work with more than one device or if the app become bigger, another importance of this layer is to make some kind of separation of concerns.
Layer three is responsible for creating and doing the measurements, here you can define all the measurements you need very simple example is counting how many time this user behavior is fired, or if you need the time between tow behaviors.
This is optional layer you can use it if you have measurements if you don't and you just need to collect the data for later use, you don't need this layer.
Layer four is responsible for transferring the data and put them in the right place and in the proper format.
So when the user create event it will be save locally in his machine first until the summation of the data reach configurable level then it will be uploaded to the server.
Any developer can create his own KPI (key performance indicator), this KPI can be summation of some user behavior, average or median of any collection of user behavior, this part of the layer if responsible for determine in what KPI this user behavior will effect.
This KPIs can easily be designed to answer developers questions like how many times the user open this after he open that, or what is the average time that the user spend in this view, or what is the next behavior after this X behavior A,B or
But there is some important data will not appear in the KPIs, because the KPIs is something that has been anticipated by the developers, but the collected data may contain information that nobody is aware of, this where the data analysis comes in.
There is another kind of data that we need to collect but only one time for each user this can be done by creating user behavior named 'First time' and as a parameter you can pass this data Ex. Monitor width and height, processor speed, OS,….
This layered structure will make it possible, and easy for any developer to replace it with his own customized layer or simply modify on the current layers.

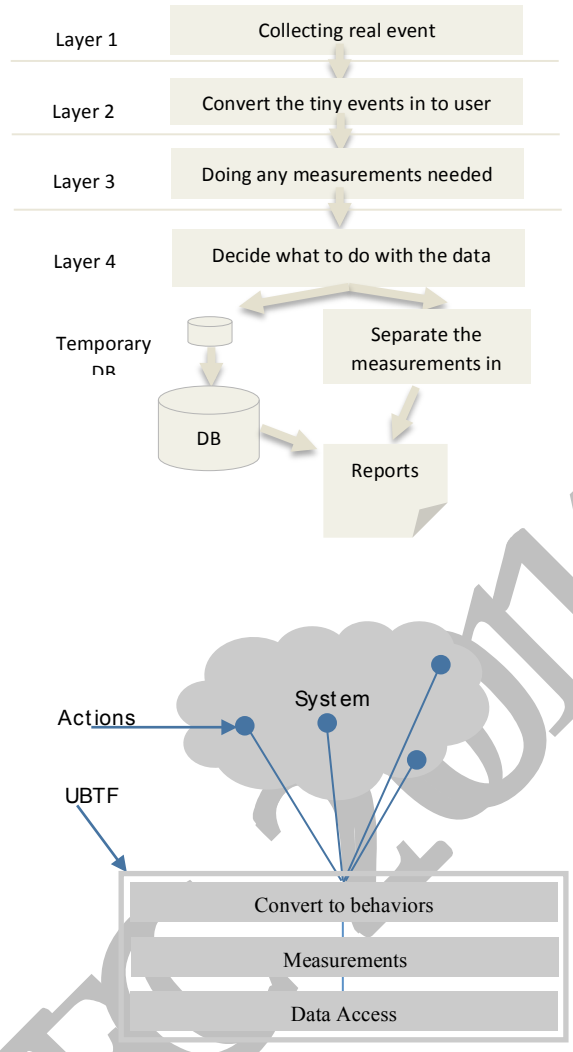

Figure 26: the integration between the system and the library

C.Deeper insight into the framework

One of the outputs is a library to make it easy for any application to deal with, any developer can start writing the tracking code while he is writing the product code (along with the development phase) or after the project finished, because it's a library so you can easily plug and play.

It's recommended for the targeted application to be developed based on MVVM design pattern because the library is designed for this king of application but that doesn't mean the framework will not work in any other type of application, but that's mean we have to replace the first tow layer of the library.

Actions: is a little events that happened inside the system like text Changed or mouse click but it has no meaning so we collect them and grab more information's about them and convert them to behaviors then send all this to next layer

Behaviors: it is a collection of one or more action, we can save it or wait and aggregate them till certain time or a certain event happened and then save it in the DB.

Measurements: responsible of collecting the behaviors and aggregate them, then save them in DB or save them directly to the DB, but this time the DB maybe distributed between the clients and then upload them to the server every once and a wh

The actions collected from different part of the application like UI, View Model… and transferred to the Behaviors Converter class, his turn is collecting more than one action or just one action and pass it to the

measurements class that in turn will aggregate the behaviors and decide when it's the best time to save the final result to the DB to prevent and data loss, because if and error occur the whole aggregated data will be loss and this could leads to data corruption.

The Experiment

In the sake of showing and implementing the tracking library we created a system to do our experiment into it, to collect the user behavior while they are using the application this application called Book Keeping 24/7 (BK247).

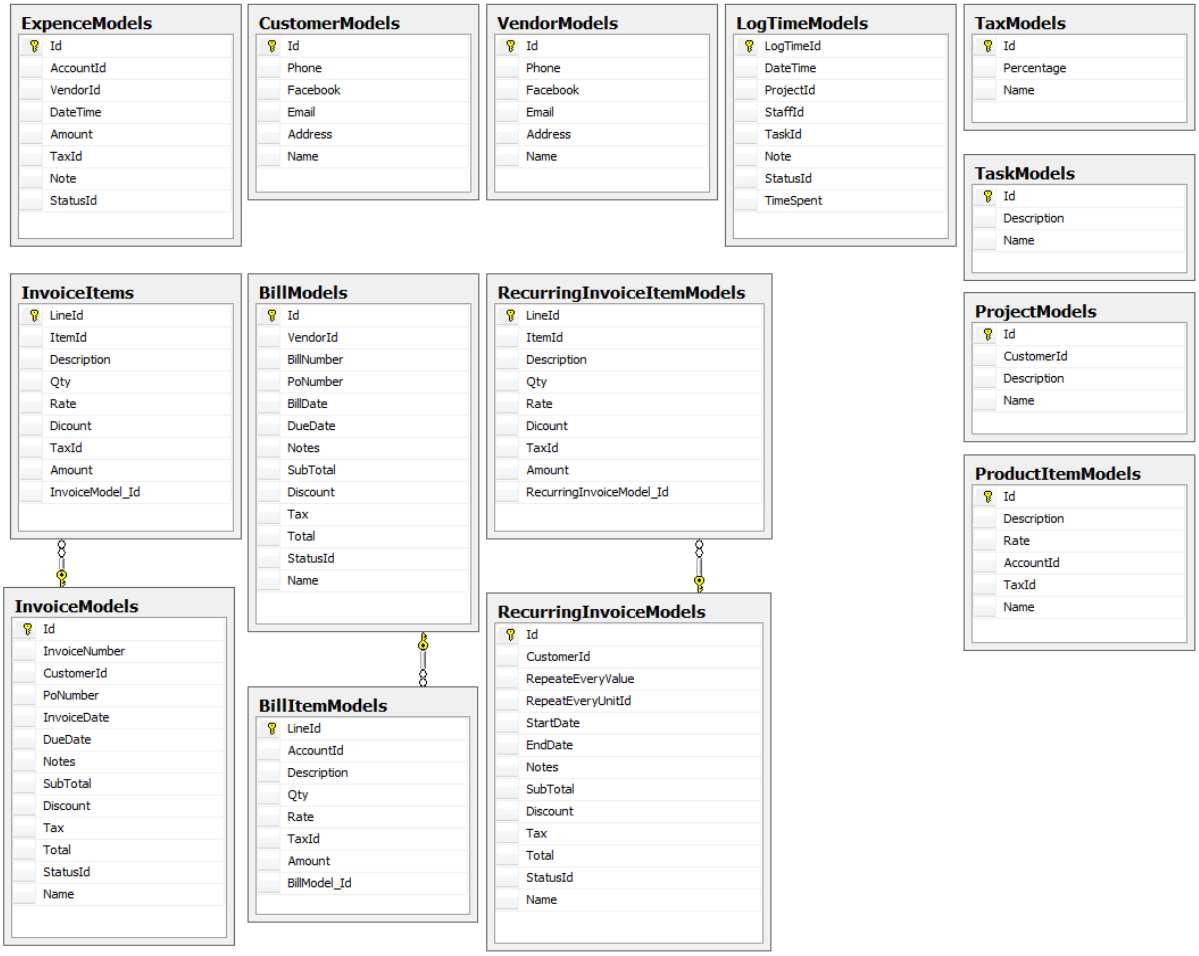

Figure 27: BK247 Database Structure

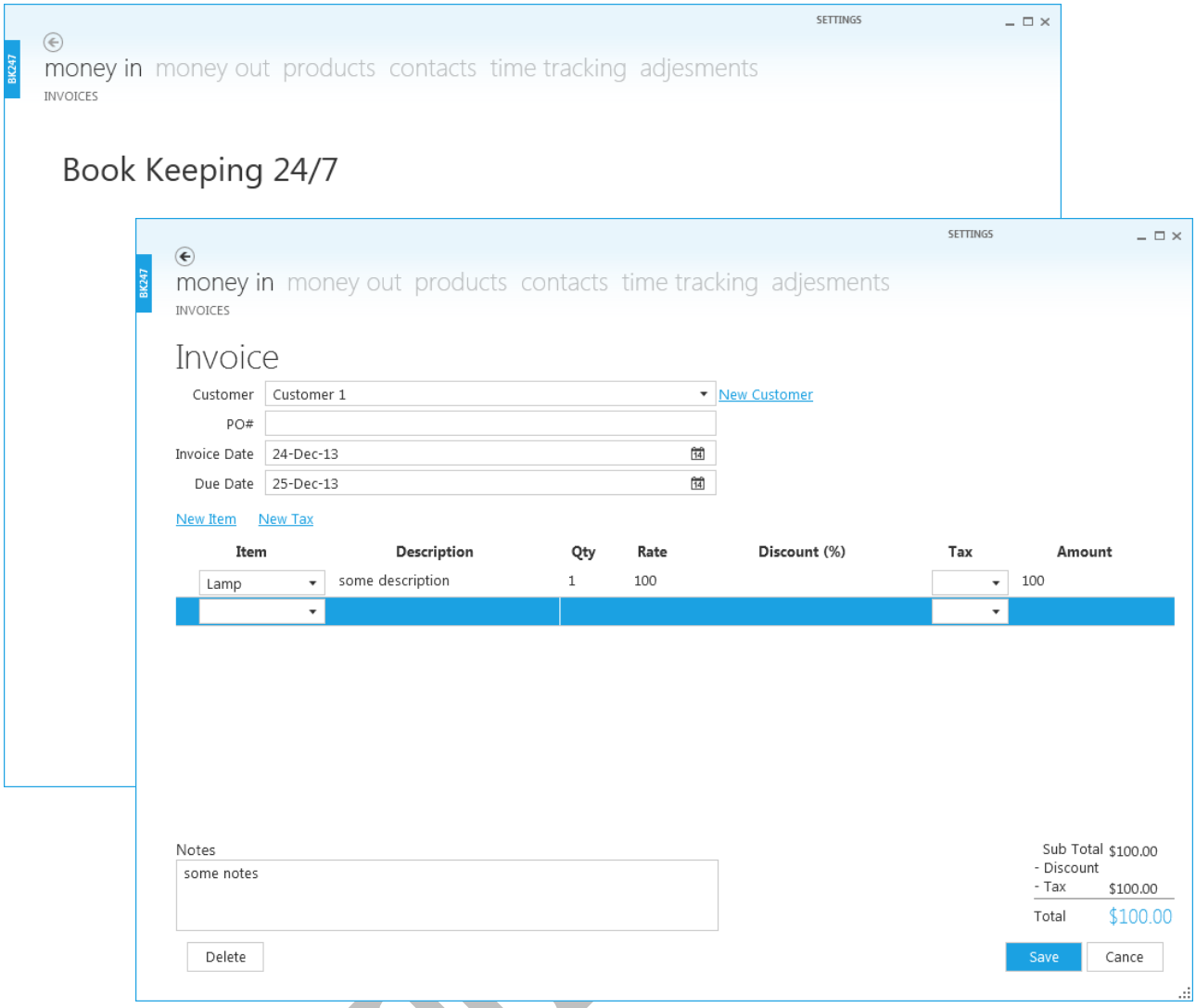

Figure 28: UBTF screenshot

We let give the contributors tasks to do in the system, this tasks vague and abstract and it more like what happened in the real life, this is because we want to see how the user will interact with the application, we wanted to give him more space so he can do non expected things so we can learn from that.

This is a list of all the tasks that we make the contributors to make into the system

1. Settings
   - Write your name
2. Invoices
   - Create a new invoice that has 2 products (Items), this items is “Lamp” by $10 and “Lamp Starter” by $5, you sell them to “Pitter”, he said something about the invoice so you should keep it in the notes for later review
   - He paid for it so make its status as paid
3. Recurring invoice
   - “Pitter” wants you to ship some office supply each week, papers and pencils that will cost $40
4. Bills
   - You bought the same 2 product from “Fabian”, 3 “lamps” by $8 and 4 ”Lamp Starters” by $2

- You Paid for it

5. Expenses
   - Fabian is VIP Vendor who broke something by $100, you couldn't make him pay for it
6. Time Tracking
   - Your company working on a project called "Pitter Office Preparation"
   - Assume you are employee in your company, and finish from the task "Preparing the Furniture"
7. Just close the application

B. User behavior tracking Database Structure

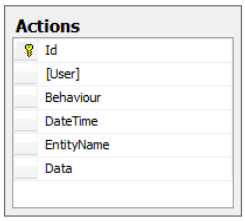

Figure 29: UBTF Database Structure

With this small, totally denormalized table you can collect all the information you need about the user interaction with BK247. Then you can analyze it later or even you can predict the user behavior.
By tracking the individual user s (as you can see above in the Actions table there is User column) we make this framework able to track each user in your organization, with a little bit more info about the users department you can generate endless number of reports like (most opened view per department, total up time per user, total up time per department, …)

C. Adopted User Behaviors

This is the user behaviors that we adopted in this experiment, you can add any one to the list and the data will not be affected
Left Mouse Press: when this two actions happened left mouse down and left mouse up
Left Mouse Down
Left Mouse Up
Right Mouse Press: when this two actions happened right mouse down and right mouse up
Right Mouse Down
Right Mouse Up
Left Mouse Drag: when the user hold down and move and then up
Right Mouse Drag
Key Press: when user pushes down keyboard button and then leave to get up
Key Hold: when users press down the button and hold it for a while
View Opened: when some view (item selected from the navigation panel) opened
Button Clicked
Write In Text Box
Select Item from Combo Box
Application Activated: when the user focus on the application or open it
Application Deactivated: when the user close the application or focus on another application in the windows
Select Date
New Entity Created
Data Grid Line Added
Data Grid Line Deleted

D.Reports

Each of this report answering developer questions, and any developer can create his own version of report by changing in the third layer, he can also separate the performance report from the behavior reports for better understanding, by performance report we mean the current environment that the application runs in like (windows version, width high of the screen, processor power, graphics card,…)

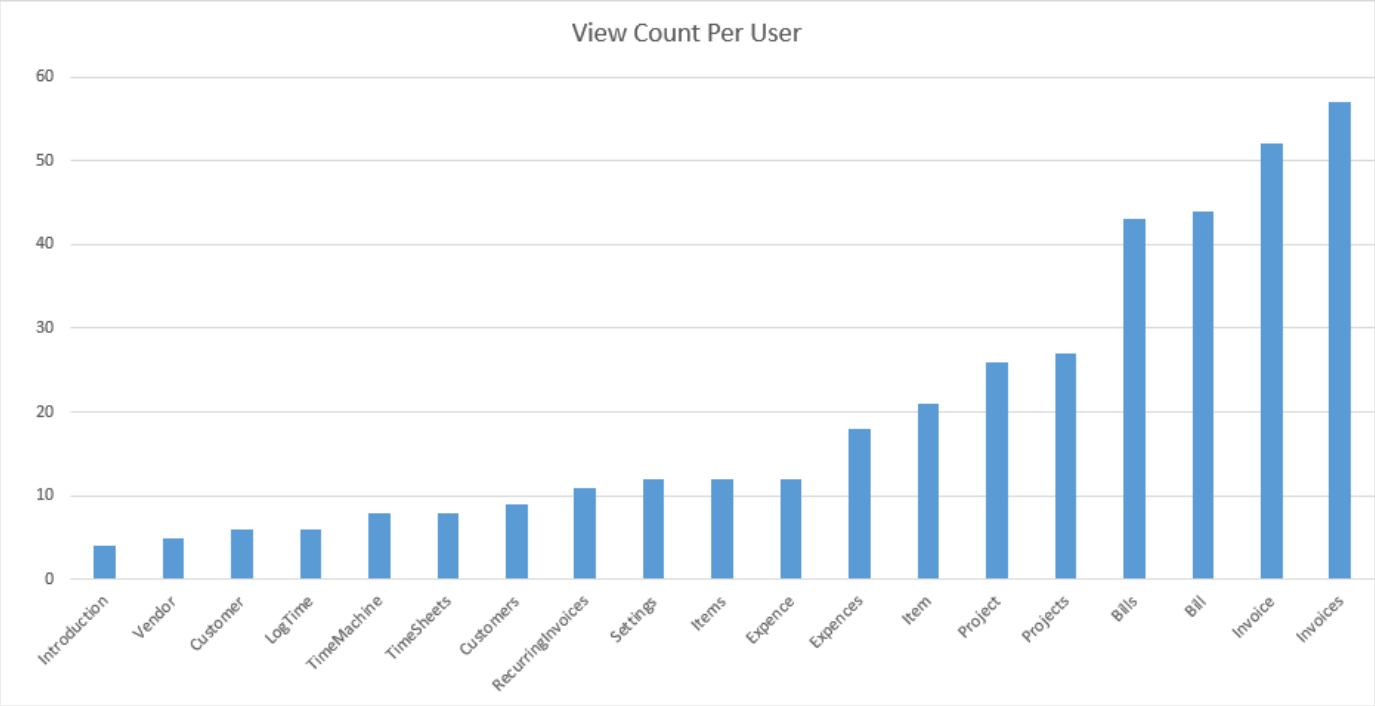

Figure 6: The most viewed UI screens per user

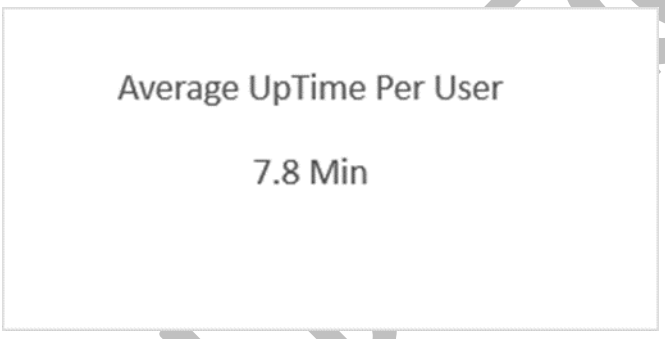

Figure 30: Average up time per user

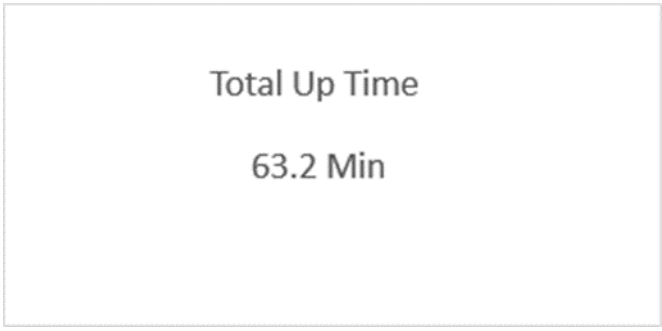

Figure 31: Total up time

E. Lesson learned from the collected data

a) We found that when user save some entity (bill, invoice, expense,..) he always go back to search screen to check whether this record is really saved or not, from this behavior we knew that there is something wrong here, we had many solutions but the top 2 were, either to show him "saved" notification message or open the search screen and highlight the new record for him, and of course we adopted the easier one.

b) There is small link beside any combo box you can make new item from there, in other words if the combo box was customers there will be link button when you press it takes you to new customer view so you can enter new one, we notice any user enter new customer from that link button he came back and use the same customer he just created, this happened not just in the customers combo box but almost any combo box like that, even if the combo box was inside data grid, so we make the application able to understand that, if you create new entity from like button the application will come back and select the

new entity for you.

c) We found that some users dragged the mouse but in the same time we don't have any drag and drop functionality in the system, when we see the opened view (by going back to the actions table and select the first open view action before the drag and drop action) we found he opened the invoices window, when we tracked the mouse position we found that he adjusted the width of the amount column, when the amount gets bigger the user will not be able to see the last digit from that number and it's dangerous because this is the money column and it may affect his financial decisions, the solution of this problem was very easy but the harm from this issue is very big, the solution is just make the money column "Auto" so the column gets bigger if the content is big.

d) At the first users will have a hard time finding the needed view for the task but once they find the view they start to learn the navigation system and they become an expert users.

F. Drawbacks

a) The web application is much more than the desktop application and recreate this library in the web world will take time and effort in the first run but once you create it it's very easy to integrate into any application, and if you have some changes in some layer like if you want to collect data from Wii device like (Benjamin Poppinga, Thomas Schlömer, Niels Henze, Susanne Boll, 2008), the frame work and the library will work fine but you have to do some changes in the first layer (actions collections layer) and the second layer also if needed, and the last part of layer 4 (reports), but also if you created for one WII game you can use it an any other one.

b) We didn't tackle any security issues we left that for the developers

c) The first step to create any report is to clean the collected data from any corruption or not logical data like (if the application send two "application Activated" action, when you focus on the) Extracting data for the report is really hard, but you can make it easier by collecting clean, not corrupted data.

G. Future work

a) A way to make the application adaptive and takes decisions from his own collected data, to help each user independently.

b) Make the developer able to specify set of tasks and sub tasks and let the user interact with the system and compare his action with the developer pre-defined tasks if there is a match them ok, if not this should be a new task and it should be reported to the developers to take some decision about it, either to add it to the tasks collection or add it to the not helpful tasks list, we should also be able to produce timely reports based on the tasks.

c) Make tips for the user depending on his action into the system, if we provide an API in the UBTF library for the application to read it and take decisions based on that metrics, this tips could be possible.

d) Make tips to the domain also.

e) Change points, when you learn something and adjust the application and redeploy it you should set a save point so you can split the old behaviors from the new ones

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Using technology to facilitate the connection with mathematics

Sinan Aydın, Fatma Serbest, Barış Demir, Mustafa Of, Hasip Uzunkaya

Anadolu Üniversitesi
Email : sinanaydin1704@yahoo.com

Abstract: This article discusses student difficulties in grasping concepts from vocational high school mathematics. Using an example from an interview with a student, we propose changes that might positively impact student understanding of concepts within a problem-solving context. In particular, we illustrate obstacles to student understanding and suggest technological interventions to address these obstacles.

Keywords : Mathematics, technology, obstacles, interview

UTILISATION OF INTELLIGENT SYSTEMS IN THE ECONOMICAL EVALUATION OF TRANSPORTATION PROJECTS

Muhammed Emin Cihangir Bağdatlı[1], Rıfat Akbıyıklı[2] and Aydın Demir[3]

[1]Department of Civil Engineering, Sakarya University, Sakarya, Turkey

bagdatli@sakarya.edu.tr

[2]Department of Civil Enigineering, Düzce University, Düzce, Turkey

rakbiyikli@gmail.com

[3]Department of Civil Engineering, Sakarya University, Sakarya, Turkey

aydindemir@sakarya.edu.tr

Abstract: Transportation projects are high-cost investments. For this reason in order to perform correct decision making process special approaches and methods have to be used in feasibility analysis. Benefit Cost Analysis (BCA) is a widely used method all over the world and in Turkey for the economical evaluation of the transportation projects. But, the most important disadvantage of this method is the difficulties in predicting the costs, missing and lacking data and the uncertainty in the long-term analysis period risks affecting the results negatively. In order to avoid this risk, protective measures such as sensitivity analysis and probability distributions are used in the traditional benefit – cost analysis. But, in a project where there are high uncertainties and approximate data are present the said methods are becoming insufficient in real-life applications. Especially, the countries with a quickly changing socio-economic structure, for the transportation projects having long-term analysis period there are uncertainties in predicting parameters such as traffic volumes, accident data, time value etc. As a result of all those items the evaluation of the feasibility of the transportation projects is always facing risks of wrong decision-making. Therefore, the need to develop a more sophisticated method eliminating all the uncertainties of the traditional benefit cost analysis becomes evident. This paper, aims to develop a model that

will contribute to the traditionally widely used benefit cost analysis in economical evaluation of transport projects by the Turkish State Highway Authority. Through this proposed model it is also aimed to eliminate the missing and uncertain data and wrong estimations in feasibility analyses. As a result the paper is proposing an intelligent system framework, utilising The Fuzzy Cognitive Map for the transportation projects' benefit cost analysis

Keywords: Economic evaluation, Benefit Cost Analysis, Transportation Projects, Fuzzy Cognitive Map, Intelligent Systems

Introduction

There are different methods for analysis of the evaluation of the transportation projects. The main idea of all of those methods is based on calculations by updating the inputs and outputs or revenues and expenses related to the project [2]. The most widely used method in the economical evaluation of the transportation investments is the Benefit Cost Analysis (BCA) method [1, 3]. Besides this method there are other methods such as, Net Present Worth (NPW), Annual Equivalent Cost (AEC) and Internal Rate of Return (IRR) method [1].The choice of the method in the economical evaluation process is depending on the amount and content of the analysis and uncertainties of some parameters in analysis. As an example; in the developing countries, since the interest rates are high and uncertain, the IRR method is selected. On the other hand when the economic life of the project is uncertain the AEC method is applied [4].

Until now benefit-cost analysis is considered as the primary economic analysis method for the infrastructure Project investments in our country. This method is a technique used in public sector as an economical tool to evaluate the efficiency of the investment projects and to choose the projects having the maximum benefits to the society or determining the priority of the projects [2]. For this reason it is considered to a very important economic analysis for big infrastructure transportation investment projects. With the help of this analysis, benefits and costs in different alternatives are determined and measured systematically and used a decision making tool to decide for the feasibility of the project.

Benefit Cost Analysis method is requiring a lot of data to be analysed. At the same time this method is also including future predictions in its long evaluation period. In order to obtain a correct result from the analysis the mentioned data and estimations also have to be correct and complete. But, it is very difficult to make correct estimations for the future in countries having social and economic indeterminacy and ambiguities. Besides not systematic data collection creates wrong statistical data and in conclusion resulting an economic analysis that is totally based on wrong inputs and as a result fatal wrong decision making becomes unavoidable. Therefore, it is needed to develop a model that will eliminate all of these ambiguities faced in the traditional benefit – cost analysis method.

In this study, it is attempted and aimed to develop a model that will contribute to the existing benefit – cost analysis used by the Turkish Highway Directorate in economic evaluation and feasibility studies of highway investments. In this respect through this proposed model it is aimed to eliminate the missing and uncertain data and wrong estimations in feasibility analyses and propose an intelligent system framework, utilising The Fuzzy Cognitive Map for the transportation projects' benefit – cost analysis.

General Directorate of Highways Traditional Benefit Cost Analysis

The economic analysis of Turkish Highway Directorate is based on two pillars: The first is costs which are composed of expenses starting from the Project Initiation to Project Handover. The second is benefits which consists of revenues expected during the Project evaluation period [6].The benefit and cost parameters used in economic analysis by the Turkish Highway Directorate is shown in Table 1.

Table 1: Parameters Used by Turkish Highway Directorate for Benefit Cost Analysis

Agency Costs (Costs)	Road Users' Costs (Benefits)
• Road Construction Costs • Operation and Maintenance Costs	• Time Costs • Accident Costs • Vehicle Operating Costs

The benefit and costs indicated in Table 1 is discounted to net present values by suitable discount rate. There are two fundamental concepts in dealing with compounding and discounting process in engineering economics. These are:

1. Compounding Process

To solve for the future sum F we use Equation 1;

$$F = P\,(1+)^n = \; P\,(\tfrac{F}{P}\,, i\,, n) \qquad (\mathbf{1})$$

Here, P is the present value, n is the interest periods and i is the interest rate. F is the accumulated sum at the end of the n periods. The factor $(1 + i)^n$ is known as the single - payment compound-amount factor. Given this factor, all other important interest factors can be derived. The (F/P) factor is referred to as compounding factor and the process of finding F is known as compounding process [1].

2. Discounting Process

Finding the present worth P of a future sum F is simply the reverse of compounding and is known as the discounting process [1].

$$P = F\left[\tfrac{1}{(1+i)^n}\right] = F(\tfrac{P}{F}\,, i, n) \qquad (2)$$

Here, the $(1/(1+i)^n$ factor is known as the single-payment present-worth factor and is designated as (P/F) factor. This factor is also referred to as the discounting factor and the process is known as discounting process [1].

The economic discounting process and the decision rule for benefit – cost analysis and (B/C) ratio is shown in Equation 3.

$$P_{Benefits} = \sum_1^n \frac{F_{i\ accident}}{(1+i)^n} + \sum_1^n \frac{F_{i\ time}}{(1+i)^n} + \sum_1^n \frac{F_{i\ vehicle\ operating}}{(1+i)^n}$$

$$P_{Costs} = \sum_1^n \frac{F_{i\,maintenance}}{(1+i)^n} + P_{construction}$$

$$\frac{P_{Benefits}}{P_{Costs}} > 1 \quad \rightarrow \quad \text{accept} \qquad (\mathbf{3})$$

In equation 3 all the benefits and costs (including the first capital investment cost) are discounted to the present value and established the ratio (B/C). If we are to accept the project the ratio has to be greater than 1. The most important features of the analysis are that all the data related to time values, vehicle operating costs, accident costs, construction costs and operation and maintenance costs have to be correct and without ambiguities. Otherwise wrong data will create wrong decision making accordingly no value for money for the taxpayers.

Ultimately a sensitivity analysis is done a s final step of the economic evaluation process for the investment project.

Benefit- Cost Analysis Proposal

It is aimed to remove all the indefinite and imprecise and missing data and wrong estimations in the developed benefit-cost model. It is aimed to evaluate the traditional benefit-cost analysis from a wider perspective of risk analysis framework. The constituent parts of the proposed framework is shown in Figure 1 below.

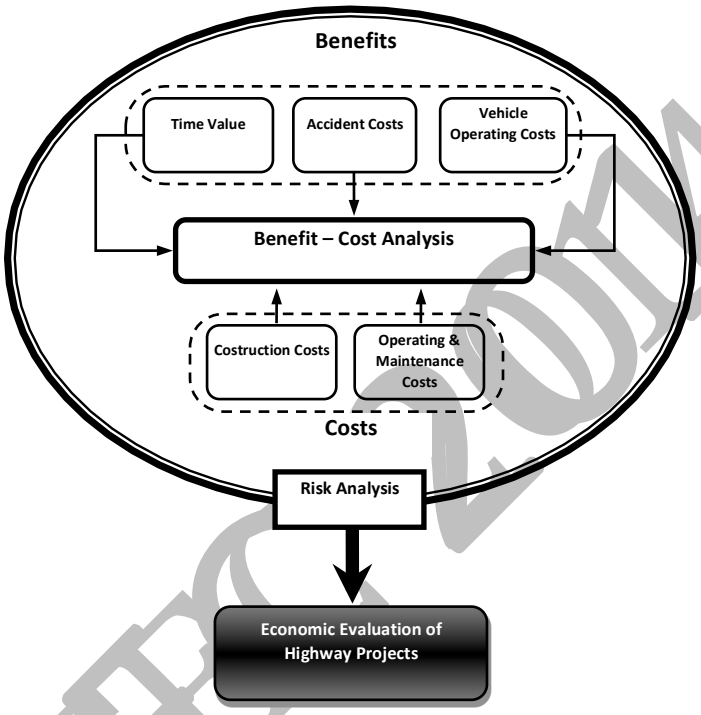

Figure 1: The Constituent Parts of the Developed Model

As it is shown in Figure 1 the parameters of traditional benefit-cost analysis it is evaluated within the domain of risk analysis framework. It is needed an intelligent system in order to realise this new analysis process. The intelligent system to be used in the proposed model is expected to have a structure that minimise the negative effects of non-linear, missing and doubtful data. It is assumed that the Fuzzy Cognitive Map method has the ability to fulfil the necessities for the development of the model.

The Fuzzy Cognitive Map play an important role in defining and modelling complex systems. The Fuzzy Cognitive Map is sheltering solutions depending on the human experience and knowledge in the direction of the dynamics of the system and against different conditions. With this structure the method is widely and effectively applied in decision making analyses. The Fuzzy Cognitive Map, as shown in Figure 2, is consisted of the conceptual variables of the nodes or the elements composing the system and the lines between the nodes having both directions and weights showing the relations between the conceptual variables [9].

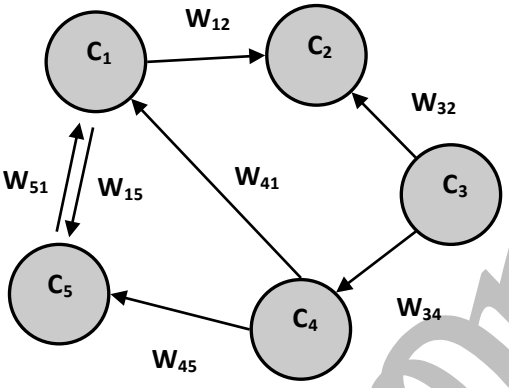

Figure 2: A Simplified Fuzzy Cognitive Map [7]

Conceptual variables or concepts; can indicate mode, variable, event, activity, aim, etc. every conceptual variable, takes variable values by time as result of interaction with other In the Classical Fuzzy Cognitive Map conceptual variable values can within the range of (0,1).. The relations between conceptual variables are defined as fuzzy and have a value in [-1,1] range [5]. The conceptual variable value (A_i) for each conceptual variable is calculated with equation 4:

$$A_i^t = f\left(\sum_{\substack{j=1 \\ j\neq i}}^{n} A_j^{t-1} W_{ji}\right) \quad (4)$$

A_i^t, gives the value of C_i conceptual variable at time t; A_i^{t-1}, gives the values of C_j influencing the conceptual variable C_i at time (t-1); W_{ji}, is the influence value to C_i from C_j conceptual variable; and f is the threshold function [8]. The most used threshold function for the fuzzy cognitive map is given in Equation 5:

$$f(x) = \frac{1}{e^{-\lambda x}} \quad (5)$$

The most important matter in fuzzy cognitive map is establishing the skeleton of the model to be improved and the prediction of the concepts in the system influencing each other. In a later step the determination of the weights between the concepts are realised. The fuzzy cognitive map structure for the developed benefit cost model is shown in Figure 3.

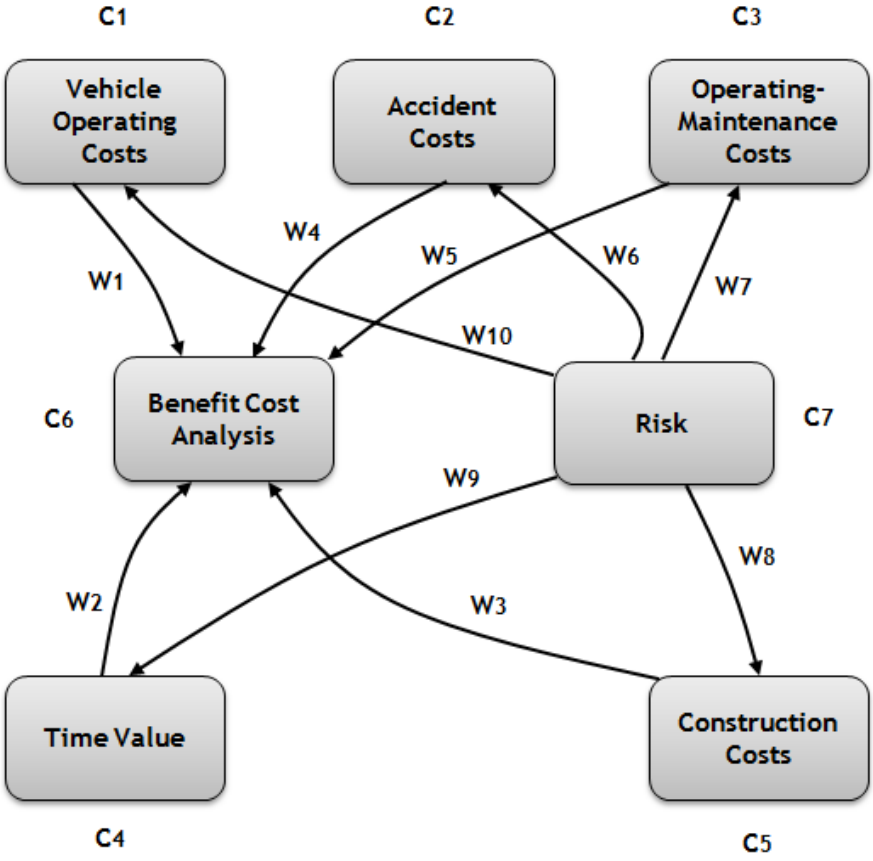

Figure 3: The Fuzzy Cognitive Map of the Developed Model

As shown in Figure 3, the traditional benefit-cost analysis is put forward in fuzzy cognitive map method. The Model, contains the fundamental parameters of traditional benefit – cost analysis namely, accident costs, time value, vehicle operating costs, construction costs and maintenance costs. In the developed model it is included the risk parameter in the traditional benefit-cost analysis and the effect of this parameter on the other parameters is considered. The system is considered in two ways: The first, predicting the relations and effect levels between the results of basic parameters of the benefit-cost analysis and fuzzy cognitive maps method. The second, fuzzy risk analysing of these basic parameters and predicting the risk value effects on the system. As a result of the analysis and by predicting the weights between the concepts an adjacency matrix will be determined. In Figure 4 is shown such an adjacency matrix for the developed model.

	C_1	C_2	C_3	C_4	C_5	C_6	C_7
C_1	0	0	0	0	0	W_1	0
C_2	0	0	0	0	0	W_4	0
C_3	0	0	0	0	0	W_5	0
C_4	0	0	0	0	0	W_2	0
C_5	0	0	0	0	0	W_3	0
C_6	0	0	0	0	0	0	0
C_7	W_{10}	W_6	W_7	W_9	W_8	0	0

Figure 4: Adjacency Matrix

In Figure 4 it is shown the adjacency matrix expressing the effectiveness weight levels between the concepts in the system. The W_1, W_4, W_5, W_2, W_3 in the matrix show the effect values related to the result of the parameters in the traditional benefit – cost analysis; the W_{10}, W6, W_7, W_9, W_8 weights show the effect of the risk parameters on the other concepts. As a result of the creation of this matrix and with the help of the Equation 5 the system will be ready to be operated.

The most important matter here is how the calculation of the effect of other concepts will be done after the inclusion of the risk parameter in the developed model. The risk parameter included in the model will affect the concepts in the system in different levels. Therefore this parameter with a special evaluation method must effect each of the concepts in the system. At this stage the techniques used to determine the weights used in the fuzzy cognitive map method will not be sufficient for this parameter. Now, a new approach is necessary for the prediction of the effects of the risk parameter on other concepts. The steps of the new proposed approach are as follows:

1- Traditional risk analysis steps have to be used in finding the effect of risk parameter on the other concepts in the system. In this respect the main steps of the traditional risk analysis have to be followed in order to the prediction of the risks, identification of the risks, estimation of the risks and evaluation of the risks.

2- The prediction and definition of the risks have to be obtained from a deep literature review of benefit-cost analysis of the General Directorate of Highways in Turkey.

3- At the stage of the estimation of risk done has to get help from the specialists of feasibility studies in the General Directorate of Highways in Turkey.

4- The evaluation of the risks has to be done using fuzzy risk analysis method in order to obtain the weight values.

The developed method is aiming to reach the result by risk analysis of each concept in the traditional benefit cost analysis. In this respect each concept will be included in the result as specified risk coefficients. These coefficients are not dynamic and will be obtained after some analysis. These, as shown in Figure 4, will be included in the matrix as static coefficients. The evaluation of these coefficients are in progress.

Conclusions

The highway investment economic evaluations is depending mainly on future predictions and estimations and obtaining of correct information and data. On the contrary, the wrong decision making by the decision makers will choose Project that are no feasible and no benefits to the society, As a result of this view many economically and socially unpredictable countries with unsufficient data for economic analysis are preparing analysis that barely are numbers without applicability in real-life projects. The sensitivity analysis, made at the end of the economic analysis, remains as a general risk analysis on the determined parameters depending on the foresight of the analyst foresight of the analyst. But, since the benefit-cost analysis is the project's "feasibility" evaluation, it has to be put forward as a complete risk evaluation analysis since it will affect the project for many years in future. In this paper risk parameter is included in the proposed benefit-cost analysis model and all the system is evaluated with this parameter aiming to get the most correct result. The final result will be obtained by the inclusion of risk parameter together with the traditional benefit-cost analysis concepts (time value, vehicle operating costs, accident costs, operation and maintenance costs) a final risk analysis will be done. Such an approach will give more reliable conclusions.

The calculation of weights for the model proposed using fuzzy cognitive maps method is continuing. When the model is final the economic evaluation of transportation projects will be closer to the real result.

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Vangölü Havzasında Yer Alan Tarihi Yapılarda Kullanılan Harç ve Sıvaların Özellikleri

Ercan IŞIK, Abdurezzak BAKIŞ, Alev AKILLI, Fatih HATTATOĞLU, Gökhan ÖZTÜRK, Emrullah VELİOĞLU

Bitlis Eren Üniversitesi
Email : ercanbitliseren@gmail.com

Abstract

Vangölü Havzası geleneksel tarihsel dokusu ile Osmanlı, Selçuklu ve Urartu medeniyetleri gibi birçok medeniyetin izlerini taşımaktadır. Tarihsel mirasımızın bir sonraki nesillere aktarılabilmesi adına tarihi yapılarda yapılacak müdahaleler önem arz etmektedir. Tarihi yapılarda, yapı malzemelerinin bir arada tutulması için kullanılan harç ve sıvaların özelliklerinin bilinmesi tarihi yapıların korunmasına yönelik yapılacak müdahalelerin ilk adımını oluşturmaktadır. Bu çalışmada havzada yer alan Van ve Bitlis illerinde yer alan tarihi yapılarda kullanılan harç ve sıvaların özellikleri ortaya konulmaya çalışılmıştır.

Keywords: Vangölü, tarihi yapı, harç, sıva

Web üzerinden Gerçek Zamanlı Bir Robot Kolu Kontrolü

Barış BORU

Sakarya Üniversitesi, Mühendislik Fakültesi, Sakarya-Turkey
barisb@sakarya.edu.tr

Özet:İnsan hayatını kolaylaştıran ve işlerini daha az iş gücü kullanarak daha kısa sürelerde yapılmasını sağlayan teknolojiler arasında robotik Önemli bir yere sahiptir. Robotik Üzerine yapIlan Çalışmalar birçok sektörde kullanIlan ve her geçen gün kullanImI artan robot kollarI Üzerine yoĞunlaŞmaktadIr. Bu ÇalIŞmada, altI eksenli bir robot kolunun web Üzerinden gerÇek zamanlI kontrolÜ Labview programlama ortamI ve Arduino mikrodenetleyici platformu kullanIlarak gerÇekleŞtirilmiŞtir. Web kullanIcI ara yÜzÜ ile uzaktan eriŞilen bilgisayar Üzerinde ÇalIŞan Labview ortamInda hazIrlanan program, aynI zamanda gerekli kontrol algoritmasInI yÜrÜtmektedir. Bu bilgisayar Arduino mikrodenetleyici ile iletiŞim halinde olmakta ve gerekli elektriksel kontrol iŞaretleri mikrodenetleyici tarafIndan Üretilerek robot kolunu hareket ettirilmektedir. Web teknolojisi, gÖrsel programlama, mikrodenetleyicili sistem ve altI eksenli robot kolunu birleŞtiren bu ÇalIŞma; diĞer uygulamalarla karŞIlaŞtIrIldIĞInda kullanIm kolaylIĞI, esnek yapIsI ve dÜŞÜk maliyeti ile Ön plana ÇIkmaktadIr. GÜnÜmÜzde endÜstri, saĞlIk, savunma ve ulaŞIm gibi birÇok kullanIm alanI olan robotik teknolojisinin ÜrÜn perspektifine bakIldIĞInda maliyetlerinin yÜksek olduĞu gÖzlenmektedir. DÜŞÜk maliyetli ve kolay uygulanabilir bir yapI olarak ortaya ÇIkan bu ÇalIŞma ÜrÜnÜ Özellikle mÜhendislik alanInda eĞitim ve araŞtIrma ÇalIŞmalarInda kullanIlma potansiyeli yÜksektir.

Anahtar kelimeler: : Robot kolu, Labview, Uzaktan Kontrol, Arduino

Glass-Ceramics in the $MgO–Al_2O_3–SiO_2$ System Based on Industrial Waste Materials

Bahadır Aydın, Atakan Ortagedik, H. Özkan Toplan and Nil Toplan

Sakarya University, Department of Metallurgical and Materials Engineering, Esentepe Campus, 54 187 Sakarya/TURKEY toplan@sakarya.edu.tr

Abstract: The system $MgO–Al_2O_3–SiO_2$ (MAS) is well known to be suitable for the production of high-strength glass–ceramics. Preparation of cheap technical MAS glass-ceramic materials by crystallizing glasses derived from Kümaş magnesite waste, quartz, alümina, kaolin and Bi_2O_3 as nucleating agent powder were investigated. In this study, cordierite was aimed using a cordierite mixture of magnesite ($MgCO_3$), Al_2O_3 and SiO_2 prepared by the addition of Bi_2O_3 (wt.% 0-5) at low temperature. The batches were melted in a alumina crucible and then casted into graphite mold which was subjected to heat treatment to induce crystallization. The glass samples were heated at the rates of 10 K/min from 298 to 1473 K for thermal analys. The cordierite ceramic was synthesized at 1200°C for 10h and 1250 °C for 20h. The produced glasses and synthesized ceramics were characterized by X–ray diffractogram (XRD) and Scanning electron microscopy (SEM).

Keywords: Bi_2O_3, MAS, magnesite waste and cordierite

Introduction

The glass ceramics based on the MAS system belong to an important class of advanced technological material, having a wide range of applications. Some of their interesting features are machinability, high thermal stability, high electrical insulation, vacuum compatibility and etc. Various properties of MAS glass ceramics like hardness, expansion coefficient, conductivity and machinability etc., among other parameters, depend on the composition and microstructure [1].

Recently MAS glass-ceramics have been considered as matrix materials in the fabrication of ceramic matrix composites for high-temperature composite applications. This system has been reported to have good materials properties such as high-Young' modulus and low thermal expansion coefficient, and increased hardness compared to the conventionally used E-glass. Composition, nucleating agents and heat treatment process all influence the crystalline phases formed. The strength of MAS glass ceramic depends on whether cordierite phase can develop as the major crystal phase [2]. Cordierite, whose chemical composition is $2MgO·2Al_2O_3·5SiO_2$, is one of the phases of the ternary MAS system, along with mullite, cristobalite, tridymite, enstatite, forsterite, sapphirine and etc. Cordierite is widely used in glass–ceramic compositions for manufacturing multilayer circuit boards, catalytic converters, filters, kiln furniture, and thermal insulation materials. Furthermore, because of the outstanding thermo-mechanical, chemical and dielectric properties of cordierite glass ceramics, they have been in use for decades in various fields, ranging from substrates for microelectronic packaging industry to cookware, heat exchangers and, more recently, glazes for floor tiles [3]. Cordierite glass-ceramics can possess strengths of up to 250 MPa above 1200°C temperature of heat treatment [2].

Cordierite-based glass–ceramic materials are considered to have broad potential for the development of dielectric materials because they have a lower dielectric constant, good electrical insulation, high mechanical strength, thermal stability and excellent shock resistance properties. The properties of glass–ceramics depend on their microstructure, and the microstructure primarily depends on the melting matrix structure prior to solidification, and and the cooling rate, which is related to the presence of crystal defects, the melting matrix structure prior to solidification and the method of the phase transformation dynamics. Therefore, to study the changes of the high-temperature liquid glass structure as a function of temperature, it is extremely vital to obtain good mechanical properties by finding the best technology for the glass–ceramics solidification and heat

treatments [4,5].

Different processes remarkably influence the reactivity of the solids. Mechanical treatments are important as long as they can help produce changes in the texture and structure of the solids, causing the particle size reduction and decreasing the reaction sintering temperature. Additives can also decrease the temperature of the reaction process during sintering. The application of additives should improve the contacts between reacting components. On the other hand, the addition of Bi_2O_3, owing to a lower melting temperature (850°C), leads to liquid phase sintering. Having in mind its greater atomic radius, it cannot be incorporated into the cordierite crystal lattice; therefore it acts as a catalyst, increasing the reaction velocity. According to the literature data, this has influence on sintering temperatures lower than 1365°C [3].

Cordierite is difficult to sinter because of the very narrow sintering temperature range (1300-1400ºC). Since a low temperature process is desirable, it is necessary to determine functional aids that can lower the temperature of the sintering process of cordierite. The melting temperature of this aid should be lower than that of the precursors. In addition, the cationic radius should be much larger than the radius of the metals in MAS to avoid substitution into cordierite sites. Different components have been used as sintering aids: Cr_2O_3, ZrO_2, K_2O, B_2O_3, TiO_2, Bi_2O_3 etc. Bi_2O_3 satisfies the necessary criteria to form a liquid phase and support cordierite sintering, such as a large diameter and low melting temperature (825ºC). Bi_2O_3 forms eutectics with magnesium, aluminum and silica [6,7].

In the present work, the glass forming behaviour of cordierite compositions in the cheaper MAS system with added Bi_2O_3 content up to 5% as a nucleating agent were studied by melting the natural raw materials such as Kümaş magnesite waste, kaolin, alümina and quartz. The produced glass samples were sintered isothermally at 1200 and 1250°C in air atmosphere for 10h and 20 h the heating rate was 10 °C/min. The produced glasses and synthesized ceramics have been characterized by X–ray diffractogram (XRD) and Scanning electron microscopy (SEM).

Experimental Procedure

The MAS glass was melted from natural raw materials of kaolin, alümina, quartz and magnesite waste. The XRF chemical analysis of the Kümaş magnesite waste is given in Table 1. Bi_2O_3 were added to every 100 g of batch material as nucleating agents.The average particle size of magnesite waste powder was determined by a particle size analyzer as about 50 μm. The chemical composition of the studied glasses is reported in Table 2.

The melting process was performed in an alumina crucible at 1500 °C in a Heraeus electric furnace for 3 h, in air. Glasses in bulk form were produced by casting melts on a graphite mould. In order to remove thermal residual stresses of the glass samples, they were annealed in a regulated Protherm Elv160/8 furnace at 600°C for 1 h. A thermal analys (DTA) was carried out using a differential thermal analyser (TA Instrument Q-600) for glass transition (T_g) and crystallization (T_p) temperatures determination. Cast glass was crushed and sieved to less than 100 μm to produce glass powder suitable for DTA. The samples were heated at the rates of 10 K/min from 298 to 1473 K. DTA experiment was performed in static air atmosphere with Al_2O_3 powder as reference material. X-ray diffraction (XRD) was conducted with a Rigaku-type diffractometer with Cu Kα radiation, which has a wavelength of 1.54059 Å, to analyse phases over a 2θ range of 10°–90°. A JEOL 6060 scanning electron microscope (SEM) with energy-dispersive X-ray spectroscopy (EDS) was used for characterization. Microstructure observations were realised at fracture glass and glass-ceramic surfaces. An experimental flow chart is given in Figure1.

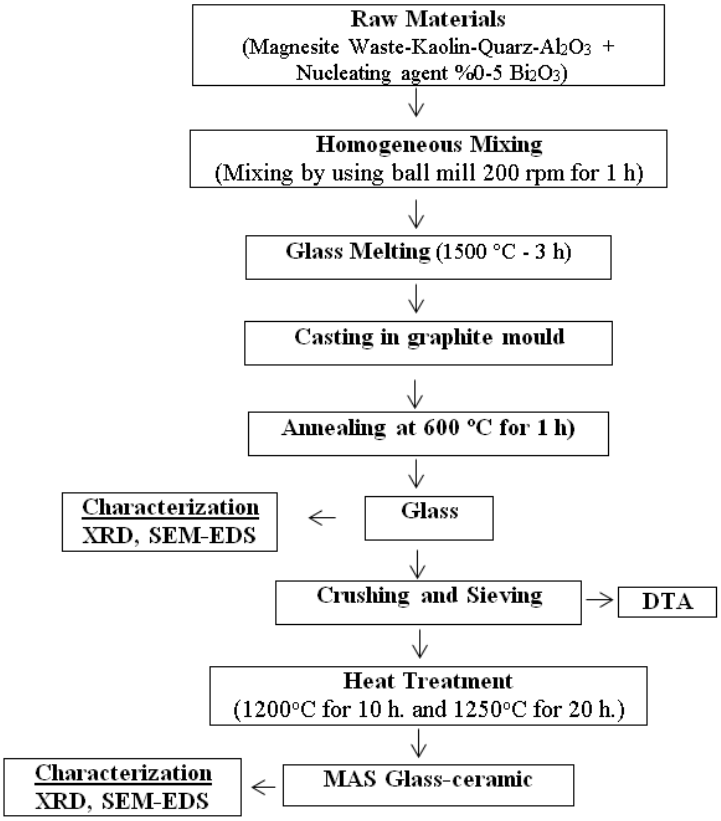


Figure 1. Flow chart of the experimental procedure

Table 1. Chemical composition of magnesite waste by XRF

Comp.	SiO_2	MgO	Fe_2O_3	CaO	Al_2O_3	TiO_2	Na_2O	K_2O	AZ.
%wt.	35.61	33.34	6.04	2.73	2.04	0.22	0.08	0.02	19.77

Table 2. Composition of oxides in the mixtures

Compositions % wt.	Quartz	Magnesite waste	Al_2O_3	Kaolin	Bi_2O_3
MAS1	20	35	20	25	0
MAS2	20	35	20	25	2.5
MAS3	20	35	20	25	5

Results and Discussions

X-ray Diffraction Analysis

Figure 2 shows XRD analysis of glass samples and as seen that all MAS compositions showed amorphous structure which indicates the glass formation abilities of the cordierite compositions. Figure 3 presents the X-ray patterns of samples annealed for 20 h in the temperature 1250°C. After annealing the sample at 1200 °C, peaks due to quartz-solid-solution were no longer observed. Then the main crystalline phase is cordierite. As demonstrated in the diffraction pattern, the main crystalline phase in sintered pellets for all three samples was cordierite. It can be clearly seen that the intensity of the cordierite peak became higher as the amount of MgO used was increased, and sample with chemical formulation $2.6MgO{\cdot}1.5Al_2O_3{\cdot}5SiO_2$ had the lowest intensity compared to the other 2 samples. Theses crystalline phases are normally present in crystallization of MAS glass [7].

The sintering at 1200 °C for 2 h led to the formation of a cordierite–mullite phase, along with the SiO_2 starting phase. The addition of 2.50 mass% Bi_2O_3 accompanied by a relatively short milling time of 56 min led to a decrease in temperatures of both the formation of cordierite and its sintering process [3]. Bi_2O_3 as a nucleating agent can promote nucleation by accelerating phase separation or by lowering the energy barrier of nucleation [8].

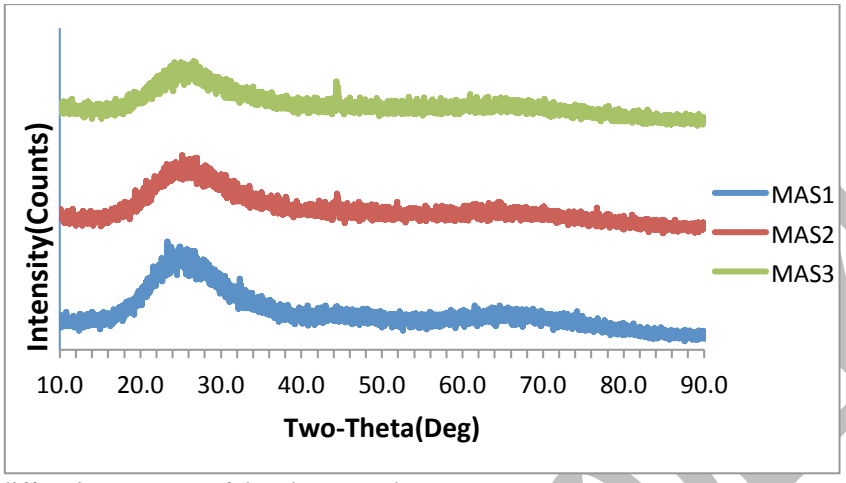


Figure 2. X-ray diffraction patterns of the glass samples

The cordierite is characterized by a complex polymorphism:

-The α–cordierite, of hexagonal symmetry (also well-known as indialite), takes place by a quick crystallization between 1000 and 1300°C.

-The β-cordierite, of orthorhombic structure, is obtained by crystallization below 950°C. This is the most common phase in natural cordierite.

-The μ-cordierite, metaestable rhombohedral phase is obtained by the crystallization of cordierite glass below 925°C. This phase is also known just as an aluminum magnesium silicate [9].

Differential Thermal Analysis

Figure 4 shows the DTA result obtained from annealed MAS 1 glass powder. DTA traces were recorded at heating rate of 10ºC min^{-1} up to 1200ºC for each cordierite glasses. Endothermic reaction at the temperature 995ºC was recorded for MAS1. This endothermic peak is attributed to the glass transition temperature (Tg) of the MAS1 glasses. Glass transition temperature of the curve was evidently about 800°C. Bi_2O_3 addition affected the glass transition temperature (Tg) of the cordierite glasses [10].The temperature corresponding to the prominent exothermic peak is the crystallization maximum temperature (T_p). It is obviously seen that the T_p decreases with the addition of oxide nucleation agent, especially the addition of Bi_2O_3 [11].

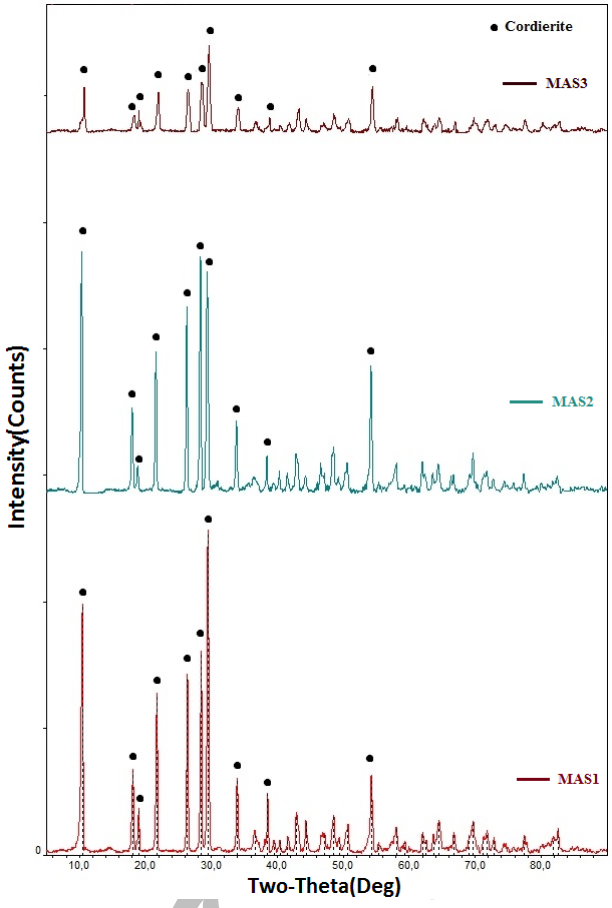


Figure 3. XRD patterns of crystallized MAS glass–ceramics (1250^{o}C'de 20h)

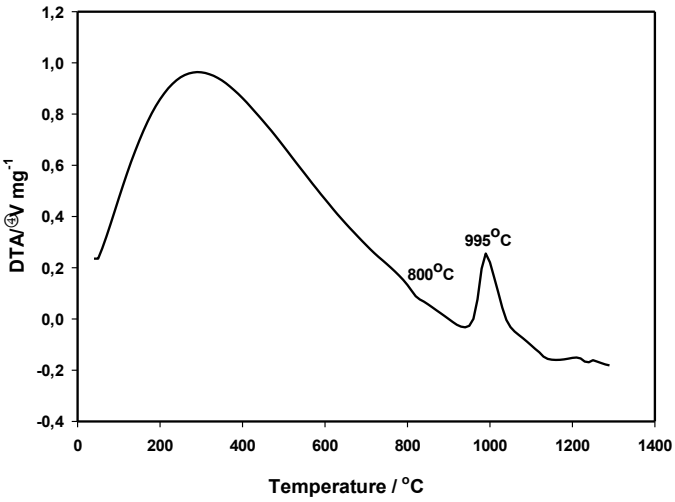
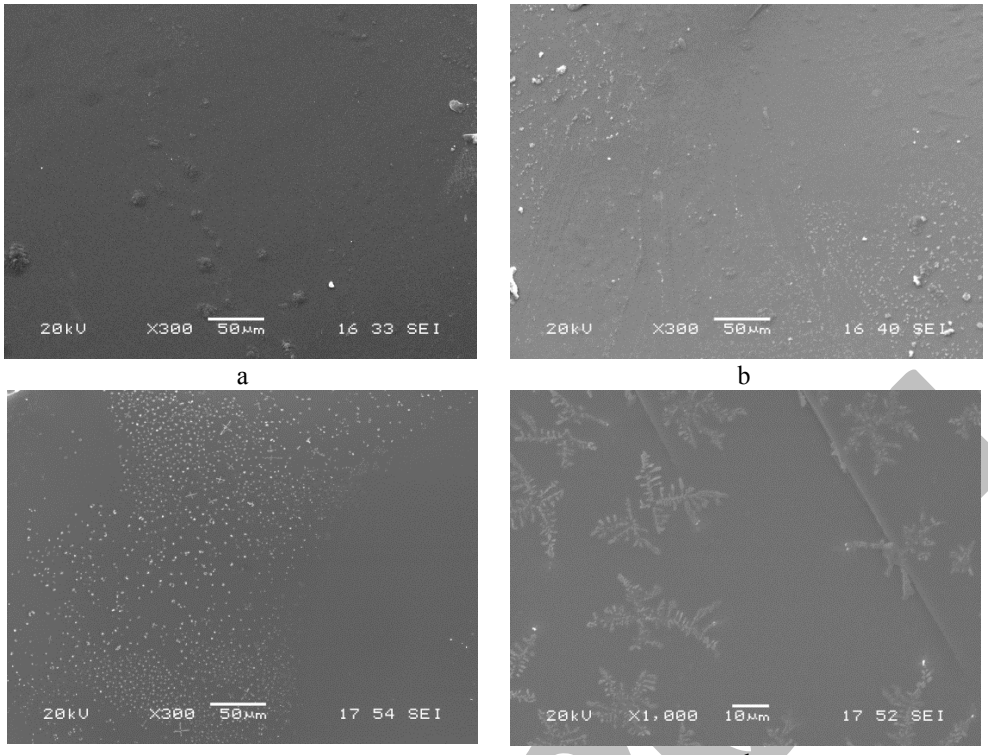


Figure 4. DTA curve for ceramic powder of MAS 1 glass

SEM Analysis

Figure 5 shows the SEM of fractured surface of glass samples. The SEM microstructure of the annealed glass sample exhibits a classical amorphous structure; the material was homogeneous.



a b c d

Figure 5. SEM micrographs of glass samples a) MAS1, b) MAS2, c,d) MAS3

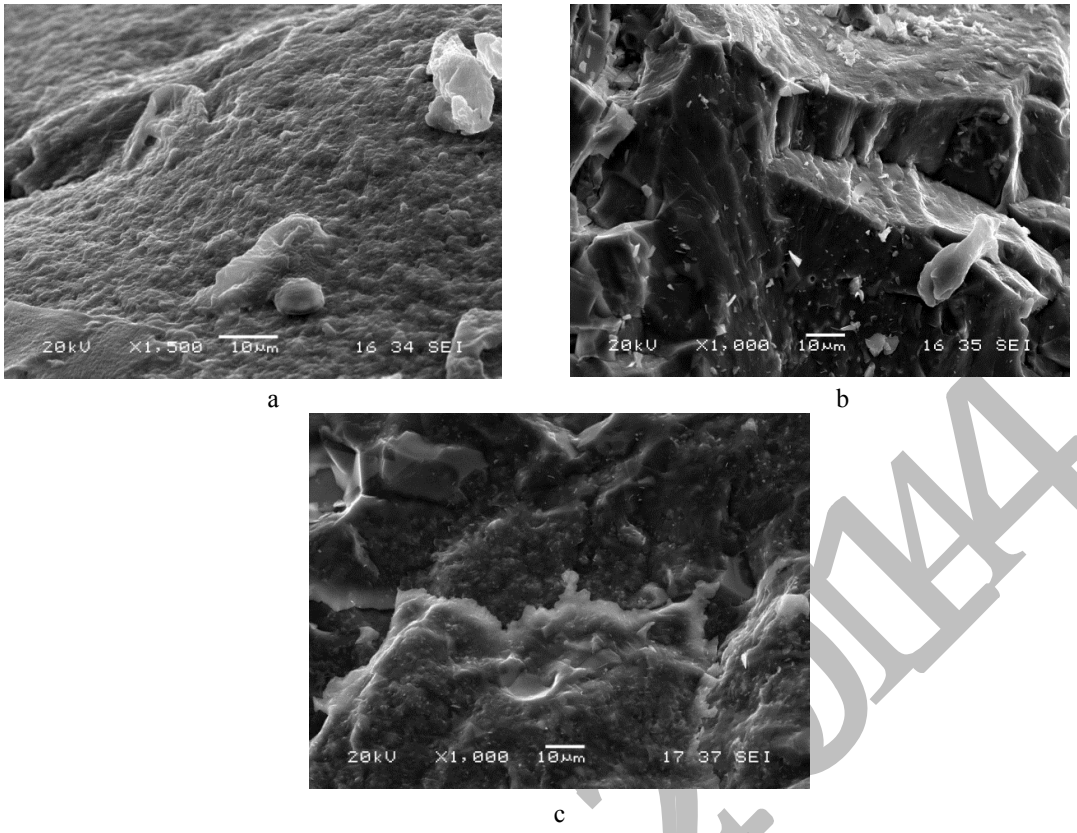
Nucleation process requires bondbreaking and re-arrangement of the structure. However at high undercooling (near Tg), the atomic mobility must remain limited so that primary nano-crystals could have a structure and composition close to that of the initial glass. It can also be proposed that the mobility at the atomic scale is achieved by lowering the viscosity [8].

Microstructure plays a key role in determining the ultimate properties of glass–ceramic materials. A wide variety of microstructural configurations can result from tailoring both composition and thermal treatment. Either surface nucleation/crystallization or internal nucleation or a combination of both can be used to design a glass–ceramic with the desired properties [12].

Figure 6 shows the SEM of fractured surface of samples sintered at 1200^{o}C for 10 hours. Microphotographs of the MAS sample sintered at 1200^{o}C for 10 hours showed no absence of the defined crystals. Irregular forms with a shell-like break were found. The sample is compact, and the glass break has well defined borders and flats.

Figure 7 shows the SEM of fractured surface of samples sintered at 1250^{o}C for 20 hours. The photograph shows the presence of interlocking, planar platelike microstructure which is responsible for machinability of this material [13].

EDS analysis of MAS3 (Fig.7 c-d) samples coded as number 1 and 3, light colored areas indicates the presence of Mg, Al, Si, Bi, Fe and O elements. EDS analysis of dark area of the samples (coded 2 and 4) have Si, Al, Mg and O elements. The material whose atom number is higher has been seen shiner; it can be said that the atom number of light colored areas have smaller Bi elements compared to others.



a b c

Figure 6. SEM microphotographs of the MAS samples sintered at 1200°C for 10 hours a) MAS1 b) MAS2 c) MAS3

Conclusions

Due to its many outstanding properties such as an elevated thermal stability, good chemical durability, and very low thermal expansion coefficient, MAS glass-ceramics is widely used, especially in the high temperature field where an excellent thermal shock resistance is required. The presence of cordierite was detected in the sintered MAS system with the addition of Bi_2O_3. This research proved that the presence of Bi_2O_3 in the initial MAS mixture, decreased the sintering temperature, compared the temperature of cordierite ceramics formation from a mixture without functional additives. The effect of increased amounts of Bi_2O_3 (0-5wt%) in the MAS system was studied. Crystallization started at around 995°C independently from the heating schedule.

Acknowledgements

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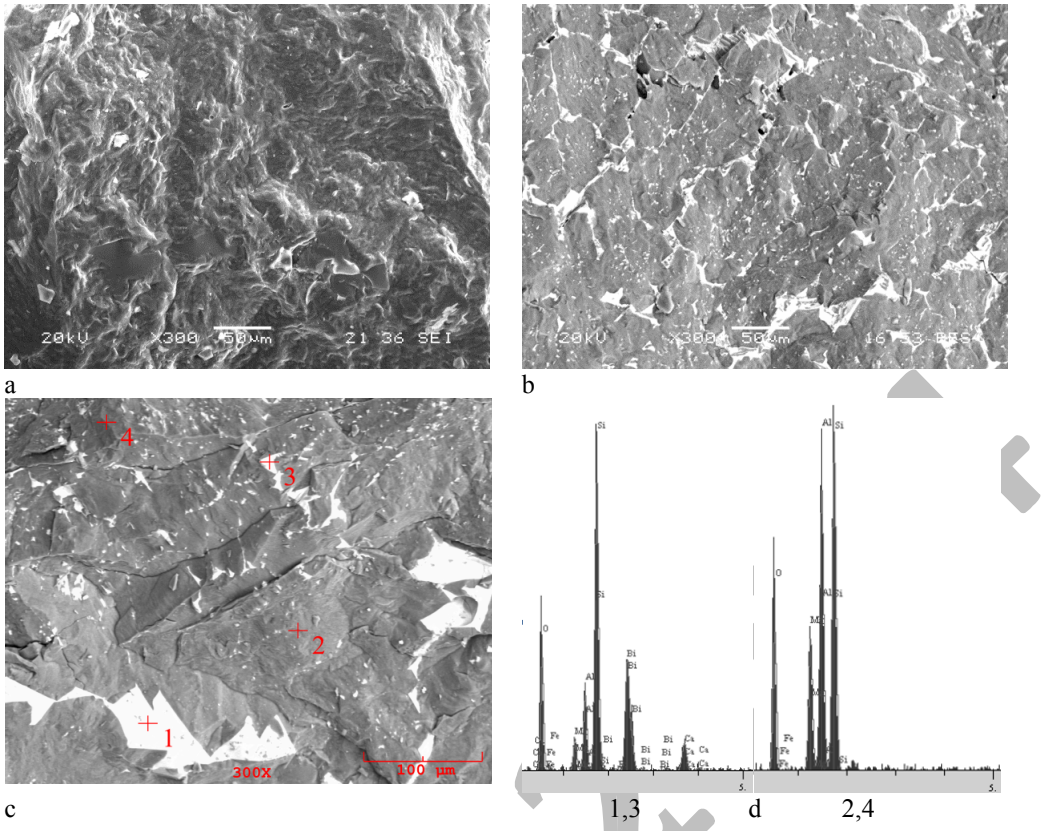

Figure 7. SEM microphotographs of the MAS samples sintered at 1250°C for 20 hours a)MAS1, b)MAS2, c)MAS3 and d. EDS analysis of MAS3

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Strontium Zirconate Powder Production for Thermal Spraying

Nil Toplan, Göksun Sönmez, Serhat Kurt and H. Özkan Toplan

University of Sakarya, Department of Metallurgical and Materials Engineering, 54187 Sakarya, TURKEY
toplan@sakarya.edu.tr

Abstract: The objective of the present work is to produce Strontium zirconate ($SrZrO_3$) powders which are used for application as materials for thermal barrier coatings (TBC) at operating temperatures >1300°C. The selection of TBC materials is restricted by some basic requirements: (1) high melting point, (2) no phase transformation between room temperature and operation temperature, (3) low thermal conductivity, (4) chemical inertness, (5) thermal expansion match with the metallic substrate, (6) good adherence to the metallic substrate and (7) low sintering rate of the porous microstructure. The number of materials that can be used as TBCs is very limited. So far, only a few materials have been found to basically satisfy these requirements. Strontium zirconate is produced by solid phase synthesis from zirconium dioxide and strontium carbonate.

In this study, $SrZrO_3$ powders were produced by sintering and crushing method. Starting powders were a high grade ZrO_2, and commercial $SrCO_3$ (Aldrich,>98%,Munich, Germany). Powders were mixed by ball-milling with a Sr/Zr atomic ratio of 1.136 and calcined at 1250 °C and 1350 °C for 24 h with a heating rate of 5 K/min. This means more than 10% of Sr was added in the precursors. The powders were calibrated the correct particle size for plasma spraying. The resulting powder was characterized using SEM-EDS and XRD techniques.

Key words: Plasma spraying, strontium zirconate, thermal barrier coating

Introduction

Thermal spray using 10-100 μm sized metallic and ceramic feedstock powders has been widely used for many years to deposit coatings applied in modifying surface properties of engineered components. The quality of the plasma sprayed coating with respect to the residual stress situation, deformation, microstructure, porosity and coating properties can be varied to a certain extend by tuning the spray parameters, like specific energy supply, spraying distance, torch geometry, simultaneous cooling, or additional selective heating, spraying powder selection, etc. While spray parameters have been intensively investigated until recently, research currently focuses on the effects of the powder on the coating properties. The physical, chemical and morphological characteristics of these powders play a predominant role in the quality of the coating that they are used to produce [1-6].

Powders from different suppliers vary due to the different powder-manufacturing methods used. Thus, thermally sprayed coatings can have significant property variations, even though different starting powders appear to be equivalent with respect to chemical composition and particle-size distribution. Powder characteristics such as shape, density, and purity also have a significant influence on the thermal-spray process used and resulting coating properties. Thus the end user must have a good understanding of all powder characteristics to be capable of matching powder type, coating rate, deposition efficiency, and price to achieve optimum coating performance [7]. To produce spray powders, precursor materials must be melted or sintered with subsequent size reduction by crushing, grinding and attrition milling. Mixture of powders and classification are also important process steps. Specialized powders for a variety of industrial applications are being produced by spray drying, fluidized bed sintering, agglomeration, fusing/melting, sintering and crushing, plasma spheroidizing, atomizing, surface coatings and sol-gel processes. Important morphological parameters are shape, surface properties, porosity, homogeneity and phase composition.

Fusing and crushing techniques of manufacturing are applied to ceramics and cermet (carbide) powders as

well as to brittle metals. Oxide ceramics are manufactured by fusing or sintering followed by crushing. The fused or sintered powders are blocky and irregular and this lowers their flowability [8,9]. Mixed oxides are mechanically mixed powders (consisting of two separate phases) or alloyed mixed crystals.

High and quality oxide ceramic powders are obtained by redox reactions and sol-gel techniques based on organometallic compounds or hydrothermal synthesis. They exhibit a very narrow size distribution and can be scaled down to a few 100nm particle size. Sol gel was originally developed to make ceramic materials for the nuclear industry in order to avoid the dust generated in grinding and sieving processes. While generally fine (<20 μm) such powders have excellent flow characteristics [5].

Plasma spray deposition or plasma spraying is a process that combines particle melting, quenching and consolidation in a single operation. The process involves injection of powder particles (metallic, ceramic or cermet powders) into a plasma jet generated by heating an inert gas in an electric arc confined within a water-cooled nozzle. The temperature at the core of the plasma jet is 10,000-15,000 K. Metal or ceramic particles injected into the plasma undergo rapid melting and at the same time are accelerated. These molten droplets moving at high velocities, exceeding 100 metres/second, impact on the surfaces of the substrate forming adherent coating. The coating is incrementally built up by the impact of successive particles by the process of flattening, cooling and solidification. By virtue of the high cooling rates, typically 10^5 to 10^6 K/sec., the resulting microstructures are fine-grained and homogeneous. Plasma sprayed ceramic coatings are extensively used for thermal barrier, wear and corrosion resistant and chemical barrier applications. The use of ceramic coatings for thermal and chemical barrier applications is well established. The choice of the specific ceramic material is decided by its thermal stability, chemical stability in the operating environment, etc. Aluminium oxide, by virtue of its reasonably high melting point (2300K) and chemically inert nature is the natural choice for thermal and chemical barrier applications. However, the main draw back of aluminina is its instability under reducing conditions. Above 1200^0C, alumina is reduced to its gaseous suboxides in presence of carbon, hydrogen and other reducing gases. By virtue of their higher melting points and better chemical stability in reducing atmospheres, yttria stabilized zirconia (YSZ) containing about 7 wt% yttrium oxide, $CaZrO_3$ and $SrZrO_3$ are expected to perform better in reducing environments [10].

By virtue of its low thermal conductivity, high melting point $SrZrO_3$ ceramic has potential applications for thermal barrier coatings (TBC). The thermal expansion coefficient of $SrZrO_3$ is larger by about 4% than that of YSZ in the temperature range 200–1200 °C. This can reduce the stress at the interface of the ceramic layer and bond coat. The value of Young's modulus of $SrZrO_3$ is lower than that of YSZ, which would lead to lower stress level for coatings. The only undesirable feature of $SrZrO_3$ for TBC applications is the temperature induced phase transitions. However, the volume change accompanying the phase transition is very small,only about 0.14% and can be tolerated. Based on their studies on thermal cycling lifetime of plasma spray deposited $SrZrO_3$–YSZ double layer coatings, Wen et al. have suggested the possible use of $SrZrO_3$ as a high temperature alternative to YSZ coatings [11].

The present investigation is based on the study of Strontium Zirconate powder production alternative to YSZ coatings. ZrO_2 and $SrCO_3$ powders were mixed in the Sr/Zr atomic ratio of 1.136 using conventional ball-milling techniques. The milled powders were stabilized by heating in air at 1250°C and 1350 °C for 24 h and calibrated the correct grain size for plasma spraying. The resulting powders and the starting powders were characterized using SEM-EDS and XRD techniques

Experimental Methods

Figure 1 presents a flow chart for the preparation of the $SrZrO_3$ powder (Tm: 2800°C). Firstly, as the starting materials, a high grade of ZrO_2 and $SrCO_3$ were used. The properties of the raw powders are shown in Table 1. They were mixed in the Sr/Zr atomic ratio of 1.136.

Table 1: Chemical analysis of raw ZrO_2 and $SrCO_3$

Powder % wt	ZrO_2	$SrCO_3$	HfO_2	SiO_2	Fe_2O_3
ZrO_2	97.64	-	1.89	0.15	0.03
$SrCO_3$	-	≥98	-	-	-

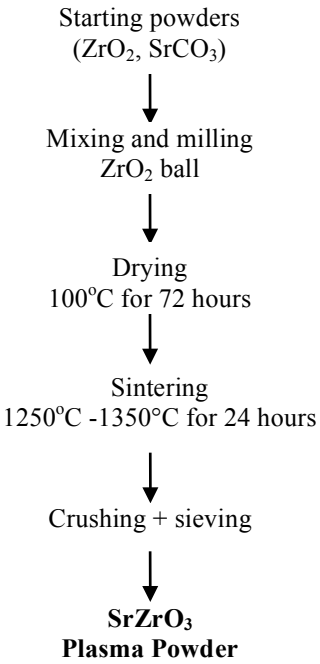

Figure 1: Flow chart for the powder production process.

The calculated amounts of oxides for the indicated compositions were ball milled for 4 h using zirconia balls and distilled water as the milling media. After drying the powders were screened and calibrated in the correct grain size for plasma spraying. Then, the temperature was set to 1250°C and 1350 °C for 24 h to complete the calcinations and partial sintering of the powders. X-ray powder diffraction was carried out with Philips PW 1710 diffractometer and CoK_{α} radiation. X-ray diffraction (XRD) was conducted with a Rigaku-type diffractometer with Cu Kα radiation, which has a wavelength of 1.54059 Å, to analyse phases over a 2θ range of 10°–110°. A JEOL 6060 scanning electron microscope (SEM) with energy-dispersive X-ray spectroscopy (EDS) was used for characterization of starting powders and produced plasma powder.

Results and Discussion

Figure 2 shows the morphology of ZrO_2 and $SrCO_3$ starting powder. Figure 3a shows the morphology $SrZrO_3$ powder before sintering prosess. Fig 3b and 3c shows the morphology $SrZrO_3$ powder after sintering 1250°C and 1350°C for 24 hours respectively. SEM examination shows that the morphology of $SrZrO_3$ powder is irregular and angular shapes owing to the sintering and crushing processes. Furthermore, these powders are not only irregular in shapes but also occasionally there are some spherical ones exist. These forms obtained by sintering-crushing technique are applied the thermal treatment to obtain spherical grains The conventional air plasma spray uses simple, tube-like injectors to entrain relatively coarse powders (>30 μm) closer to the core of the plasma jet [6].

Fig. 4 (a-c) presents the XRD patterns $SrZrO_3$ plasma powder heat treated in a furnace in the temperature range from 1250-1350°C for 24 h under oxygen atmosphere. All $SrZrO_3$ plasma powders crystallize in an orthorhombic structure according to literature. At room temperature, $SrZrO_3$ presents an orthorhombic structure with a ZrO_6 octahedra tilted in a unit cell as shown in Fig. 5 [12].

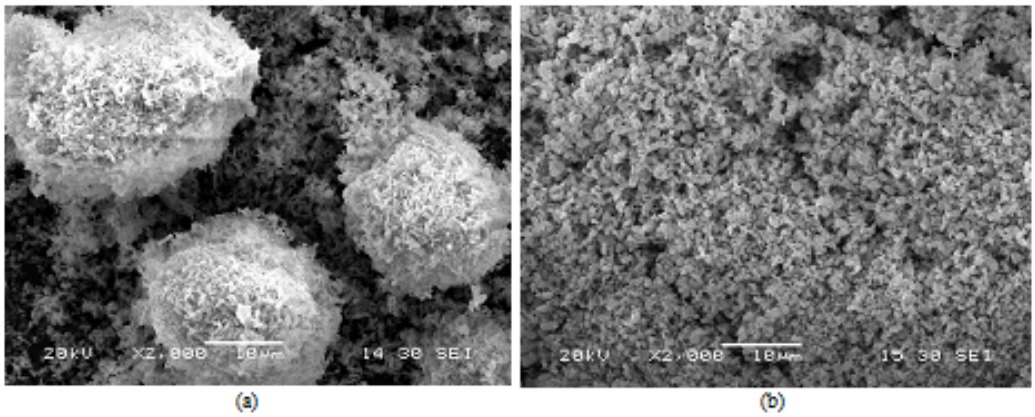

Figure 2: (a) Morphology of the $SrCO_3$ powder (b) ZrO_2 powder

Thermodynamic equilibrium calculations reveal a temperature of 600°C for the equilibrium of $SrCO_3+ZrO_2 \Longleftrightarrow SrZrO_3 + CO_2$ at 1 bar CO_2. This reaction is not completed at around 1275°C, and hence decomposition of $SrCO_3$ takes place. However, the reverse reaction of $SrZrO_3$ to $SrCO_3$ and ZrO_2 is not observed. This means that $SrZrO_3$ is stable in pure 1 atm CO_2 atmosphere. XRD data showed that $SrZrO_3$ with perovskite-type structure belongs to orthorhombic structure at room temperature and the space group is *Pcmn*. The lattice parameters of $SrZrO_3$ evaluated by XRD are a=55.816, b=58.225, c=55.813. XRD as follows: Orthorhombic→Tetragonal→Tetragonal→Cubic at 973, 1103, and 1443 K, respectively [13].

$SrZrO_3$ has been found to exhibit better performance on cycling at surface temperatures higher than 1250 °C, whether as a lone ceramic topcoat or an overlay for YSZ in a double-layer system. At an intermediate temperature of about 730°C, $SrZrO_3$ undergoes an undesirable phase transformation from orthorhombic to pseudo-tetragonal. Such transformation could be suppressed by doping with Gd or Yb, which also improves the thermophysical properties of the coatings at elevated temperatures [14].

DSC and TG measurements performed on precursors show that $SrCO_3$ exhibits the polymorphic transformation from the orthorhombic phase (space group Pmcn) to the rhombohedral phase (space group R-3m) at 932°C, whereas the decomposition reaction occurs at 1153°C. These features are accompanied by up to ~45% mass loss that is due to CO_2 emission from $SrCO_3$ decomposition, mainly. ZrO_2 shows the phase transformations from monoclinic (i.e., low temperature phase) to tetragonal (i.e., high temperature phase) at 1196 °C and the reversible martensitic transformation, at 1017 °C. The DSC/TG curves measured on the equimolar mixture following the heat treatment profile used in this work (i.e., 1250 °C for 8 h, with a heating rate of 3°C/min) shows the phase transformations observed for precursors, with the following differences: (i) the decomposition temperature of $SrCO_3$ is lower (i.e., 1033°C) due to the presence of acidic ZrO_2 in the mixture; (ii) the phase transformation from monoclinic to tetragonal occurs at a higher temperature (i.e., at 1210°C). The formation of $SrZrO_3$ is observed at 1236°C. The exoenergetic peak corresponding to the reversible transformation of ZrO_2 from tetragonal to monoclinic is not present upon cooling to room temperature. This indicates that $SrZrO_3$ forms readily from SrO and tetragonal ZrO_2. The fact that the features corresponding to the reversible transformation of ZrO_2 (i.e., from tetragonal to monoclinic phase) are not present in the equimolar mixture indicates that the formation of $SrZrO_3$ powders is complete after 8 h (i.e., or longer) of thermal treatment at 1250°C [15].

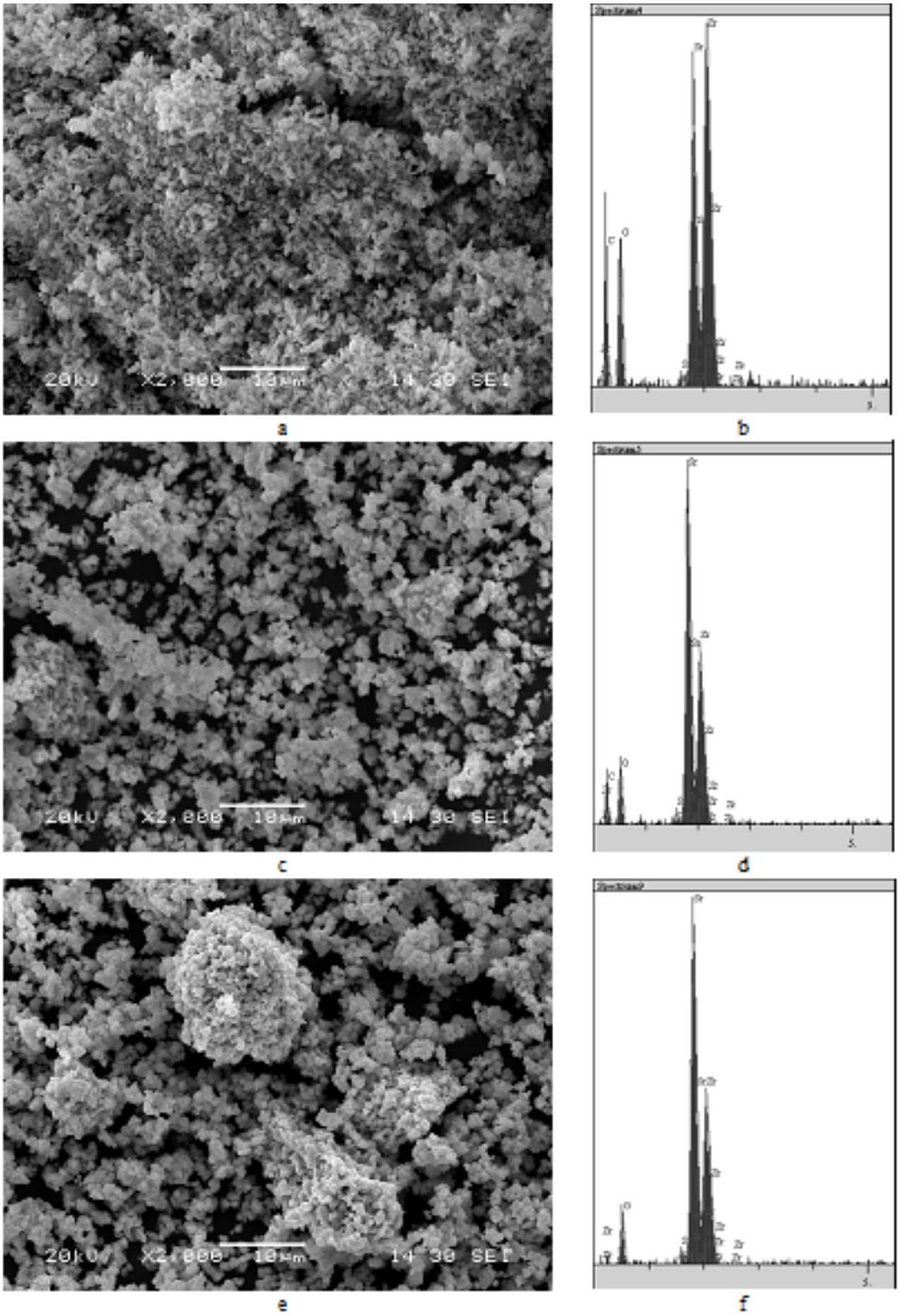

Figure 3: Morphology of the $SrZrO_3$ powder a. Before sintering, b. after sintering 1250^{o}C 24 h, c. after sintering 1350^{o}C 24 h

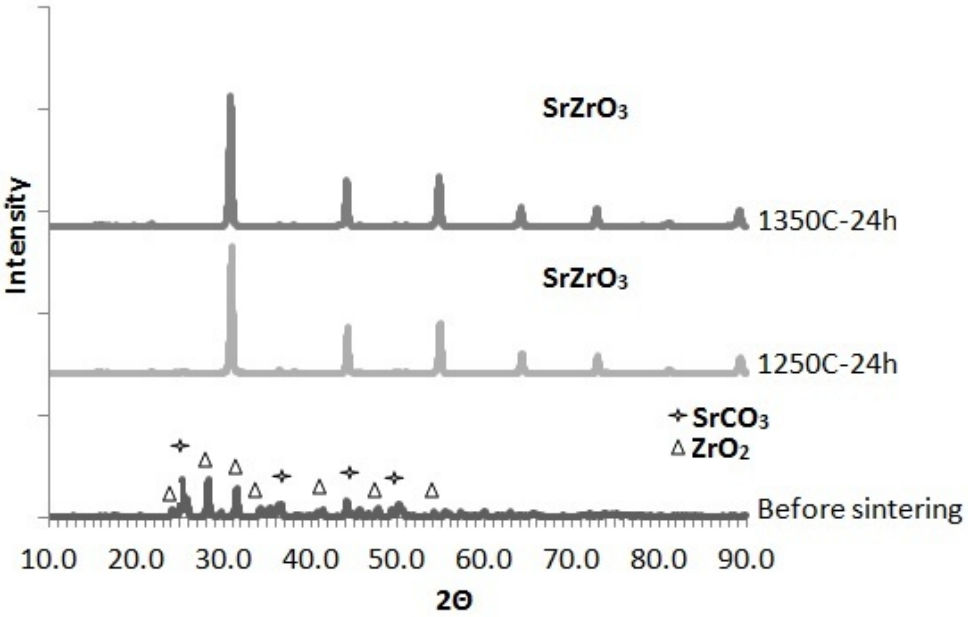

Figure 4: XRD pattern of the $SrZrO_3$ plasma powder a. Before sintering, b. after sintering 1250^oC 24 h, c. after sintering 1350^oC 24 h

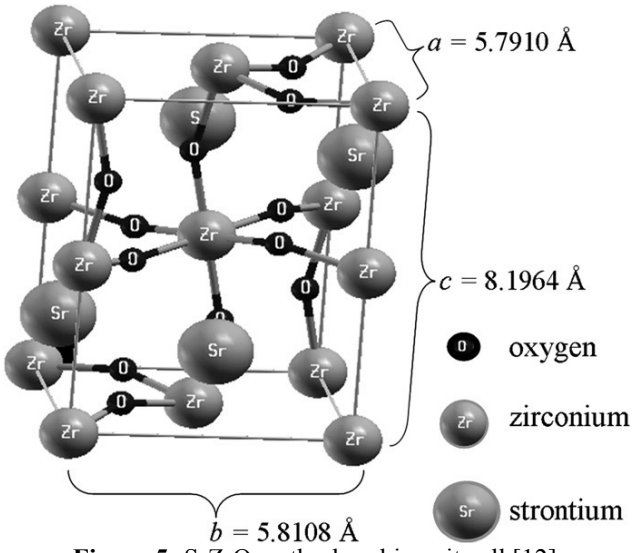

Figure 5: $SrZrO_3$ orthorhombic unit cell [12]

Conclusions

A perovskite-type $SrZrO_3$ compound was prepared by a solid state reaction. The X-ray diffraction pattern of $SrZrO_3$ represents a single phase of a perovskite-type structure. With a high melting temperature over 2600°C, good chemical and mechanical properties in a wide range of temperatures, recently $SrZrO_3$ has been investigated as a promising candidate material for the application of thermal barrier coatings (TBCs).

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