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Message from the Editor-in-Chief

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April 01, 2016
Prof. Dr. Aytekin ISMAN
Sakarya University

Letter from the Editor

Dear Tojsat Readers,

Now, we are reading 6th volume of The Online Journal of Science and Technology. We finished the istec 2015 conference hold in Saint Petersburg, Russia. These papers receives interests from all over the areas of science and technology. The selected, peer-reviewed papers were accepted for publication apart from contributions from all over the World. The accepted and published papers are from information technology to mechanical engineering.

April 01, 2016

Prof. Dr. Mustafa S. DUNDAR

Sakarya University

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A PLANAR ROBOT DESIGN AND CONSTRUCTION WITH MAPLE

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Abstract: Maple is used to do numerical computation, plot graphs and do exact symbolic manipulations and word processing. In this study we demonstrate how Maple can be used for the simulation of a planar robot. This offers the possibility to become familiar of mathematical modelling. The mechanism under consideration is a so-called F-mechanisms (Can & Stachel, 2014), i.e., a planar parallel 3-RRR robot with three synchronously driven cranks. It turns out that at this example it is not possible to find the poses of the moving triangle exactly by graphical methods with traditional instruments only. Hence, numerical methods are essential for the analysis of motions which can be performed by a planar robot.

Keywords: Maple, scientific computing, mathematical modelling, planar mechanism, planar parallel 3-RRR-robot.

Introduction

F-mechanisms were first introduced and analyzed by Can (2012) and Can & Stachel (2014). These are high-speed planar mechanisms with modifiable compulsory courses based on parallel robots simultaneously driven cranks. Staicu (2008) has the kinematics of such robot treated; the website of Ahamed provides a controllable interactive simulation of parallel planar manipulators. In the following, we review the characteristics of F-mechanisms:

Definition A Fehrer-mechanism (F-mechanism in short), is a kinematic chain with 8-links $\Sigma_0, \ldots, \Sigma_7$ and 9 revolute joints A_0, B_0, C_0, $A_1, \ldots, C_2$ (see Figure 1) with the following properties:

1) There are three driving cranks $A_0A_1 \subset \Sigma_1$, $B_0B_1 \subset \Sigma_2$, and $C_0C_1 \subset \Sigma_3$. They rotate with the same angular velocity ω about the respective anchor points A_0, B_0 and C_0, all fixed in the frame Σ_0. The links Σ_1 and Σ_3 rotate counter-clockwise; Σ_2 rotates either counter-clockwise (direct F-mechanism) or clockwise (indirect F-mechanism).

2) The bars $A_1A_2 \subset \Sigma_4$, $B_1B_2 \subset \Sigma_5$, and $C_1C_2 \subset \Sigma_6$ connect the active cranks with the moving frame Σ_7. The points A_2, B_2, C_2 are attached to Σ_7.

3) Variable phase shiftings between the cranks enable to modify the constrained motion Σ_7/Σ_0.

The lengths of the cranks are denoted by $a_1 = \overline{A_0A_1}$, $b_1 = \overline{B_0B_1}$ and $c_1 = \overline{C_0C_1}$. The bars' lengths are $a_2 = \overline{A_1A_2}$, $b_2 = \overline{B_1B_2}$ and $c_2 = \overline{C_1C_2}$.

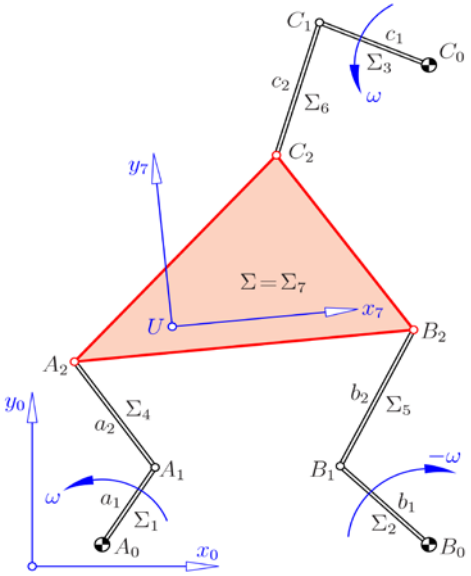

Figure 1: A planar parallel 3-RRR robot (An indirect F-mechanism)

Maple Procedure and Construction of the Motion

After all mathematical representation was given by Can & Stachel (2014), we will only give design and construction of a planar parallel robot with Maple which is displayed in Figure 2 also addressed in Fig. 3 and Fig 4. Its dimensions are as follows:

fixed triangle: A_0 = (0.0, 0.0), B_0 = (52.5, 8.0), C_0 = (40.0, 99.0),
lengths of cranks: a_1 = 19.0, b_1 = 14.0, c_1 = 16.0,
phase shifts: ä$_b$ = 243^0, δ_c = −15^0,
lengths of bars: a_2 = 35.0, b_2 = 34.0, c_2 = 54.0,
moving triangle: A_2 = (0.0, 0.0), B_2 = (40.0, 18.0), C_2 = (−7.0, 28.0).

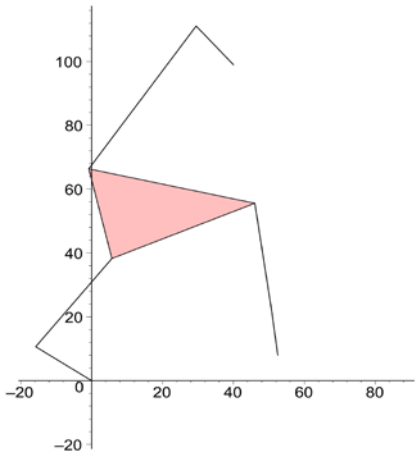

Figure 2: An indirect F-mechanism displayed using Maple

From here we start to write the program with using Maple:

```
> restart:
> with(linalg):with(plots):
> A0:=[0,0]: B0:=[52.5,8]: C0:=[40,99]:
> A2g:=[0,0]: B2g:=[40,18]: C2g:=[-7,28]:
> la1:=19: lb1:=14: lc1:=16:
> la2:=35: lb2:=34: lc2:=54:
> omegab:=-1:
> phasgradb:=243: phasgradc:=-15:
> phasb:=evalf(phasgradb*Pi/180): phasc:=evalf(phasgradc*Pi/180):
> pi:=evalf(Pi): x:=eva200lf(326*Pi/180):
> epsilon:=pi: mitte:=x:
> start:=mitte-epsilon: ende:=mitte+epsilon:
> anz:=200:
> dif:=ende-start: w:=dif/anz:
> idx0:=1:
```

Now we set the points A_1, B_1 and C_1 to depending on tangent *f1*, *f2* and *f3* half drive angle. In addition, the angle of rotation is t := φ_{70} introduced. Furthermore, we introduce the shifting vector trans = (u, v):= $\mathbf{u}_0$ and an orthogonal matrix dreh := A.

```
> Arm:=[((1-f^2)/(1+f^2)),(2*f/(1+f^2))]:
> A1:=A0+la1*(subs(f=f1,Arm)):
> B1:=B0+lb1*(subs(f=f2,Arm)):
> C1:=C0+lc1*(subs(f=f3,Arm)):
> trans:=[u,v]:
> co:=(1-t^2)/(1+t^2): si:=2*t/(1+t^2):
> dreh:=matrix(2,2,[co,-si,si,co]):
> A2:=simplify(matadd(evalm(dreh &* A2g),trans)):
> B2:=simplify(matadd(evalm(dreh &* B2g),trans)):
> C2:=simplify(matadd(evalm(dreh &* C2g),trans)):
```

Equivalent to the system of equations (4) in Can & Stachel (2014) are now the equations AG1 = 0, AG2 = 0 and AG3 = 0 :


```
> AG1:=numer(simplify(((A2[1]-A1[1])^2+(A2[2]-A1[2])^2)-la2^2)):
> a1:=coeff(AG1,u^2):
> AG2:=numer(simplify(((B2[1]-B1[1])^2+(B2[2]-B1[2])^2)-lb2^2)):
> a2:=coeff(AG2,u^2):
> AG3:=numer(simplify(((C2[1]-C1[1])^2+(C2[2]-C1[2])^2)-lc2^2)):
> a3:=coeff(AG3,u^2):
```

It is followed by the elimination of $\mathbf{u}_0^2 = u^2 + v^2$ by subtraction. We take into account only the coefficients a_i of u^2. There remain two linear equations eq [1] and eq [2], we solve for u and v:

```
> eq[1]:=eval(numer(combine(a1*AG2-a2*AG1))):
> eq[2]:=eval(numer(combine(a1*AG3-a3*AG1))):
> G1:=collect(expand(eq[1]),[u,v]):
> G2:=collect(expand(eq[2]),[u,v]):
> P:=coeff(G1,u): Q:=coeff(G1,v):
> S:=coeff(G2,u): T:=coeff(G2,v):
> R:=-subs(u=0,v=0,G1): U:=-subs(u=0,v=0,G2):
> mat:=matrix(2,2,[P,Q,S,T]):
> vec:=[R,U]:
> loesung:=linsolve(mat,vec):
> uu:=loesung[1]:
> vv:=loesung[2]:
> tt:=numer(simplify(subs(u=uu,v=vv,AG1))):
```

We denote the individual values of the angle drive for the cranks A_0A_1, B_0B_1 and C_0C_1 respectively with ff1[i], ff1[i] and ff3[i], for i = 1, ..., anz (`anz:=200:`) and start the main loop of the program:

```
> for i from 0 to anz do
> ff1[i]:=start+i*w:
> ff2[i]:=omegab*ff1[i]+phasb:
> ff3[i]:=ff1[i]+phasc:
> tt_werte[i]:=[fsolve(evalf(subs(f1=tan(ff1[i]/2),f2=tan(ff2[i]/2),
  f3=tan(ff3[i]/2),tt)))];
```

Case of i = 0 we choose one of the zeros arbitrary (see Figure 2).

```
> t_neu[0]:=tt_werte[0][idx0]:
```

Otherwise, we find the number of zeros from using

```
> nbr[i]:= nops(tt_werte[i]);
```

and search for fixed i the solution tt werte[i][j], $1 \leq j \leq$ nbr[i] that the calculated approximation value from the previous position naeh[i] := tneu[$i-1$] + dtneu[$i-1$] comes closest. This is done as follows:

```
> naeh[i]:= t_neu[i-1] + dt_neu[i-1];
> idx[i]:= 1;
> for j from 2 to nbr[i] do
  if abs(tt_werte[i][j]-naeh[i])<abs(tt_werte[i][idx[i]]-naeh[i])
  then idx[i]:= j fi
  od;
```

Then we set

```
> t_neu[i]:=tt_werte[i][idx[i]]:
```

The here proposed selection of the 'right' zero point must be observed four conditions:

```
> idx[I]:= 1;
> if abs(naeh[I])<2 then
  for j from 2 to nbr[I] do
  if abs(tt_werte[I][j]-naeh[I]) <
  abs(tt_werte[I][idx[I]]-naeh[I]) then idx[I]:= j fi
  od
```



```
  else
  for j from 2 to nbr[I] do
  if abs((1/tt_werte[I][j])-(1/naeh[I])) <
  abs((1/tt_werte[I][idx[I]])-(1/naeh[I]))
  then idx[I]:= j fi
  od
  fi;
> t_neu[i]:=tt_werte[i][idx[i]];
```

Velocity Analysis of the Motion

In the following we calculate an approximate value of the next correct position.

```
> A1:=A0+la1*(subs(f=tan(ff1[i]/2),Arm));
> B1:=B0+lb1*(subs(f=tan(ff2[i]/2),Arm));
> C1:=C0+lc1*(subs(f=tan(ff3[i]/2),Arm));
> d1:=A1-A0: d2:=B1-B0: d3:=C1-C0:
> vA1:=w*[-d1[2],d1[1]]:
> vB1:=w*omegab*[-d2[2],d2[1]]:
> vC1:=w*[-d3[2],d3[1]]:
> X[i]:=[x1[i],x2[i]]:
> Y[i]:=matrix(2,2,[0,-x3[i],x3[i],0]):
> u_werte:=evalf(subs(f1=tan(ff1[i]/2),f2=tan(ff2[i]/2),
  f3=tan(ff3[i]/2),t=t_neu[i],uu));
> v_werte:=evalf(subs(f1=tan(ff1[i]/2),f2=tan(ff2[i]/2),
  f3=tan(ff3[i]/2),t=t_neu[i],vv));
> transm:=[uu_werte,vv_werte]:
> c2:=evalf(subs(t=t_neu[i],co)):
> s2:=evalf(subs(t=t_neu[i],si)):
> drehm:=matrix(2,2,[c2,-s2,s2,c2]):
> A2:=convert(evalf((matadd(evalm(drehm &* A2g),transm))),list):
> B2:=convert(evalf((matadd(evalm(drehm &* B2g),transm))),list):
> C2:=convert(evalf((matadd(evalm(drehm &* C2g),transm))),list):
> vA2:=simplify(matadd(evalm(Y[i] &* A2),X[i])):
> vB2:=simplify(matadd(evalm(Y[i] &* B2),X[i])):
> vC2:=simplify(matadd(evalm(Y[i] &* C2),X[i])):
> V11:=matadd(vA2,-vA1): V12:=matadd(A2,-A1):
> V21:=matadd(vB2,-vB1): V22:=matadd(B2,-B1):
> V31:=matadd(vC2,-vC1): V32:=matadd(C2,-C1):
> GL1:=simplify(innerprod(V11,V12));
> GL2:=simplify(innerprod(V21,V22));
> GL3:=simplify(innerprod(V31,V32));
> P1:=coeff(GL1,x1[i]): P2:=coeff(GL2,x1[i]): P3:=coeff(GL3,x1[i]):
> Q1:=coeff(GL1,x2[i]): Q2:=coeff(GL2,x2[i]): Q3:=coeff(GL3,x2[i]):
> R1:=coeff(GL1,x3[i]): R2:=coeff(GL2,x3[i]): R3:=coeff(GL3,x3[i]):
> T1:=-subs(x1[i]=0,x2[i]=0,x3[i]=0,GL1):
> T2:=-subs(x1[i]=0,x2[i]=0,x3[i]=0,GL2):
> T3:=-subs(x1[i]=0,x2[i]=0,x3[i]=0,GL3):
> mat:=matrix(3,3,[P1,Q1,R1,P2,Q2,R2,P3,Q3,R3]):
> vec:=[T1,T2,T3]:
> losung:=linsolve(mat,vec):
> x1[i]:= losung[1]: x2[i]:= losung[2]:
> x3[i]:= losung[3]:
> dt_neu[i]:= eval((1+t_neu[i]*t_neu[i])*x3[i]/2):
> od:
```

Displaying of the Motion

And finally should animation of the motion with Maple generated, one must proceed according to the calculation of the positions within the loop as follows:

```
> for i from 0 to anz do
> AA1[i]:=A0+la1*(subs(f=tan(ff1[i]/2),Arm));
> BB1[i]:=B0+lb1*(subs(f=tan(ff2[i]/2),Arm));
> CC1[i]:=C0+lc1*(subs(f=tan(ff3[i]/2),Arm));
> uu_werte:=evalf(subs(f1=tan(ff1[i]/2),f2=tan(ff2[i]/2),
 f3=tan(ff3[i]/2),t=t_neu[i],uu));
> vv_werte:=evalf(subs(f1=tan(ff1[i]/2),f2=tan(ff2[i]/2),
 f3=tan(ff3[i]/2),t=t_neu[i],vv));
```



```
> trans2:=[uu_werte,vv_werte];
> c2:=evalf(subs(t=t_neu[i],co)):
> s2:=evalf(subs(t=t_neu[i],si)):
> dreh2:=matrix(2,2,[c2,-s2,s2,c2]):
> AA2[i]:=convert(evalf((matadd(evalm(dreh2&*A2g),trans2))),list):
> BB2[i]:=convert(evalf((matadd(evalm(dreh2&*B2g),trans2))),list):
> CC2[i]:=convert(evalf((matadd(evalm(dreh2&*C2g),trans2))),list):
> Dreieck[i]:=polygonplot([AA2[i],BB2[i],CC2[i]],color=red):
> Gelenk_a01[i]:=polygonplot([A0,AA1[i]],thickness=2):
> Gelenk_a12[i]:=polygonplot([AA1[i],AA2[i]],thickness=2):
> Gelenk_b01[i]:=polygonplot([B0,BB1[i]],thickness=2):
> Gelenk_b12[i]:=polygonplot([BB1[i],BB2[i]],thickness=2):
> Gelenk_c01[i]:=polygonplot([C0,CC1[i]],thickness=2):
> Gelenk_c12[i]:=polygonplot([CC1[i],CC2[i]],thickness=2):
> od:
> Konfiguration:=seq(display(Dreieck[i],Gelenk_a01[i],Gelenk_b01[i],
Gelenk_c01[i],Gelenk_a12[i],Gelenk_b12[i],Gelenk_c12[i]),i=1..anz):
> display(Konfiguration,scaling=constrained,insequence=true);
```

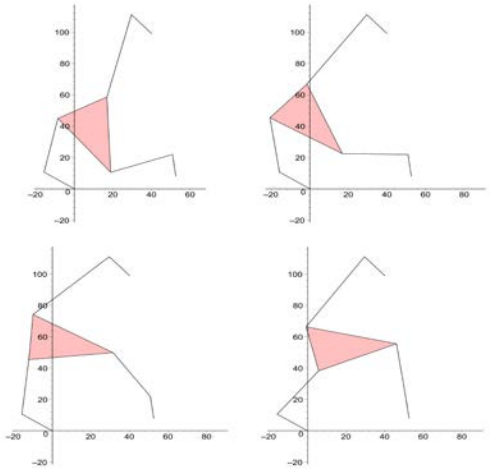

Figure 3: Different poses of given example

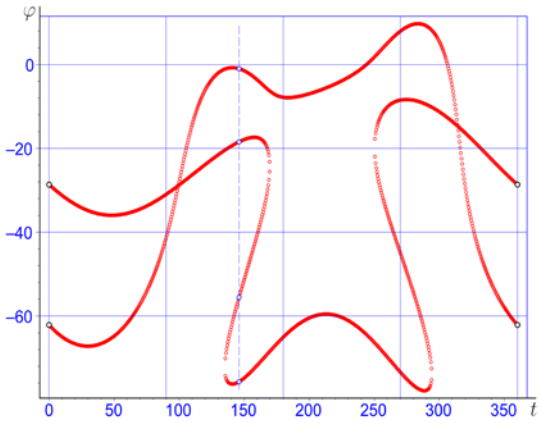

Figure 4: Diagram showing φ_{70} in given example

If you want to have an overview how many rotational angle φ_{70} are possible, for how many positions the moving plane Σ_7 for which drive angles (here with ff1[i] denotes), so it can be drawing in a graph (see Figure 4) discrete ff1- values the corresponding - each in degrees- φ_{70} value (in this case tt_werte[i][j]) .

Acknowledgements

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A STOCHASTIC-OPTIMIZATION MODEL FOR DETERMINING THE OPTIMAL MICRO-SITING OF WIND TURBINES

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Abstract: We propose a general model for the placement of wind turbines in a rectangular grid formation over a flat area. For better realism, we consider stochastic wind speeds and directions, in conjunction with the wake effects that upstream turbines impose on downstream ones. The objective is to pack as many turbines as economically optimal in a given area, i.e. to maximize the expected MW output per dollar of capital investment and O&M costs per meter square. Due to the complex structure of the mathematical model, we apply a hybrid approach of Monte-Carlo sampling of wind speeds and directions together with the Nelder-Mead heuristic method to search for the optimal horizontal and vertical spacing of the turbines. Results of a case study based on a real dataset of wind speeds and directions, a selected commercial turbine's approximated power curve, and industry estimates of costs is discussed.

Keywords: wind energy, wind power, wind investment, micro-siting, wake effect

Introduction

Wind energy has gained great attention because it represents an important option for reducing the reliance on hydrocarbons for energy production, especially for electricity. With the current technology, one challenge faced in wind farm design is the appropriate placement of the individual wind turbines in order to optimally harvest the energy from the wind. Grouping the turbines leads to a reduction of the power produced by the downstream wind turbines due the so-called "wake" effect. That is, if a turbine is within the area of the turbulence caused by another turbine, or the area behind another turbine, the wind speed suffers a reduction, and therefore, there is a decrease in its electricity production. On the other hand, spacing the turbines too far apart requires a larger land area for the wind farm, which may not only bring added costs but also be just infeasible.

Because of the considerable amount of power loss due to the wake effects in a large wind farm, it is considered one of the main issues that should be focused on when optimizing the wind turbine position. Several studies have been conducted in recent years in order to maximize energy production and the efficiency of the turbines. These studies have focused primarily on obtaining the optimal placement of turbines within a wind farm, based on their output efficiency.

To state this problem, we define two objectives: (i) maximization of energy production, and (ii) minimization of the total cost and land area requirements. In the present research we use an objective function that represent the expected MW output per dollar of capital investment and O&M costs per meter square of land (i.e. MW/$m^2). By use of the Nelder-Mead heuristic method adapted to stochastic wind speeds and directions, we search for the optimal vertical and horizontal spacing (respectively in the North-South and East-West coordinate axes) of a rectangular grid of wind turbines. That is, given a fixed number of turbines in a rectangular formation, the goal is maximize the area-density of the expected power return on the investment.

The remainder of the paper is organized as follows. Section two formulates the model of the wake model used in the wind farm. Section three presents describes the wind farm layout optimization model, including such components and parameters as the power curves, the wind direction and speed distribution, and cost estimation. Section four presents the two case scenarios and discusses the results of the optimization process. Finally, in section five we present our conclusions and discuss futures avenues of research on the problem.

The Wake Model

Wind turbine wakes are generally divided into three different regions, as described in Figure 1. These are the near wake region, the transition region, and the far wake region. This model assumes the wake region is an empirical linear expansion region, Jensen Model, starting from behind the wind turbine, as shown in Figure 2. Here the model is characterized by a uniform velocity profile at any distance x in the downstream behind the turbine.

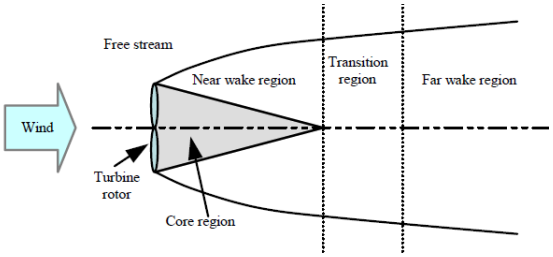

Figure 1: Wake Regions Behind a Wind Turbine

To start analyzing the model we first write the wind speed at a distance x behind the turbine. Let us consider Figure 2 again, where we have a turbine T_0 generating a wake region. We can write the equation of the wake radius at distance x from turbine i as:

$$r_x = r_0 + \alpha x \tag{1}$$

Where r_0 is the rotor radius of turbine T_0, and α is a decay factor expressing how fast the wake breaks down. An analytical equation is given for α concerning the height z of the turbine generating the wake and the constant surface roughness z_0, which depends on the terrain characteristics in the form of

$$\alpha = \frac{0.5}{\ln\left(\frac{z}{z_0}\right)}. \tag{2}$$

If we consider v_0 as the ambient wind speed and v_1 as the wind speed at distance x, then we can write a balance of mass equation as

$$\pi r_0^2 u + \pi(r_x^2 - r_0^2)v_0 = \pi r_x^2 v_1, \tag{3}$$

where u is the wind speed just behind turbine T_0.

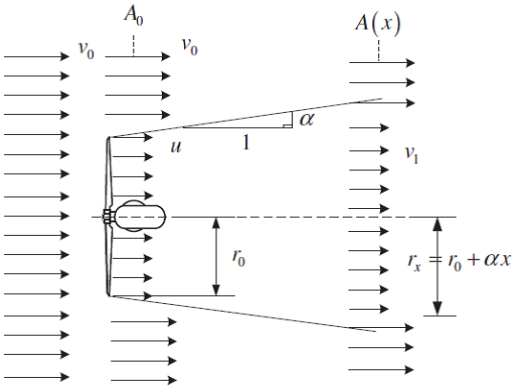

Figure 2: Single Wind Turbine Wake Model

A study of the aerodynamics of wind turbines provides us with an analytical equation connecting the ambient speed with the wind speed right behind the turbine. From this we can write

$$u = \sqrt{1 - C_T}\, v_0,$$

Where the term C_T is the thrust coefficient of the turbine. Solving the previous equation for v_1, we obtain

$$v_1 = v_0\left(1 - \left(-1\sqrt{1 - C_T}\right)\frac{r_0^2}{r_x^2}\right). \tag{4}$$

The previous equation expresses the wind speed at distance x behind a turbine T_0 when the radius of the wake at

that distance is r_x. In case of a wind farm, where we have two turbines, i and j, and Turbine j is in the wake region of Turbine i, then the wind speed affecting Turbine j is given by

$$v_j = v_0\left(1 - \left(1 - \sqrt{1 - C_T}\right)\frac{r_i^2}{r_j^2}\right). \tag{5}$$

From Equation 5 we can see how the speed received by Turbine j is reduced due to the wake effect of Turbine i. Therefore, the power output of Turbine j will be reduced too.

Equation 5 gives the resulting wind speed at a given turbine when we considered that the turbine is totally covered and affected by the wake effects. Which means that the wind speed is the same over all the turbine surface. But in wind farm we can find partial shadowing which means the turbine surface is partially in the wake area and not totally. Therefore, the turbine will be affected by different wind speed at its rotor's sweep area and the calculation of the power output needs more attention. To this end, the speed from the wake effects affecting the turbine can be rewritten to take the partial shadowing into account:

$$v_x = v_0\left(1 + \left(\sqrt{1 - C_T} - 1\right)\frac{r_i^2}{r_j^2}\frac{A_{jshadowed}}{A_j}\right), \tag{6}$$

where A_j is the total area of the turbine and $A_{shadowed}$ is the shadowed area by the affecting turbine. Here we must note that there are different shadowing possibilities between the two turbines: complete shadowing, quasi-complete, partial shadowing and no shadowing. Therefore before applying the formula we must determine the type of shadowing depending on the horizontal and vertical distances between the two turbines and the direction of the wind. This study considers these detailed geometric calculations, whose details are not presented here.

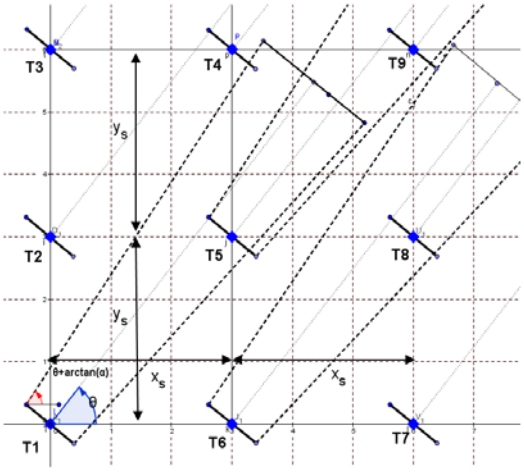

Figure 3: Bird's Eye View Illustration of Multiple Wakes within a Wind Farm

In a wind farm each turbine will produce a wake area, as shown in Figure 3. This will cause a turbine to possibly be under the effect of multiple wakes caused by different turbines. Therefore, a method to combine the different single wakes effects is required. One of the used methods is the sum of squares of velocity deficit, and this method is useful here since it provides a formula for the deficit wind speed as

$$\delta v_{xjdiff} = 1 - \frac{v_x}{v_0} = \left(1 - \sqrt{1 - C_T}\right)\frac{r_i^2}{r_j^2}\frac{A_{jshadowed}}{A_j}. \tag{7}$$

And combining the multiple wakes effects, we obtain

$$\delta v_{xidiff} = \sqrt{\sum_{j\in U_i}\left(\delta v_{xjdiff}\right)^2}, \tag{8}$$

Where U_i is the collection of turbines affecting turbine i by its wake. Then the total speed at Turbine i will be given by

$$v_i = v_0\left(1 - \delta v_{xidiff}\right). \tag{9}$$

Combining our calculations, we conclude that the wind speed affecting Turbine j is given by

$$v_i = v_0\left(1 - \sqrt{\sum_{j\in U_i}\left(\left(1-\sqrt{1-C_T}\right)\frac{r_i^2}{r_j^2}\frac{A_{jshadowed}}{A_j}\right)^2}\right). \quad (10)$$

Wind Farm Layout Optimization Model

We consider a rectangular grid of a certain number of turbines where they are separated by a distance of x on the horizontal dimension and a distance of y on the vertical dimension (see Figure 4). For this study, we simply take the horizontal axis to be the exact East-West direction and the vertical axis to the North-South direction. While it is possible to choose the axes in a arguably more efficient fashion (e.g., setting the vertical axis to be the speed-weighted mean of directions), or even defining an additional optimization variable for the "tilt" angle of the rectangular layout, these generalizations are left as a topic for further study. The objective is to find the most optimal values of x and y with respect to the objective of maximizing the economic return per grid area as explained previously.

As also shown in Figure 4, the stochastic wind blows from the direction θ and with a speed of $v(\theta)$ (i..e whose distribution depends on θ) at a prespecified height equal to the turbines' hubs. We also assume here that the wind's direction and magnitude applied uniformly all over the wind farm in the vertical and horizontal planes. In other words, each turbine is assumed to receive a uniform wind direction and speed over its entire rotor speed area and all turbines receive the same direction and speed regardless of their position on the grid. In reality wind's speed usually increases with height (i.e. upper sections of the turbines sweep area will receive higher speeds) and, due to the considerably high volatile nature of wind, distant locations in a given wind farm can be facing significantly different speeds (and perhaps directions) as wind travels throughout the farm's considerable large area. Nevertheless, the uniformity assumption that we make are not just for mathematical simplicity, but, rather, because of the limited time- and height- resolution of typical wind data and also since the errors should partly cancel each other out. In our model, the turbines still receive different speeds due to the complex wake effects occurring within the wind farm. Given the "adjusted" speed for each turbine, we use the turbine's specific "power curve" to estimate its power output of the turbine.

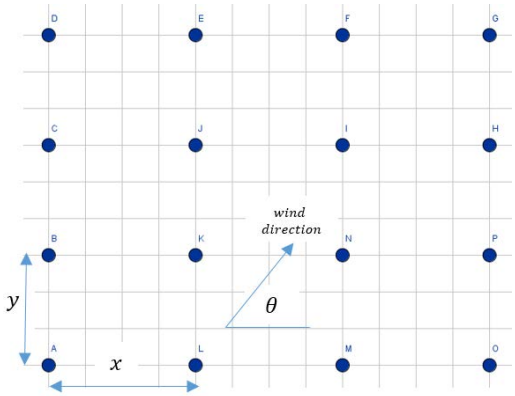

Figure 4: Wind Farm Grid Layout

The power curve of a wind turbine describes the turbine's generated power versus the wind speed, $p = f(v)$, when the wind is perpendicular to the rotational plane. When the speed of wind reaches a threshold of so-called "cut-in" value, the turbine starts generating power, and as the speed increases the power generated increases non-linearly to its maximum value at the so-called "saturation" speed (or, rated speed). Due to structural stability and other concerns, the turbine is regulated to generate a steady maximum (or, rated) output between the saturation speed and the so-called "cut-out" speed, beyond which the blades are stopped as operating the turbine at such "storm" winds poses mechanical and safety hazards. Based on the theory laid out in Betz's Law and also empirical evidence, the increasing portion of the power curve between the cut-in and saturation speeds is often modeled as a cubic function of the form cv^3, where c is a constant depending on the turbine's mechanical properties and of the air flow (density, temperature, etc.) and v is the wind speed. In reality, however, the increasing portion begins deviating from the cubic behavior and curls rather smoothly the maximum plateau level. The shape of the increasing section of the power curve is suitably described by a (approximately cubic) convex lower section and a concave and flattening upper-section (see Figure 5).

For this study, we considered several different models of Vestas turbines and we approximated their power curves by fitting suitable polynomials to their discrete speed-power data that was available from the manufacturer. Two-piece polynomials were fitted (using Mathematica 9) to the increasing portion of the data –one to the convex lower half and a another to the concave upper half. The polynomials vary between 4 and 8 in degrees in order to yield an exact fit to the data points and some degree of subjectivism was involved in identifying the two separate portions in order to obtain the best fit. The power curve fitting results for 8 Vestas models of various rated powers and other parameters are shown in Figure 5. For our case study, chose to use the Vestas V90 with 3MW maximum power output.

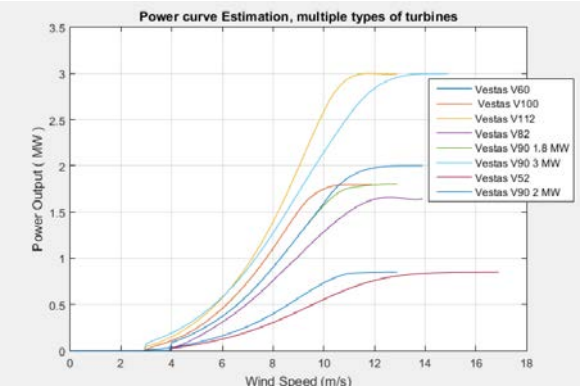

Figure 5: Estimated Power Curves for Several Vestas Wind Turbine Models

For a better realism of the optimization process, we consider stochastic wind speeds and directions. Wind speed and direction measurements collected by the YEGM (Turkish Renewable Energy General Directorate) at various sites Turkey during 2003-2011 were obtained. The wind data is comprised of 10-minute apart measurements of speed and direction at 30 meters height. The total length of the measurement period (i.e. number of years) vary between sites, and the data had to be cleaned rigorously for missing or obviously erroneous values. To assure continuity of the used data, two suitable sites were chosen to be used in the case study. One is the Biga site, which is near the same-named town of the Çanakkale province in the Marmara region of Turkey. The second is the Tavas site, which is a town of the Denizli Province in the inner Aegean region of Turkey. The Biga site was selected partly because it is one of the strongest-wind sites in Turkey. The Tavas site, on the other hand, can be classified as a moderate-to-low wind site. This choice of this particular site pair is motivated by comparison purposes. We use one year's length of data for each site, yielding a total of 52704 (10 minutes data over 366 days) speed-direction data points for each site. Moreover, since the data were taken at a 30 meters height, they were converted to a more meaningful hub height of 100 meters using the standard Equation 13 given below. In Equation 13, α is an empirically derived coefficient that varies dependent upon the stability of the atmosphere. For this study, we adopt the standard value of 0.143 for this parameter.

$$v_{100} = v_{30}\left(\frac{100}{30}\right)^{\alpha} \tag{11}$$

Figure 6 below presents a more detailed picture of the two sites' wind properties in the form of a modified "wind rose", i.e. a joint circular histogram of the distribution of the wind direction and average wind speed at that site. The histograms consist of 5° bins for the direction, where the color of the bin corresponds to the average speed of the wind in that direction according to the given color scale.

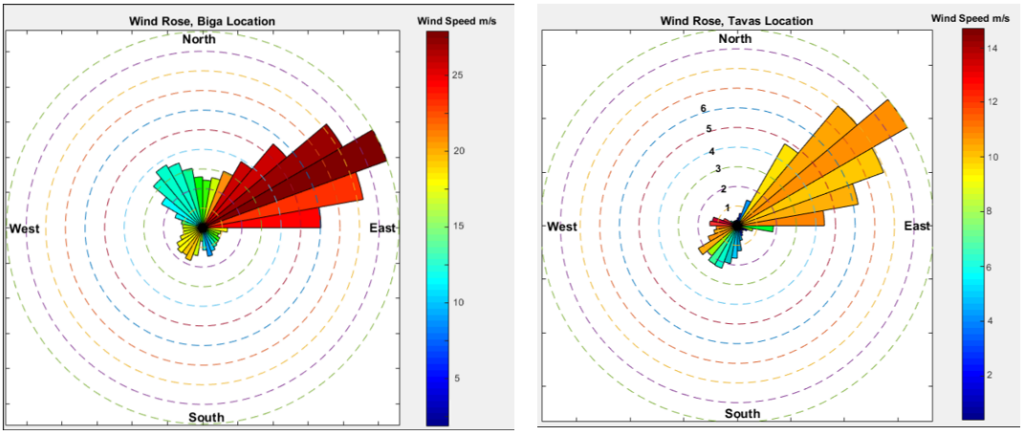

Figure 6: Annual Wind Roses for the Biga and Tavas Sites

It is once apparent that the Biga site is considerably windier than the Tavas site and that the wind at both sites blow predominantly in the Northeast direction. Other observations from Figure include that for both locations wind almost never blows in the South-East quadrant of the direction coordinates (and for Tavas, also almost never in the North-West quadrant) and that there's very moderate wind occurrence in the opposite direction of the predominant North-East. These other details of the presented Wind roses could be explained better in a more-informed context of the geography and topography of the sites.

To verify the commonly encountered Weibull behavior of the wind speeds, a fitting process of the Weibull distribution over the whole data was performed. Based on Figure 7, we can justify that the wind speed data agrees strongly with a Weibull distribution, and, therefore, we can safely perform random variate generation using the estimated Weibull parameters in order to use for our simulated samples.

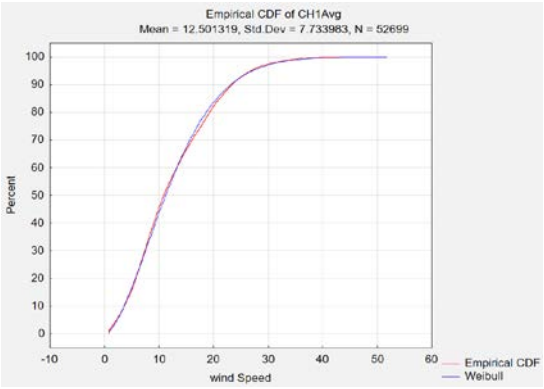

Figure 7: Weibull Distribution Fit for the Biga Site Wind Speed Data

Based on the analyses of Wiser and Bolinger (2013). for the wind farm development project carried out in the USA in 2012, the average capital cost for projects with more than 5 MW output is around 1,900 $ /kW. In our case, we take the cost to be around 2,000 $ /KW. In addition to this initial capital cost, we also take the O&M costs into account. Because O&M costs are realized over time, they are customarily reported in dollars per energy produced, i.e. $/MWh. To get an estimate for this rather elusive cost type, we again refer the issues of the D.O.E. reports (Wiser and Bolinger, 2012, 2013), which give the example of two wind farm operators reporting that the total operating costs are around 20 $/MWh. Assuming an economic life span of the turbines of 20 years and using a discount rate of 6%, the present worth of the total O&M costs can be calculated as

$$cost = (\$2{,}000{,}000/MW) * P_{max}(MW) + (11.469yr) * (\$20/MWh) * (8{,}784hr/yr * m(MW)), \quad (14)$$

where P_{max} is the total power output and m is the mean power production.

Optimization Scenarios and Results

Performing the optimization using the whole data set (52704 point) for every *x*-*y* pair of spacing of the turbines require a huge amount of calculation time. Therefore, make use of a hybrid approach of Monte-Carlo sampling of wind directions combined with a Weibull random-variate generation of the speed from the corresponding Weibull fit.

We provide an itemized description of our approach for simulating one direction-speed pair as follows:

- We divide the wind direction into 360 discrete categories (i.e. slices) in increments of 1° Celsius and calculate the frequency of the direction data in each category.
- For each category we fit a Weibull distribution to the wind speed data corresponding to the direction data in that slice.
- For each sample to be simulated, we first generate a random discrete direction via Monte-Carlo simulation using the categories' relative frequencies (we take the simulated direction to be the middle of that slice, i.e. 0.5°, 1.5°,…., 359.5°).
- Next we generate a wind-speed random variate using the estimated Weibull distribution for that slice.
- Based on the simulated direction and speed, we calculate the wake effects and the effective speed facing each individual turbine on the grid.
- We next calculate each turbine's output using the power curve and average the results over all the objective function.
- We finally obtain the value of the objective function by dividing the average output by the total cost of a turbine and by the total area of the grid.

The histogram in Figure 8, which is actually a "flattened-out" wind rose, shows the distribution of the wind direction and the average wind speed for the 360 1-degree slices for the Biga site. Each slice has its individual estimated Weibull speed distribution, which are not presented here.

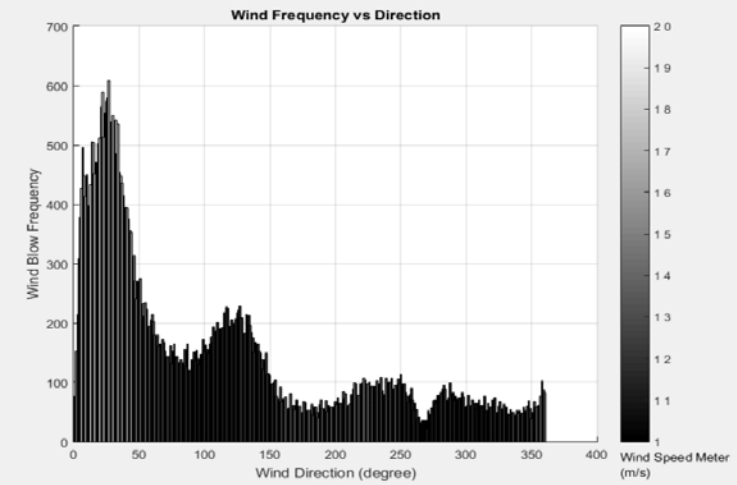

Figure 8: distribution of wind speed over direction

Due to the complex nature of the model, mostly because of the incorporation of the wake effects, a differential calculus formulation of the objective function is not trivial. Due to the low variable-dimensionality of the problem and the considerable computational effort required to perform the calculations for each single simulated sample, the Nelder-Mead heuristic method presents itself as a suitable algorithm. With two decision variables (*x* and *y*) the method requires only 3 points in the *x*-*y* plane to implement. For our stochastic model, however, the objective function value for each Nelder-Mead point needs to be defined as the average of many simulations. Deciding that 1000 simulations for each point is a reasonable compromise between representative accuracy and computational power, we implemented the algorithm with the stopping criterion that the objective function value has not improved by more than 0.01% for the past 100 iterations.

In this study, we present the results for two square cases of the grid, a 10x10 grid and a 30x30 grid. The optimization results for the Biga and Tavas sites are presented in, respectively, Table 1 and Table 2 below.

Table 1: Case Study Results for the Biga Site (Vestas V90 – 90 m Rotor Diameter).

Number of turbines in x-axis	Number of turbines in y-axis	Spacing distance in the x-axis	Spacing distance in the y-axis
10	10	584.3 m	211.4 m
30	30	590.6 m	221.9 m

From Table 1, we see that the *x*-spacing is considerable larger than the *y*-spacing for both grid sizes (the ratio *x*/*y* is 2.77 for the 10x10 grid and 2.67 for the 30x30 grid). This result is consistent with the predominant wind directions at the Biga site as evident from Figures 6 and 7 –winds are stronger and more frequent in the East-North-East direction (first octant of the compass). A larger *x*-spacing would thus help reduce wake effects more than a larger *y*-spacing. Given 90-meter rotor diameter of the Vestas V90 – 3MW turbine, this indicates a spacing of 6.49 diameters along the *x*-axis and a spacing of 2.34 diameters along the *y*-axis for the 10x10 grid and very close values for the 30x30 grid. These numbers also compare reasonably with the industry rule of thumb of spacing the turbines by 2 diameters in the perpendicular line to the prevailing wind direction and by 7 diameters along this direction (note that our grids is not oriented to face the "prevalent" wind direction perpendicularly, but are in the fixed East-West and North-South axes). The result that turbines are slightly more packed in a smaller grid can be explained by the "boundary" effect as follows: Turbines at certain borders of the grid will be impacted much less (the East and South borders in the case of Biga) from the wake effects as compared to turbines in the interior and on the opposite borders. The fact that the "border" turbines constitute a greater fraction of the total number of turbines in a smaller grid as compared to a larger grid will compensate better for internal wake losses, and, thus, it may allow tighter optimal packing of the whole turbine set.

Results for the Tavas site in Table 2 are quite close to the values for the Biga site and bear largely similar interpretations. However, comparing the two sites is somewhat confusing. Both the *x*- and y-spacing for the Tavas 10x10 grid is slightly larger than their counterparts for the Biga site, possibly owing to the fact that the prevailing winds at the Tavas site are slightly more in the North direction as compared to Biga. However, both of spacing values are for the 30x30 grid are slightly less at the Tavas site than at Biga, thus, running counterintuitive to the previous explanation. It is also noteworthy that while the *y*-spacing at Tavas increases slightly from the 10x10 to the 30x30 grid, as consistent with the "border turbines" effect, the x-spacing decreases slightly. Given the complex nature of the model and the non-deterministic behavior of a heuristic algorithm, we caution from over-comparing the two sites and postulating unsupported conclusions.

Table 2: Case Study Results for the Tavas Site (Vestas V90 – 90 m Rotor Diameter)

Number of turbines in x-axis	Number of turbines in y-axis	Spacing distance in the x-axis	Spacing distance in the y-axis
10	10	591.5 m	215.6 m
30	30	583.4 m	218.8 m

Conclusion and Future Research

The general problem of the optimal micro-siting of wind turbines a complicated one due to several reasons. This paper aims to develop a mathematical for a special case of the model where turbines of the same type are placed at uniformly spaced grid points over a flat wind farm area in the form of a rectangle whose edges sit on the East-West and North-South directions. The model's main focus is to incorporate the complex wake effects that may occur within a wind farm that critically impact the total output. This paper also differs from other studies that consider only the total output in that we consider an economic objective, the return on investment per area required. The wake effects are modeled in an idealized –yet mathematically quite complicated– formulation a la Jensen (Katic et al., 1986). The consideration of stochastic wind speeds and directions, and the use in the case study of real measurement data from 2 sites in Turkey, is yet another aspect of the study that increases its realism. The numerical and analytical complexities introduced by the incorporation of wake effects and the use of real data are dealt with by adopting a hybrid approach of using the heuristic Nelder-Mead optimization method based on Monte-Carlo simulation of random samples of wind direction-speed pairs.

Despite the fixed orientation of the grid, the model's result seem to validate the industry' simplistic rule of thumb practice of spacing the turbines by 2 and 7 rotor diameters along, respectively, the perpendicular and parallel direction of the "prevalent" winds. Introducing a third decision variable corresponding to the "tilt" angle of the rectangular grid, which would be optimized together with the horizontal and vertical turbine spacings, could yield even-more confirming results, but this is the subject of future generalizations of the model. The case study results

also indicate –albeit with an exception– that a larger wind farm (i.e. having more turbines) requires larger spacing between the turbines in order to operate optimally, possibly owing to the fact that a greater portion of the turbines in a larger wind farm are in the farm's interior region where the wake effects are stronger than on the boundaries. Nevertheless, we offer these interpretations with some degree of caution as the aforementioned observations and possible other ones ask for a more generalized model as well as many more site cases to be analyzed, which again, are among planned extensions of the present study.

Acknowledgements

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AN INQUARY STUDY OF NiO FILMS DEPOSITED WITH SOL-GEL SPIN COATING

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Abstract: Y incorporated nickel oxide thin films have been deposited via sol-gel route by using spin coater. The structural, morphological and optical properties of films have been inquired. The films had nano-sized polycrystalline cubic structure. The optical characterizations indicated that the band gap and Urbach energy continuously went up with Y contribution. The present investigation reveals the properties of nickel oxide are healed and controlled with Y contribution and these films are probably good candidates for various applications.

Keywords: NiO, Sol-gel, Y doping

Introduction

Nickel oxide (NiO), which is one of transition metal oxides, is an intriguing material for magnetic and electrochromic applications, organic light emitting diodes, catalysts, smart windows and solar cells (Reguig et al., 2007; Turgut et al., 2015) antiferromagnetic feature, good optical transmittance with a wide band gap of 3.6-4.0 eV, thermal and chemical stableness (Patil et al., 2002; Gowthami et al., 2014). A stoichiometric NiO is a good insulator with resistivity of about 10^{13} ohm.cm**,** but non-stoichiometry, which is resulted from nickel vacancies and oxygen interstitials, makes it a p-type semiconductor material (Joshi et. al., 2006). The structural, magnetic, optical, electrical, morphological and electrochromic properties of NiO material can be improved by doping with foreign elements such as Li, Cu, K, P, Y and other elements. To the our the best knowledge, there is no report about investigation of Y doping effect on characteristic features of NiO. Therefore, it is necessary to make various studies in order to understand detailed influence of Y doping on properties of NiO. Hence, in present study, pure and Y doped NiO films have been fabricated via a sol-gel spin coating technique which is simple, safe, cheap and capable of fabricating homogenous and good quality films (Turgut et al., 2015) and Y doping effect on crystallographic, morphological and optical properties of NiO films have been investigated.

Material and Method

Pure (YNO-0), 1 at. % (YNO-1), 2 at. % (YNO-2), 3 at. % (YNO-3), 5 at. % (YNO-5) and 7 at. % (YNO-7) yttrium doped NiO thin films were prepared with spin coating by using nickel(II) acetate tetrahydrate, yttrium(III) chloride, methanol and monoethanolamine. After the solutions were prepared, they were aged for three months and finally solutions were dribbled onto micro slide glasses that were spun at velocity of 3500 rpm for 25 seconds by spin coater. The pre-grown layers were sintered at 200 ^{o}C for 10 min. This procedure was reiterated for ten times. Lastly, the whole samples were annealed at 550 ^{o}C for 1 hour in air. The crystallographic, surface and optical features of pure and Y doped films were inquired by a Rigaku/Smart Lab x-ray diffractometer (XRD), Nanomagnetic Instruments AFM (atomic force microscope), Perkin Elmer UV/VIS Lambda 35 spectrophotometer.

Results and Discussions

The XRD patterns in Fig.1 reveal all films have polycrystalline cubic bunsenite NiO structure (JCPDS card no: 47–1049) with (200) preferential orientation.

Sta et al. (2014) observed the similar crystallographic structure for Li doped NiO films prepared by sol-gel spin coating. As seen from Fig.1, the peaks' intensities gradually decrease with Y contribution, which suggests Y doping causes a deteriorating in the crystallinity of NiO. The textured coefficient (TC) is calculated by Eq. (1)

$$TC_{(hkl)} = \frac{I_{(hkl)}/I_0}{(\frac{1}{N})\sum I_{(hkl)}/I_0} \quad (1)$$

where I_{hkl}, $I_{0(hkl)}$ and N are the intensities of relative and standard peak, the number of peaks.

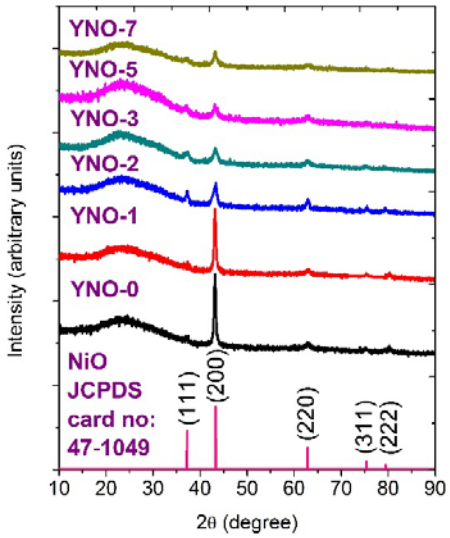

Figure 1. The XRD patterns of YNO thin films

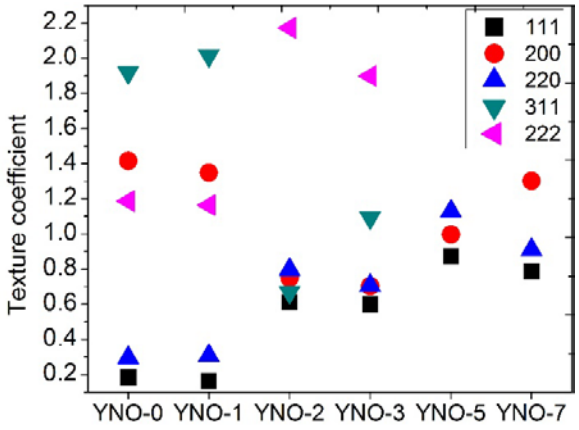

Figure 2. The variation of TC values of NiO with Y doping

The alteration of TC values with Y doping (Fig. 2) indicates that the TC values of some peaks are greater than one and this remarks the more crystallites than one are directed at those orientations (Duman et al., 2014). The mean crystallite size (D) and micro-strain values for samples are identified by Eqs. (2) and (3)

$$D = \frac{0.9\lambda}{(\beta cos\theta)} \quad (2)$$

$$\varepsilon = \left(\frac{1}{sin\theta}\right)\left[\left(\frac{\lambda}{D}\right) - (\beta cos\theta)\right] \quad (3)$$

where β is full width at half of the peak maximum (FWHM) and it is computed by $\beta^2 = \beta^2_{obs} - \beta^2_{inst}$ (β_{obs} is measured from XRD, β_{inst} is instrumental broadening). The mean crystallite size value for undoped sample continuously decreases from 21.32 nm to 20.80 nm, 17.77 nm, 17.06 nm, 15.76 nm and 13.84 nm for YNO-1, NYO-2, NYO-3, NYO-5 and NYO-7 samples. However, the micro-strain value gradually increases from $1.96x10^{-3}$, to the values of $2.01x10^{-3}$, $2.35x10^{-3}$, $2.64x10^{-3}$, $2.98x10^{-3}$ and $3.04x10^{-3}$ with Y doping. These results clearly indicate that the crystallinity of films decreases with Y doping ratio. The decreasing crystallinity of NiO with Y doping can be resulted from higher ionic radius of Y^{3+} (0.90 Å) than Ni^{2+} (0.69 Å) (Greenwood and Earnshaw, 1997). The difference between ionic radii can introduce a lattice distortion and an increase in amount of disorders.

The 2D and 3D AFM micrographs (Fig. 3) show there are nano-sized particles on the surfaces of films and their distribution is nearly homogenous. These images also exhibit the particle size incessantly decreases with raising Y doping ratio. This alteration is very good consistent with variation of crystallite size determined from XRD analysis. The surface roughness value of NiO film initially decreases from 1.23 nm to 0.98 nm, 0.94 nm and 0.62 nm with Y doping up to 3 at. % content and then it starts to increase to the values of 0.96 nm and 1.05 nm with more Y doping.

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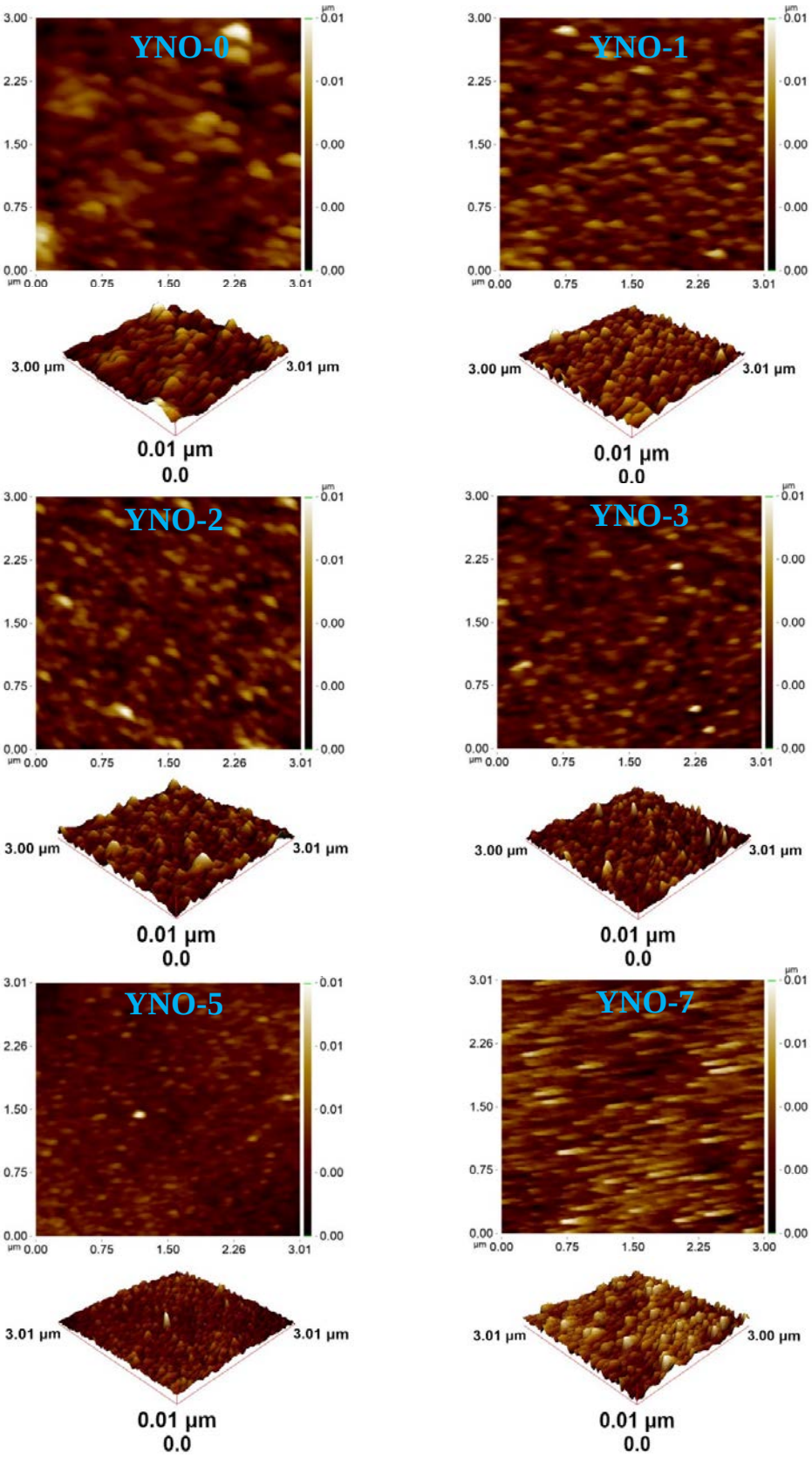

Figure 3. The AFM images of YNO thin films

The transmittance and $(\alpha h\nu)^2$ vs. $h\nu$ graphs are given in Fig. 4a-b. The transmittance values are about 80 %-96 % over wavelength range of 450-1100 nm. The value of optical band gap (E_g) is calculated by Eqs. (4), (5)

$$\alpha = \ln(1/T)/d \quad (4)$$

$$\alpha h\nu = K(h\nu - E_g)^{1/2} \quad (5)$$

where α, T, d and K are absorption coefficient, transmittance, film thickness and constant. As seen from $(\alpha h\nu)^2$ vs. $h\nu$ graphs (Fig. 4b), the E_g value for pure NiO film continuously increases from 3.274 eV to 3.809 eV with Y doping. An increasing in E_g with Y doping is probably resulted from decreasing crystallite size, which is clearly seen from XRD and AFM analysis

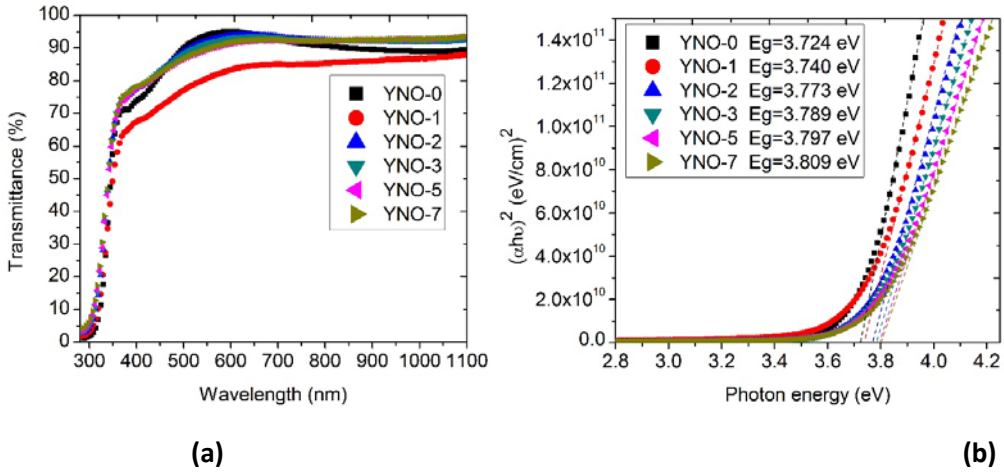

Figure 4. (a) The optical transmittance (b) $(\alpha h\nu)^2$ vs. (hν) curves of YNO films

This is known to be quantum confinement effect and band gap of a semiconductor is reversely proportional to crystallite size (Lin et al., 2005). The similar result was also observed for P doped NiO films (Das et al., 2010). The absorption tail is also inquired for deposited films. The absorption edge is called as the Urbach tail (Urbach, 1953) and it is given by Eq. (6)

$$\alpha(E,T) = \alpha_0 \exp\left(\frac{E-E_0}{E_u(T,X)}\right) \quad (6)$$

The Urbach energy (E_u) is related to temperature (T) and crystal disorders (X). However, Cody et al. (1981) indicated non-thermal component depending on the structural disorders. Hereby, E_u values are determined by Eq. (7)

$$\ln\alpha = E\frac{1}{E_u}\cdot\left(\ln(\alpha_0) + \frac{E_0}{E_u}\right) \quad (7)$$

$E_u = \Delta(h\nu)/\Delta(\ln\alpha)$ and it is based only on the degree of structural disorders. From Fig.5, the Urbach energy value of pure NiO gradually increases with increasing Y doping ratio.

This suggests Y incorporation into NiO causes a significant raise in the E_u values as a result of increasing structural disorders, which is seen from XRD analysis. An interesting point for this study is that E_g and E_u have a similar variation with Y doping ratio. The transitions from tail and band to tail because of expanding of Urbach tail would cause a decrease in E_g. But as indicated before, decreasing crystallite size is dominant factor for increasing optical band gap. A similar tendency between E_g and E_u was found for ZnO semiconductor material (Demirselcuk and Bilgin, 2013).

Conclusion

In this investigation, Y doped NiO samples were synthesized for the first time by sol-gel spin coating. The crystallographic and topographic investigations showed the samples were made of nano-sized particles with bunsenite NiO structure. The crystallinity and crystallite size decreased with Y content, however the values of micro-strain, optical band gap and Urbach energy increased with Y contribution level. It can be concluded the features of NiO films may be altered with Y doping.

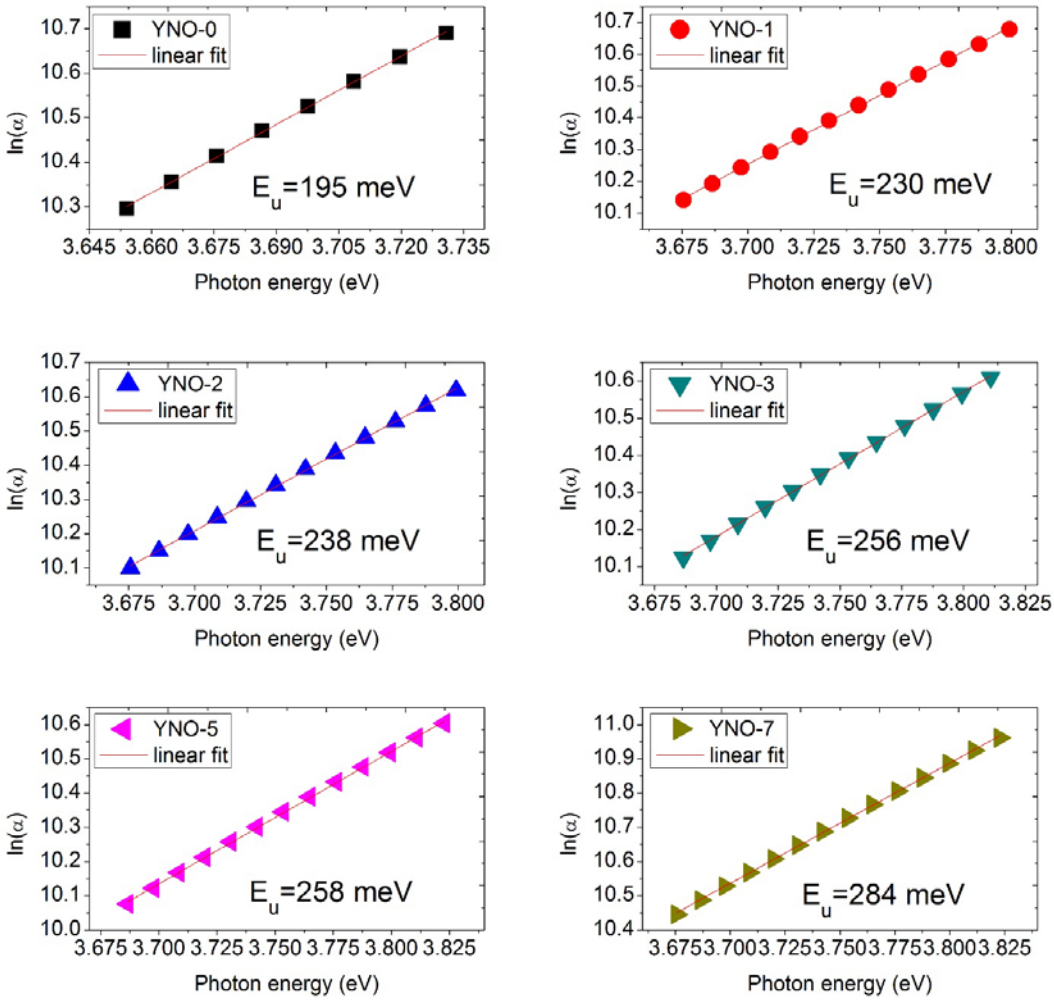

Figure 5. The curves of lnα vs. photon energy

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COMPARATIVE ANALYSIS OF CURRENT METHODS IN SEARCHING OPEN EDUCATION CONTENT REPOSITORIES

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Abstract: The current generation of learners are living in a eConnected society where the technology and content are open. Open learning enables learners to be self-determined and interest-guided. To make online learning successful, it is critical that learners need effective ways of finding the appropriate learning resources. However, due to the generally unstructured nature and overwhelming quantity of learning content, effective learning remains challenging. This study compares different features offered by the Open learning content search platforms, and analyzes the past one-year website usage metrics data to gather insights about the usage. This paper also discusses the gaps in the current Open Content search dilemma and proposes potential solutions.

Keywords*:* Open Educational Resources(OER), Content search, Open Learning, Massive Open Online Courses(MOOC), Distance Education, Learner Centered Learning

Introduction

Computer-aided instruction (CAI) has evolved from its humble origins, to the level of Massive Open Online Course (MOOC), which was introduced in 2008 as open online courses aimed at unlimited participation. The Internet and the entire World Wide Web (WWW) constitute the largest and most comprehensive knowledge base in the history of the world. Learners are living through this information explosion (Chiou & Shih, 2015). Currently, e-learning is not simply providing the course materials, while the trend of Massive Open Online Courses (MOOCs) and the concept of flipped classrooms (Goodwin & Miller, 2013) is well applied everywhere. Rai & Chunrao (2015) states that "In recent years, Massive Open Online Courses (MOOCs) have attracted millions of learners around the world, through various MOOC providers, such as edX, Coursera, and Udacity. MOOCs allow millions of learners to enroll in courses form reputed universities such as Harvard University, Stanford University, Massachusetts Institute of Technology (MIT), and University of California at Berkeley (UCB). Outside of MOOCs, professors are creating and releasing their own content using tools such as Slideshare and YouTube. Every day, millions of learners make use of free, open online tools, and resources (MacDonald, 2015). Open content learning resources such as MIT's OpenCourseWare project (OCW), TED videos, Khan Academy, YouTube videos, and the MERLOT (Malloy & Hanley 2001; Hanley 2015) project are a few examples of systems through which millions of learners learn on the web every day.

Open learning enables learners to be self-determined and interest-guided. Stacey (2013) educators to "Go beyond open enrollments and use open pedagogies that leverage the entire web not just the specific content in the MOOC platform". Learners are often unable identify which material is needed, useful, and required at their level. Hence, open content learning design must assimilate the material from various sources and provide a new pedagogy that is appropriate to the needs of today's learners (Smyth, Bossu & Stagg, 2015). This paper explains the design for an Open Content Social Learning (OCSL) system that leverages Open Content to deliver an adaptive and personalized experience accounting for the pedagogical needs of the learners and similar learners

and the need to recommend learning activities in a pedagogically effective order.

A great majority of these Open Educational Resources (OER) initiatives are based on established web based technology platforms and have accumulated large volumes of quality resources which are shared openly. However, one limitation inhibiting the wider adoption of OER is the current inability to effectively search for academically useful OER from a diversity of sources (Yergler, 2010). While the open content grows in popularity, and the proliferation of repositories and portals for open content, it becomes more difficult for potential users to find the content they need (Dichev & Dicheva, 2012). Learners are often unable to identify which material is needed, useful, and required at their level. Hence, open content learning design must assimilate the material from various sources and provide a new pedagogy that is appropriate to the needs of today's learners (Smyth, Bossu & Stagg, 2015). In this paper, we present our analysis of the current Open learning content platforms. We reviewed the research papers relevant to OER search platforms, studied the survey results from learners and teachers, collected & analyzed the metrics from Alexa.com for the top eight OER search platforms, and then compared the features of the top eight OER search platforms. After the study and analysis, we proposed some potential solutions to overcome the OER adoption due to the massive and diversified volume of content by providing effective personalized search.

History of OER, OCW and MOOC

The term Learning Object, was first popularized by Wayne Hodgins in 1994 when he named the CedMA working group "Learning Architectures, APIs and Learning Objects", which has become the Holy Grail of content creation and aggregation in the computer-mediated learning field (Polsani, 2006). In 1998, David Wiley coined the term "open content", to which the principles of the open source free software can be applied to content. (Caswell, Henson, Jensen, & Wiley, 2008). This movement helped the creation of the first widely adopted open license for content called "Open Publication License" (Wiley & Gurrell, 2009). In 2001 Larry Lessig and others founded the Creative Commons (Commons, 2009) and released a flexible set of licenses which improved Open Publication License's confusing license option structure. One role of Creative Commons, in the history of OER, is to increase the credibility and confidence in their legally superior, much easier to use licenses brought to the open content community. Also in 2001, MIT announced its OpenCourseWare(OCW) initiative to publish nearly every university course for free public access for non-commercial use (West & Victor, 2011). MIT's OpenCourseWare played a critical role in the history of OER with its brand and commitment (Yuan, MacNeill & Kraan, 2008). Since first being coined by UNESCO in 2002, the term Open Educational Resources has evolved to meet the fast pace of the changing and diverse contexts in which it has now been used (Bossu, Bull, & Brown, 2012). Open Educational Resources (OERs) are teaching and learning materials that anyone can use and share freely, without charge. The worldwide OER movement is rooted in the idea of high quality education at no cost. The Cape Town Declaration (2007) states that "Educators worldwide are developing a vast pool of educational resources on the Internet, open and free for all to use. These educators are creating a world where each and every person on earth can access and contribute to the sum of all human knowledge. They are also planting the seeds of a new pedagogy where educators and learners create, shape and evolve knowledge together, deepening their skills and understanding as they go." The term MOOC was developed in 2008 by Dave Cormier and Bryan Alexander to describe a course experiment utilizing connectivism (Moe, 2015).

In summary, OER initiatives have resulted in the development of open content and open courses in higher education. OCW is a free and open digital publication of university-level educational materials. MOOCs are free online courses without formal entry requirement nor participation limit. OERs, OCW and MOOC are closely related to the Openness movement in education promoting the ideas of how people should produce, share, and build education.

Related Research

One of the challenges facing open learning is that while the open content grows in popularity and we witness the proliferation of repositories and portals for OER content, it becomes more difficult for potential users to find the content they need. The power in OER is not in their production; it is in their reuse by other educators and learners. If OER discovery is improved and simplified, many OER aspirations such as widespread remix, repurposing, and redistribution could become part of the educational practice (Dichev & Dicheva, 2012). The Paris OER Declaration (2012) states the need for more research in this area as "encourage the development of user-friendly tools to locate and retrieve OER that are specific and relevant to particular needs". Unwin (2005) argues that the problem with open content is not the lack of available resources on the Internet, but the inability to effectively locate suitable resources for academic use. Research shows (Mercer, Koenig, McGeachin & Tucker, 2011) that learners frequently arrive at open content items from outside search engines rather than by browsing through the repository's organizational structure. Jamali & Asadi (2010) state that scientists are

increasingly relying on Google to find scholarly literature and college students overwhelmingly use search engines as a starting point of their information searches.

Open content on the web can be found with some basic meta-data, such as the title, document type, and location, but additional metadata are required for the content to enable effective searching. Indexing, categorization and tagging methods are critical to search the content to offer a personalized learning experience (Barros, Costa, Magalhães,& Paiva, 2015). OER efforts led to a fragmented landscape of concurrent metadata schemas or interface mechanisms that were not designed to offer mechanisms to enable the exchange of resources between these repositories. Recent studies show that this scenario makes it harder to reuse the resources located in OER Repositories. The motivation to learn and engage with the e-Learning solution is key to its effectiveness, especially when the effectiveness is defined as the time spent on the learning platform instead of spending too much time finding for the right content.

1. How do the learners' find OER content online?
2. Is there a significant difference in the time spent on the site based on the traffic from direct visits to search engine driven traffic?
3. Is the learner engagement with the OER platform varies based on the features offered by the platform?

Comparison of Current OER Search Platforms

Most of the search platforms currently use standard search techniques by combining conventional information retrieval techniques that are based on page content, such as word vector space (Salton, & McGill, 1983), with link analysis techniques based on the hypertext structure of the Web, such as PageRank (Brin & Page, 1998) and HITS (Devi, Gupta, & Dixit, 2014).

Web search engines built on standard search techniques, parse text into tokens to be indexed into an inverted index for any relevant information about documents (such as categories, subject or other attributes). The results are then ranked to obtain an ordered list of results. The PageRank (Page, Brin, Motwani & Winograd, 1999) value for page u is dependent on the PageRank values for each page v that is contained in the set Bu (the set that contains all of the pages that link to page u), divided by the number L(v) of links from page v. The PageRank value for any page u can be expressed as

$$PR(u) = \sum_{v \epsilon B_u} \frac{PR(u)}{L(u)},$$

The PageRank algorithm (Brin & Page, 1998) attempts to provide an objective estimate of the Web page's importance. However, the importance of the Web page is subjective for different users. Learners loose confidence in open content if their search results produce random irrelevant content. The true relevancy of a page depends on the interests, goals and existing knowledge of the individual users; a global ranking of a web page might not necessarily capture the importance of a page for a given individual user.

Data Collection and Analysis

The purpose of this study was to examine learners' OER interaction patterns, effectiveness of OER content search and features offered in the OER platforms for effective learning. Currently, there are no research reports with the detailed metrics of the OER resources used, usage patterns of the OER repository and how satisfied the users are. Survey based results may not be able to provide the overall effectiveness because of the volume and diversified nature of the open content and users. Jansen & Molina states (2006) that the Alexa.com ranking is an indicator of the popularity of an engine. In this study, we use Alexa.com (Xun, 2015) to examine the performance of the most commonly used eight OER search platforms. We selected curriki.org, oeconsortium.org, oercommons.org, mooc-list.org, merlot.org, class-central.org, cnx.org and coursetalk.org for further analysis. Alexa.com's bounce rating (Arslan & Seker, 2014) is an indicator of the number of bounces, which means that the users just visit a single page and then leaves the web site. The higher bounce rates the lower the web reputation index, while the lower values indicate a higher reputation value. Lower percentage generally indicates that the user spends more time on the web site. Page Views per User (Chu, Chen, Jia, Pouwelse, & Epema 2014) is another indicator to calculate the number of pages visited by a single user. The higher number means that the user is spending more time to visit more pages and we consider these views as an indicator to a more attractive web site.

The following table produces the result of the top 8 OER search platforms and the performance metrics (average page views per user, bounce rate and time spent on site) of global internet users who visited the site over the past 1 year.

Table 1: Top eight OER search platforms and performance metrics over the past 1 year

Site	Number of page views/user	Bounce Rate	Time on site (minutes)
curriki.org	4.4	38.40%	8:35
oeconsortium.org	3.1	38.90%	2:16
oercommons.org	3.3	44.70%	3:05
mooc-list.com	2.19	50.99%	2:19
merlot.org	2.3	51.90%	3:15
class-central.com	2.6	53.70%	2:35
cnx.org	2.11	63.00%	2:29
coursetalk.com	1.79	73.40%	1:21

The following diagram explains the percentage of traffic for the top 8 OER search platforms from various sources (search, social, links and direct visit).

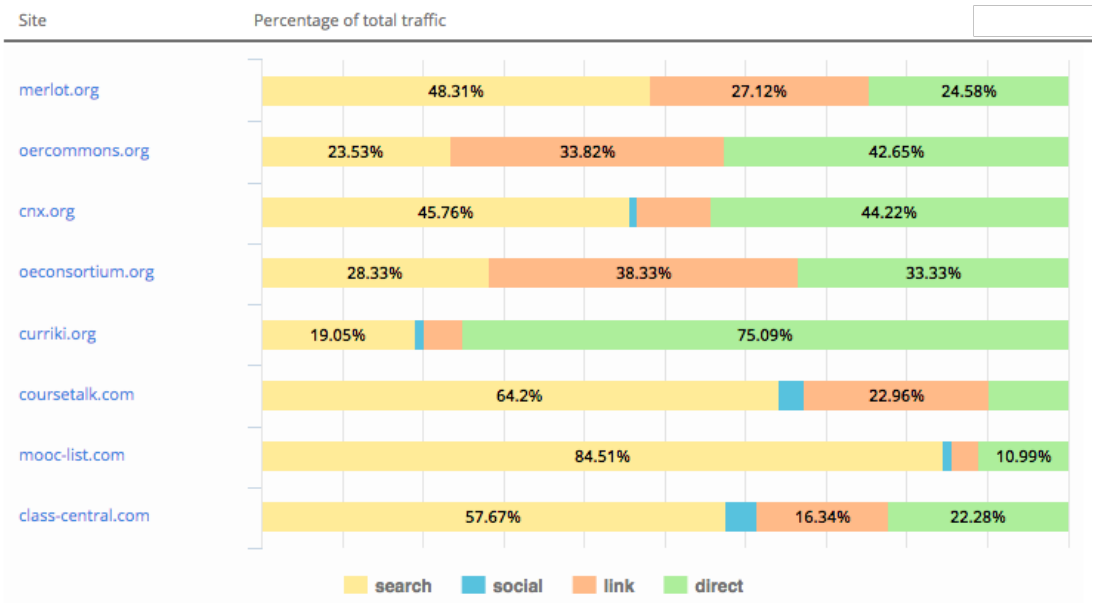

Figure 1: Traffic for the OER search platforms from various sources over the past 1 year

Our hypothesis is: There will be a significant difference in the time spent on the site based on the traffic from direct visits relative to the search engine driven traffic. curriki.org is getting 75.09% of its traffic from direct visits, the highest by 30.87 percentage points. Average user spends approximately 8 minutes on the curriki.org web site compared to 1 minute on the classcentral.com platform.

Analysis of OER Search Platform Features

During this study, we analyzed some of the critical features that require for effective learning in an open learning environment on the most popular OER search platforms.

Table 2: Comparison of features offered by the most commonly used OER search platforms

Feature	OER search platform	Result
Feature: Advance Search functionality to filter and refine the content based on their content choices like type of content, date modified, keywords, author etc. This feature helps the learners to retrieve OER that are specific and relevant to their learning. The Paris OER Declaration (2012) states the importance of this feature as "user-friendly tools to locate and retrieve OER that are specific and relevant to particular needs".	merlot.org	Yes
	oercommons.org	Yes
	cnx.org	No
	oeconsortium.org	No
	curriki.org	Yes
	coursetalk.com	Yes
	mooc-list.com	Yes
	class-central.com	Yes
Feature: Supports peer review and ratings to understand the quality of the content. This feature helps the learners to know the quality of the content peer reviewed by other learners. As research suggested by (Gehringer, Ma & Duong, 2016) online review sites often let readers see helpfulness ratings or other information on reviewers as well as permit users to flag reviews they consider inappropriate or inaccurate.	merlot.org	Yes
	oercommons.org	Yes
	cnx.org	No
	oeconsortium.org	No
	curriki.org	Yes
	coursetalk.com	No
	mooc-list.com	No
	class-central.com	No
Feature: Login functionality, dashboard view and personalized portal to organize/save learning collections, learning plan which offers richer learning experience and enables engagement. Brusilovsky, Kobas & Nejdi (2007) suggest that students would be less likely to suffer from information overload if they were presented with personalized activities.	merlot.org	Yes
	oercommons.org	Partial
	cnx.org	No
	oeconsortium.org	No
	curriki.org	Yes
	coursetalk.com	No
	mooc-list.com	No
	class-central.com	No
Feature: Total number of searchable learning content available	merlot.org	63,000
	oercommons.org	70,000

	cnx.org	20,000
	oeconsortium.org	50,000
	curriki.org	58,000
	coursetalk.com	44,000
	mooc-list.com	12,000
	class-central.com	3,000
Feature: Supports collaboration with fellow learners to enable peer learning & review. Lane, McAndrew & Santos (2009) reviewed the experiences with the OpenLearn site from the UK Open University and identified that the learning outcomes are positive when individual learners and institutions communicating and collaborating online and considers the influences of offline networks.	merlot.org	No
	oercommons.org	No
	cnx.org	No
	oeconsortium.org	No
	curriki.org	Yes
	coursetalk.com	No
	mooc-list.com	No
	class-central.com	No
Feature: Content recommendation based on learner's activity and goals. Paireekreng & Wong (2010) observe that prior knowledge of each learner's activity and an effective user profile is required for personalization.	merlot.org	No
	oercommons.org	No
	cnx.org	No
	oeconsortium.org	No
	curriki.org	No
	coursetalk.com	No
	mooc-list.com	No
	class-central.com	No
Feature: Content recommendation based on similar learners and peer grouping. Cuéllar, Delgado, & Pegalajar (2011) proposed the learning management platform as a social network and do social network analysis (SNA) over teachers, learners, learning resources and their interactions.	merlot.org	No
	oercommons.org	No
	cnx.org	No
	oeconsortium.org	No
	curriki.org	No
	coursetalk.com	No
	mooc-list.com	No
	class-central.com	No

Gap Analysis

It is highly unlikely that the millions of users who have access to the Internet are so similar in their interests that one approach to browsing or searching, respectively, fits all needs (Gauch, Chaffee, & Pretschner, 2003). A solution is needed that will personalize the information selection and presentation for each user (Brusilovsky, Kobas & Nejdi, 2007). Information overload is a concern due to the easy access to an abundance of online information sources (O'Donnell, Lawless, Sharp & Wade, 2015). Another aspect of effective search and personalized results is consideration of the learner's profile. All learners are unique; no two will achieve the same learning outcomes across a range of subject areas. Clear guidance can be provided on the diverse learning needs of each student by collecting and continuously updating metadata that is stored for learners in user profiles. Chan (2000) describes that implicit profile creation based on observations of user's actions has been used in more recent projects and describes the types of information that is available. This model considers the frequency of visits to a page, the amount of time spent on each page, how recently a page was visited, and whether the page was bookmarked. The user's learning behavior is used to create user profiles in several systems. Paireekreng & Wong (2010) observe that prior knowledge of each learner's activity and an effective user profile is required for personalization. Kurshan (2008) states that "drawing on the social network model, Curriki is advancing a collaborative culture of learning, creating and sharing that is paramount to a networked learning environment". Alexa.com performance metrics proved curriki is attracting more learners to its platform and make them engaged in the learning. Research shows that effective learning requires the following:

1. Learner centric adaptive learning by personalizing with relevant content based on the learner's goals, style, habits and prior knowledge.
2. Learner centric social learning based on the goals, learning style and behavioral patterns of similar learners.

Most of the current systems OER Commons (Yoav Yair 2014, D'Antoni, S 2009), iseek.org (Bansal 2013), Project MERLOT (Malloy & Hanley 2001; Hanley 2015), OCW (Vahdati 2015) and mooc-list (Holotescu, Grosseck, Cretu & Naaji, 2014) are not personalized with recommended content and search results. They do not offer personalized content based on a learner's goals and prior knowledge. To overcome these limitations, further research is required to develop an Open Content Repository by consuming the OER content and personalizing the learning experience based on the learner's goals and activities and similar learners' learning activities.

Conclusion and Further Research

We began with a review of the existing OER search engines and examine some of the research studies that pertain to the effectiveness of Open content searches. We found that most of the existing research is based on surveys and real-time user metrics was not considered. We thus designed a study to test and evaluate the OER platforms based on Alexa.com ranking results. We also compared the features across the top 8 OER search platforms and documented the results.

The proposed further research is to focus on Learner Attribute-based Matching (LAM) to enhance the conventional search experience by building a user profile to provide more personalized search results based on learning style, type of content, recent activity, content categories, or other interests of the users. The art of keeping learners engaged and motivated is a critical component of any learning platform design. This approach shifts the paradigm because it requires software systems to be sufficiently intelligent to recommend information to users. As an enhancement, we can implicitly and explicitly collect information from learners about their learning behaviors, learning goals, and other criteria. While a conventional search engine builds a sparse matrix of terms that are mapped to documents in the content index, the recommendation is to design to map the user's behavior to those documents.

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CREATING ONTOLOGY BASED CONCEPT MAPS WHICH CAN BE QUERIED IN COMPUTER ENVIROMENT

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Abstract: Nowadays, Semantic web and ontology applications which came with it, are commonly used in social media, entertainment and shopping sites. But usage of semantic web in education field is limited. Semantic web applications are useful developing tools and E-Learning objects can be used for creation and editing. It is important that Individuals on the internet arrange educational techniques based on their interests and needs (Stutt & Motta 2004). Thus, it is envisaged that, semantic web applications will have large contribution conception when moving to individualized education in future education. The aim of this study is to create concept maps for educators, which is one of the significant learning techniques and widely applied in the teaching process, by using ontologies. In accordance to this aim, an ontology based system made with "Protégé 4.3" developing tool based on RDF(Resource Description Framework) language and can be queried in E-Learning environment by using ontology query language SPARQL (SPARQL Protocol and RDF Query Language). Moreover, the developed system is able to present concepts visually to educators, which could not be done by concept maps generated with classic methods and ensured to access textual information. Therefore, students are able to perform better relations between former and recently learned concepts and achieve constructive learning easier. In future studies, ontology based concept maps which is only used as learning material in education phases, are expected to be used more effectively also in planning, learning and evaluation stages.

Key Words: Semantic, Ontologies, Concept Maps, Constructive Learning, SPARQL

Introduction

As it will be made many definitions of Education, today's most commonly used definition is the behavior of individual, is the process of deliberately bring about the desired change in the direction of their lives through. All developed countries have education systems that hosted within their own social values to transfer their cultural heritage to the next generation. In recent years, these systems need to be constantly renewed with the rapid developments occurring in the field of science and technology. The ultimate aim of governments in education systems is to ensure the training of qualified individuals which produce knowledge, questioning, critical thinking, criticizing and judgment maker which can be used for purposes of science and technology (Gültepe, 2014, p.24).The most critical point in the system for training established teaching is how to plan and implementation of education. Academic work in the field of education is focused in direction of "the development of effective educational system" (Ergin, 1991, p.371). Coming from the past to present, there are many methods and techniques of teaching-learning strategies. Strategies, methods and variations in techniques makes learning more effective and easier. Therefore, teaching and learning strategies, significantly affects student achievement (Tekışık, 2002, p.1).

In this study, the creation of computer-aided concept maps was achieved using ontologies. In the second part of this study, the development of concept maps which is an effective educational method and importance of it has been emphasized in terms of education. Ontologies are defined which determine how to read and interpret well-defined web data using machines. Similarities and superior sides of concept maps with ontologies according to each other are discussed. Also definition of SPARQL (SPARQL Protocol and RDF Query Language) ontology query language has been discussed. In the third part of this study, with examples it has been described that of how to create an ontology using protégé editor. It has been discussed how to transfer the created ontology to web environment and how to query these concept maps which are created with support of ontology using SAPRQL. In the fourth part of the study, it mentioned results and future works planned to be done in the future.

Meaningful Learning and Concept Maps

One of the widely used strategies of Teaching-learning is David Ausubel's (1963) verbal based teaching technique. Even though there are different methods to achieve meaningful learning the concept maps are one of the most effective learning methods (Kaptan, 1998, p.95). At first, Tony Buzan introduced concept maps to world with publishing books about it, at the same time it has become a technique which in future many people will adopt and

use (Adodo, 2013, p.163). Novak and Gowin in 1984, show that using concept maps is a creative method when clarifying student's concepts in a particular domain and the relationship between these concepts. Justifying information requires a high level of learning. Concept maps makes learning discipline to scientists and individuals by simplifying the knowledge creation process. (Novak, 1993, p.167).

Concept maps can be considered as mechanisms which define concepts to be learned by students, and the relation to be made between these concepts and appeal to the visual senses for learning effectively. At the same time, it is indicated that using concept maps is an effective learning technique and the develop students' thinking, analyzing, problem solving and their creativity abilities (Novak & Gowin & Johansen, 1983 p.625). But despite of these benefits concept maps are not used efficiently as requested. This problem has two main reasons. First one is, having difficult and costly preparation and second one is limited reusability. In the latest researches, it has been envisaged that concept maps to be created using ontologies will solve these problems. The greatest feature of ontologies which are main structure of semantic web is reusability and created easily using editors. Thus it is expected to bring new perspective to concept maps. Ontologies makes creating concept maps for teachers easier (Chu, Lee & Tsai, 2011).

Semantic Web and Ontologies

Semantic web (Berners-Lee, 2001, p.34) is an internet plug-in that is mostly studied in the academic and industrial fields which goal is making language of data in the internet environment in a way that not only understandable by human languages, but also being understandable, interpretable and usable by machines, in this way machines can easily find information, which aims to share information and be able to combine them. The basic structure of the Semantic Web are ontologies. "Ontologies have key duty in technology by integrating interoperability and data, information and processes" (Grobelnik & Mladenic & Fortuna, 2009, p.59). Overall, Overall ontologies which is the most important component of semantic web based on RDF format. RDF is a data model to define data for semantic web. This model is based on objects in the web environment, the identification of resource properties and property values. RDF is made of RDF triples which are used to define and describe data. The objective of RDF triples is to store data as component forms. These triples are similar to the base sentence being used daily in dialogues, by having subject, predicate and the object. Subject shows data source, predicate shows properties of source and the relationship between subject and object.

When viewed this aspect, structure of ontologies which is conceptualized representation (Gruber, 1993) is similar to structure of concept maps which is a successful method of meaningful learning (Silva & Padilha et al. 2012, p.33). Concept maps and ontologies, while defining clearly classes and concepts and relationship between them, provide describe ability of the different concepts. Concept maps created using ontologies have differences with concept maps created using classic methods, because of including ability to define properties to classes, individuals and restrictions. (Hsieh & Lee & Chu, 2013, p.561). Concept maps created using ontologies in comparison to maps created using classic methods, has to offer more open and expressive form information (Graudina, Grunspenkis & Milasevica, 2012, p.29). Also, different from classic concept maps, ontology based maps shows more meaningful specifications by only using concepts and relation between concepts (Graudina & Grundspenkis, 2008, p.173).

Jena and Sparql

SPARQL is a query language used to query RDF data. SPARQL is used to make queries in different data resources. With having much similarity to SQL (Structured Query Language) language in terms of used words and structure, queries are written in triple store format.

Methods and Materials

Scope of the developed system is secondary school science and technology lesson. System is a web-based software, which can do semantic search and logical layoffs, because of being web-based anyone can use it independent of time and space. The base knowledge of the system in other words RDF triples is created using OWL language in Protégé 4.3 editor, developed by Stanford University. In the project, issues of primary school's science and technology lesson's concept's class features, limitations, qualifications and relations between these classes are designed using protégé. In the web-based application, developed RDF triples are queried using SPARQL ontology language and desired data depend on the user presented.

Ontology Development Process

Ontology development is an essential process that should be considered. The ontology development process should be made with specific methodology.t is the process that predicts which activity will take place. In this project, due to the ease of use and general acceptance by the investigators 101 methodology (Noy, N.F., McGuiness, D.L,

2001) is used. The basic steps of the methodology are as follows.

1. Determining the domain and scope of the ontology
2. Consider reusing existing ontologies
3. Enumerating important terms in the ontology
4. Defining the classes and the class hierarchy
5. Defining the properties of classes—slots
6. Defining the facts of the slots
7. Creating instances(individuals)

Determining the domain and scope of the ontology

In the first step of this methodology used for creating ontology, areas and scope of the application to be developed should be extensively discussed. When defining this domain, project is going to be used by whom, for what purpose and where it's going to be used, these declarations should be made, and then domain and area should be defined. Also, what questions this ontology is going to find answer and which problems it's going to solve should be defined in this stage. Some of the decisions, can be changed later, when developing ontology. This project aims to help teacher of the primary school 3-4-5-6-7-8 Science and Technology course, by creating concept maps using ontology, and also make student which takes the course understand the concept effectively.

Consider reusing existing ontologies

One of the aims for this project, is to prevent time loss when making concept maps in learning processes. As we said previously, the advantages to create ontology based concept maps in comparison to classic method based ones, is reusability. Due to this fact, before starting the creation process of an ontology, examining the resources about field to be made and if there are similar resources, instead of creating exact same, to think about expanding it. Sometimes, there are some ontologies may need to be imported to our own work. According to prior research it can be seen that there is insufficient scope in concept maps made with ontologies. Moreover lack of necessary inquiries and works done has not been put into place that can be easily be reached.

Enumerating important terms in the ontology

Concepts to be used in ontology, relation between concepts and properties of these concepts, without any distinction as lists should be documented. In this work, Ontology terms list are created using topics of Science and Technology course and terms needed when creating concept map of this subject's. In the next stage, with using this list, classes are inserted into a hierarchical order and concept properties were defined. Defining class hierarchy and concept properties is a nested process, thus, it made simultaneously. Some of the terms in ontologies can be added or changed in the creating process.

Defining the classes and the class hierarchy

There can be many methods used when determining class place order but the mostly used is the method Uschold and Gruninger (1996) mentioned in their work. These methods are defined as below:

> **Up-Down**: The development process starts from the upper class and continues towards lower classes. A path is followed from the most public class to the most private class.
> **Down-Up:** Starts the development process by identifying lower classes then by grouping upper classes are created. Follows a path from the private classes to the most public class.
> **Combination:** Ontology of the desired subject is defined as creating first and most striking concepts and making generalizations based on state privatizations.

In this study, since classes of ontology to be created are in a systematic list from upside to down, top-down method was deemed appropriate to proceed faster. If list of classes to be created is defined completely, using the general to the particular method provides convenience to the developer.

Defining the properties of classes—slots

Classes and hierarchical structure created, on their own do not show clearly the information to be given to desired audience. Semantic relations to specify the characteristics of properties and class definitions can be used in the ontology. There are two kinds of properties; Object properties and data properties. Object properties defines already created relationship between two classes, internal or external parts and the characteristics of the class.

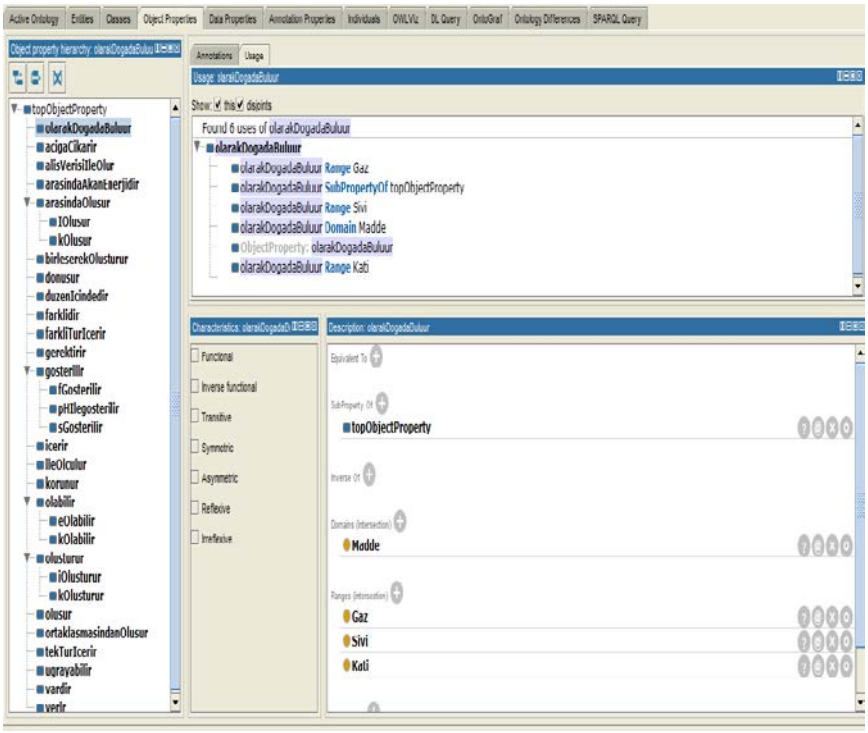

Figure 1: Showing of object attributes

For example in this study “isFoundInNature” property is defined. While the domain of this property is Material” class, range of this property are “Solid”, “liquid and “gas” classes. If we look to this example as type of RDF trio, we can simply understand that: Substance can be found as solid liquid and gas in nature. (Figure 1)

Defining the facts of the slots

In this step, properties of attribution which defined in previous step are determined. These attribution may have value, value type, restriction and other properties.

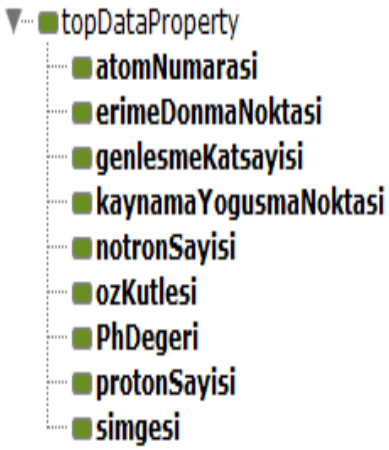

Figure 2: Properties of Data property object

In this study, properties of substance and atom classes, values these properties can get and value types are defined (Figure 2).One of the properties of “atom” class is atom number.

Creating instances (individuals)

Last step of creating ontologies is to create individuals related to previously defined classes. The class which individual will be created should be selected, then individuals of that class will be created. There is not any limitation in individual number. Value type, values and restricts should be defined if there is any.

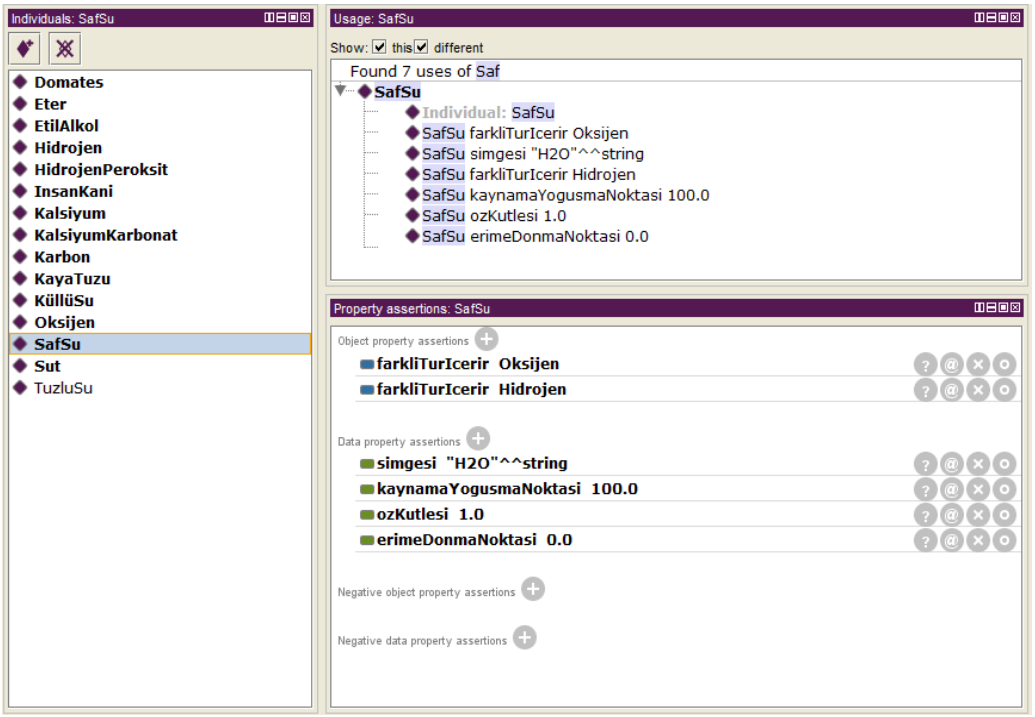

Figure 3: Individuals of classes and their values and restricts

Individuals related to classes “Atom” and “Substance” are defined in this study (Figure 3). Data property assertions and object property assertions of compound class are defined.

Query the Ontology in Web Environment

One of the greatest advantage of concept maps created using ontologies in comparison to concept maps created using classic methods, is that concept maps are written in a language that machines can understand, too. So the meaning of concept maps can be obtained as textual. This makes student’s better associate previously learned concepts and new concepts, and makes meaningful learning active.

In order to make access of concept maps easier, they have been transferred to web environment. Users can examine concept maps of any science study subject using web environment and can make relevant queries on this subject (Figure 4) “Apache Jena Fuseki” has been used for transferring the created ontology to the web environment. Apache Jena Fuseki can give end-point (link) of loaded ontology. With help of this end-point, connection is established using language used in web environment. PHP is used for developing web environment. One of the reasons to prefer PHP is that both PHP and “Apache Jena Fuseki” can work on apache server without any problem. Also, another reason is PHP is open-source language. The interaction between PHP and “Apache Jena Fuseki” is achieved using “sparqllib.php” library of PHP. Using this library, queries in the SPARQL language are transferred to Apache Jena Fuseki Server and results are gained to store other needed data, MySQL database was preferred because of good compatibility with PHP.

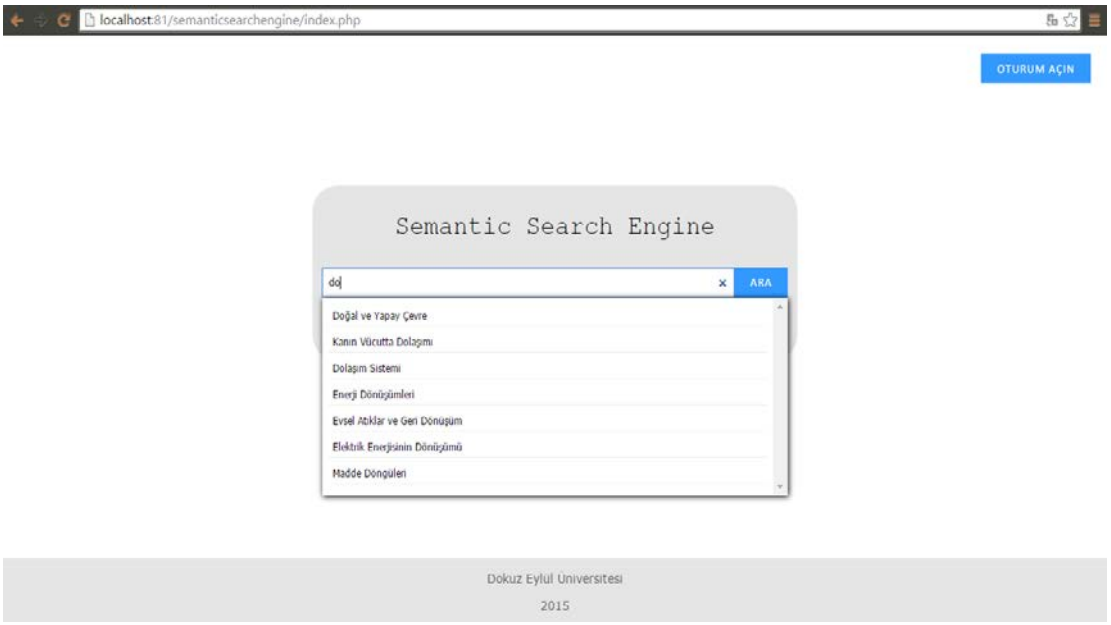

Figure 4: SPARQL query page of created website

Conclusion and Discussion

Since the emergence of the concept map, has been used by teachers as learning material actively. Concept maps establish meaning relationship by associating previous knowledge of students with new information. Also, it improves problem solving, analytical thinking and inferring cognitive abilities of students. However, concepts maps created using classic methods has some main problems. The first one is difficult and time-consuming process of creating concept maps using classic methods. When there is need to add new concept to map or change any concept in map, there may be need to recreate concept map. Concept maps created using classic methods have limited reusability. Also because of being created manually on paper it is difficult to store and archive. Nowadays rapid development of the computer usage in learning classical methods does not attract attention of students. So affective readiness of student decreasing.

Concept maps created using computers in comparison to maps created using classic methods have advantages. Concept maps designed using computers, show concepts in a hierarchical order. In addition the name of this concepts can be changed. The meaningful relationship can be created between concepts and more comprehensive maps in comparison to classic created concept maps (Baki & Mandacı Şahin, 2004, p.91). Moreover, in the process of creating concept maps gives the ability to save in any stage and continue later. When concept maps are used again, they can be found in computer environment easily and changed with respect to daily conditions in the manner of required technology. Also, improves update process and reusability functions.

Ontologies which are main structure of semantic web that came with Web 3.0 has similarities in structure with concept maps used as learning material. Concept maps created using ontology can be queried using SPARQL. This way get students attention to described of concept map on the desired subject. In this concept, ontology based concept maps are made with subject of science and technology courses in primary school curriculum, and queried in internet environment. In next studies, ontology based concept maps can be used in most subject and courses of primary school and provide meaningful learning. In addition to use ontology based concept maps as a teaching method, it can be used in the planning training and education, evaluation stages and correcting students previously learned wrong concepts.

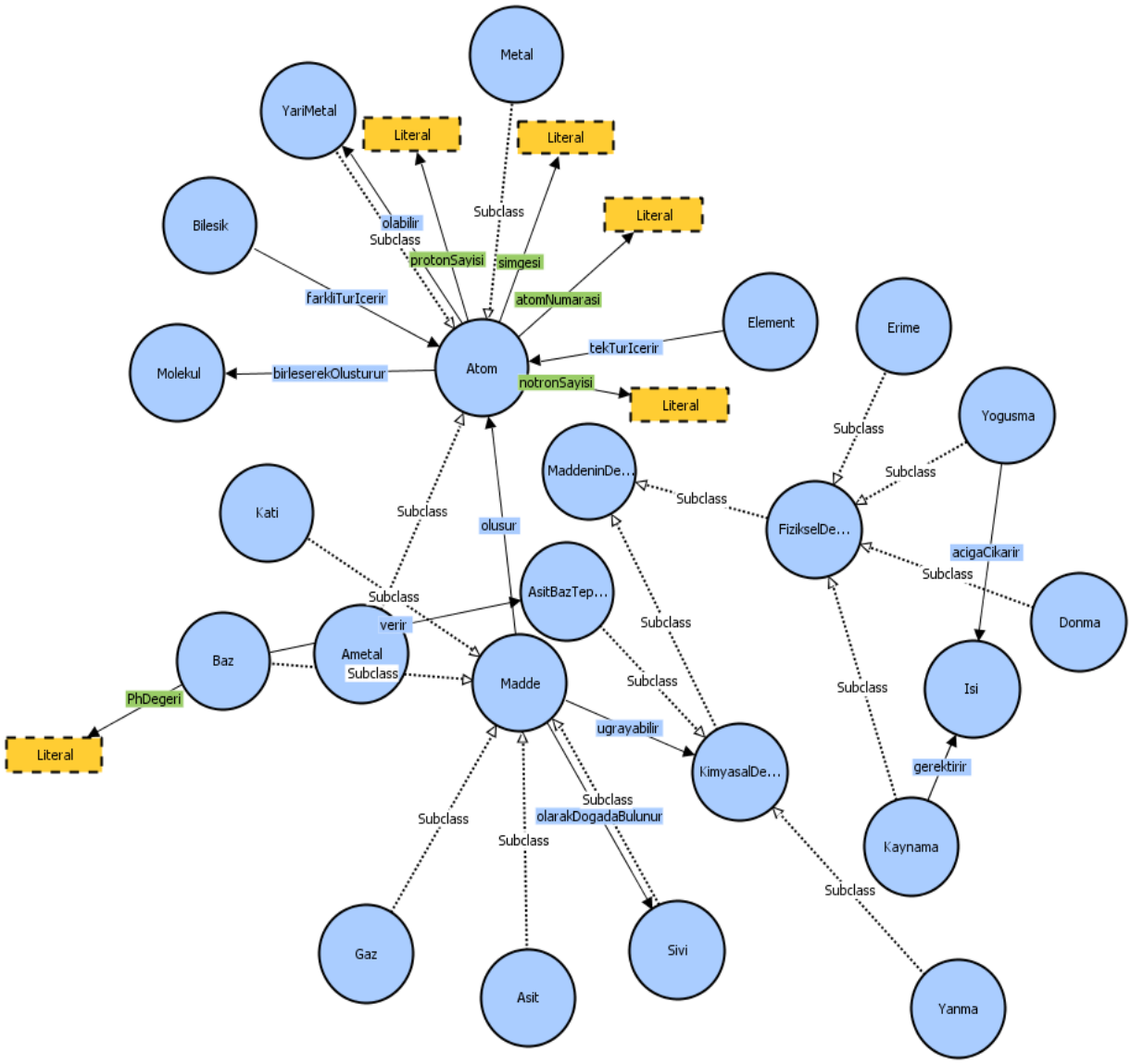

Figure 5: A concept map created using protégé ontology editor

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ELASTIC FOUNDATION EFFECTS ON THREE DIMENSIONAL ARCH DAMS

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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.

Introduction

It is not possible that continuing life without water. Therefore, humanity have efforted to situate around water resourses from past to now. On the other hand, settlements away from water supplies were not available every time and every place to water. Because the settlers needed to water storing and dams for drinking, using and irrigation in proceeded eras. Thanks to dams, producing hydro-electric power is a significant place at the world today also. On the other side, enabling flood control supplies safety areas of settlement to downstream, agriculture and industry. Also, dams regulates regime of flow and average of downstream flow even dry seasons.

In our country dams which have been builted up until now, consist of %75 earthfill dams, %17 rockfill dams and only %2 arch dams . Arch dams transfer pressure of water to slopes via arch. Arch dams have thinner sections than compare with concrete gravity dams and it causes saving concrete. Generally, arch thickness has to be smaller than %60 height of arch. When the thickness of arch section rises, arch gravity and concrete gravity dam must be considered (Ozsoy, 2007). Constructing of arch dam is more beneficial to produce water energy if only suitable valley status and foundation ground conditions are available. However, disadvantage of arch dam is that analyses and design process are more complex than other alternative dam types. Besides, qualification of the slopes must carry the effect is obligatory. To construct an arch dam, valley must have high potantial bearing capacity of foundation and slopes.

At first these dam types were built with stone wall or cut stone after producing concrete, they are planned as a concrete. Collapse ratio of arch dams is less than all other dam types (Ağıralioğlu, 2005).

Eeffect of Forces on Arch Dams

The most important factor of arch dams projects is that calculation of effect forces on dams is determined truly. Effected forces on arch dams;

1) Self weight of arch dam
2) hydrostatic water pressure
3) hydrodynamic water pressure
4) change of temperature
5) equivalent seismic load
6) silt pressure
7) ice pressure
8) wind pressure
9) wave pressure

Model and Analysis Stages

Three dimensional finite element model of arch dam was planned by SAP 2000. Following stages were monitored while creating model by SAP 2000.

1) Three dimensional solid geometrical model was created by SAP 2000.
2) Material properties of the model was assigned (concrete, weight per unit of volume, poission's ratio, compressive strength, tensile strength, elasticity modulus)
3) Dam body and foundation properties were defined.
4) Foundation and slopes were performed as fixed support or pin support according to firm soil or weak soil
5) Combinations of load and loads used for analyses were defined.
6) Records of acceleration components used for time history analysis were done.
7) Analysis were solved under records of strong motion and self weight dam.
8) Maximum and minimum principal stresses and displacements occured on dam body were determined.
9) Dimensioning were evaluated according to analysis results.

Method

In this study, finite element method was used for modelling and analysis. Dam body was divided 204 finite elements. Size of finite element mesh was selected as small as possible in order to get realistic results. Analysis type is linear, loading type is time history, the time history type is modal. Time history analysis method can be used in order to calculate more correct values of displacements, stresses and shear forces. Time history earthquake analysis is used to avoid from many limitations response spectral and investigate buildings under ground motion effects.

When finite element mesh of dam foundation were created, soil-structure interaction and shape of slopes were taken into account. Soil depth from dam base is 120 m. Three dimensional finite element model of 3. type dam comprises of eight nodal elements. Three degree of freedom was defined every nodal point as displacements of directions x, y and z. Three dimensional finite element model has 263 nodal points and 204 number of solids. Linear analysis performed on time history, archs component of dam is assumed monolitic, homogen and isotropic under ground motion. Nodal points where join points of concrete blocks were ignored. Acception of rigid foundation makes solution of dam-foundation interaction problems easy. In the case of dam settlement upon a rock area or extra hard soils, assuming foundation as a rigid may provide more sufficient results. However, if strength of foundation ground is low, assuming foundation as a rigid contrary solutions occured.

Based on finite element method of arch dam analysis programs takes into account massless foundation condition (Tan, 1995). Dam foundation size must be one or two times of dam height provides sufficient approach on downstream and upstream parts of dam. The farest boundary nodal points of foundation rock, which were used finite element method, are assumed to be fixed. The main idea of massless foundation assumption is preventing resonance at the low frequencies obtained from dam-foundation system (Dowling, 1987). Disadvantage of this approach is that damping of material and propagation are not considered. A dynamic analysis must include these dampings because of the load effection on dam. Five different soil parameters were determined to sand stone using required resources. Soil models were categorized. Young's modulus, poission ratio and weight densities were determined. According to real acceleration datas tensile behaviour and displacements of soil were investigated.

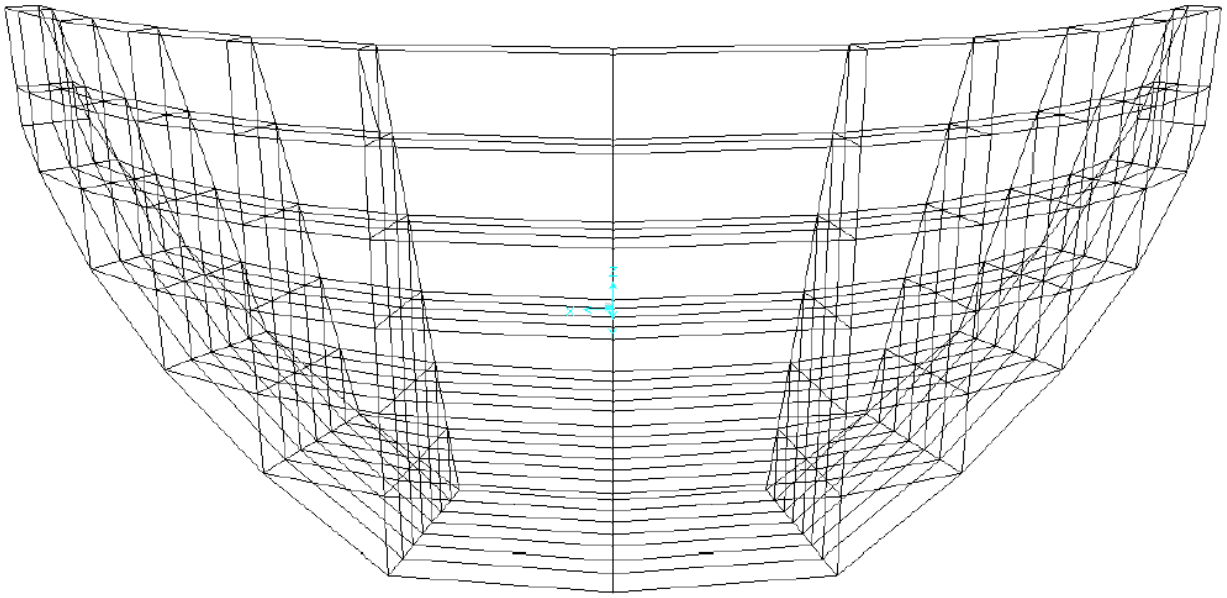


Figure1. In the event embedded foundation that finite element mesh of three dimensional arch dam

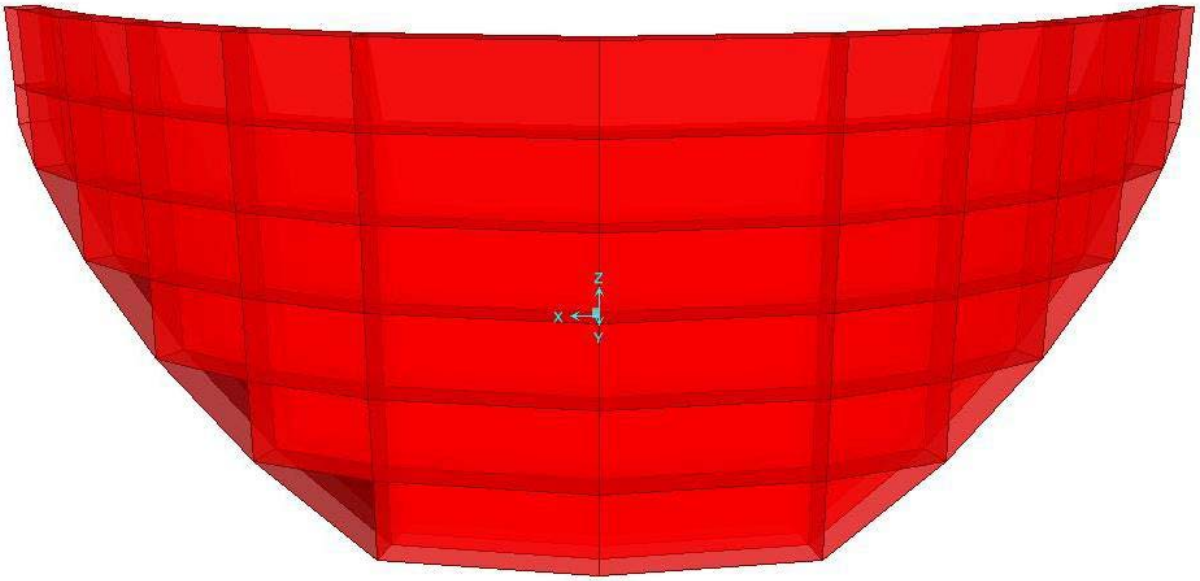


Figure 2. Finite element model of three dimensional type 3 arch dam

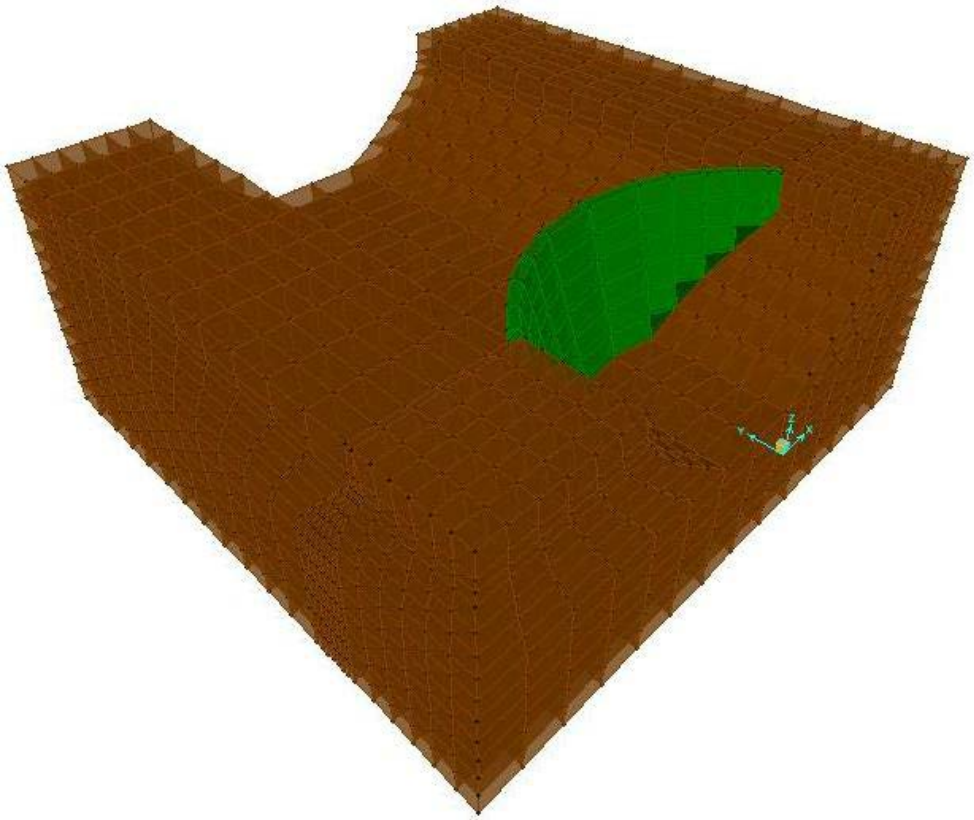


Figure 3. Model 1 three dimensional finite element model of arch dam-foundation

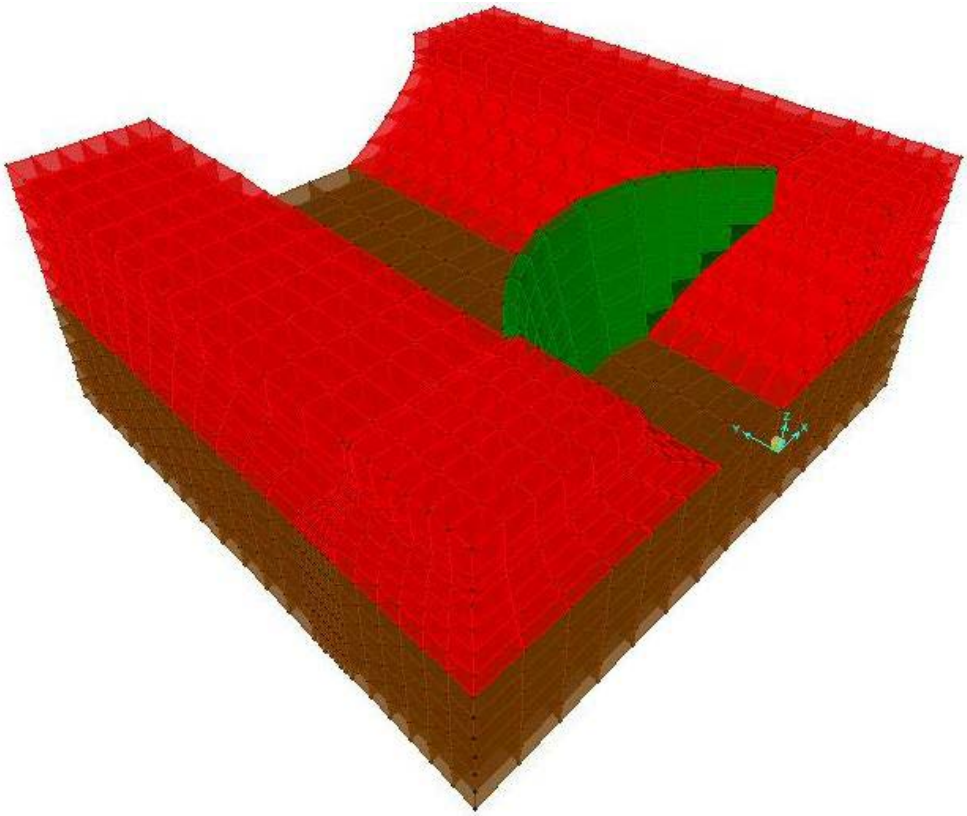


Figure 4. Model 2 three dimensional finite element model of arch dam-foundation

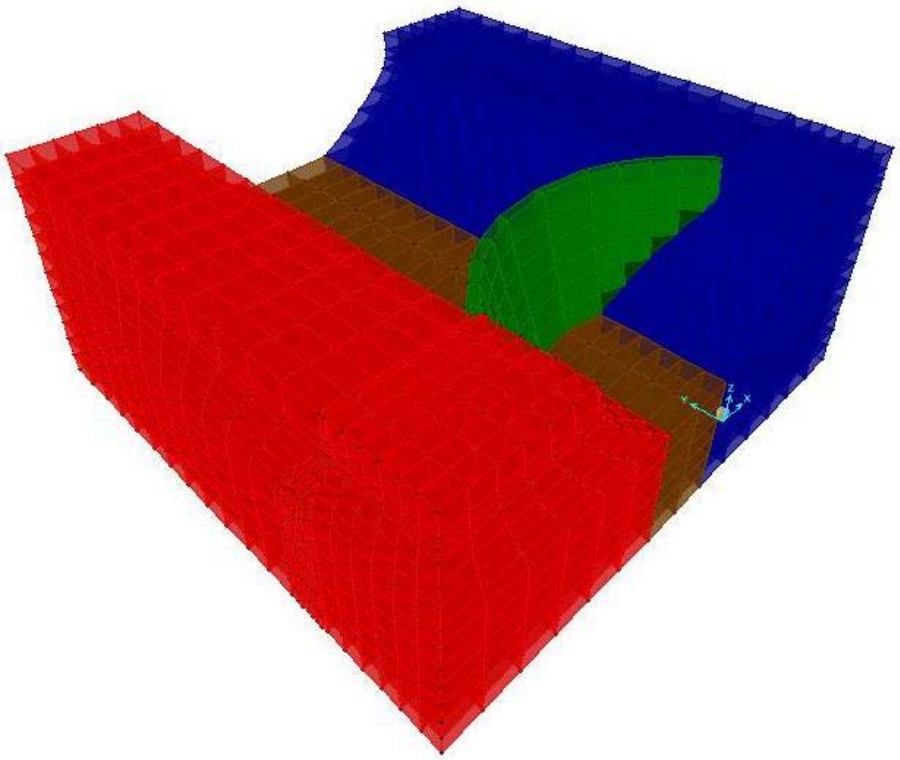


Figure 5. Model 3 three dimensional finite element model of arch dam-foundation

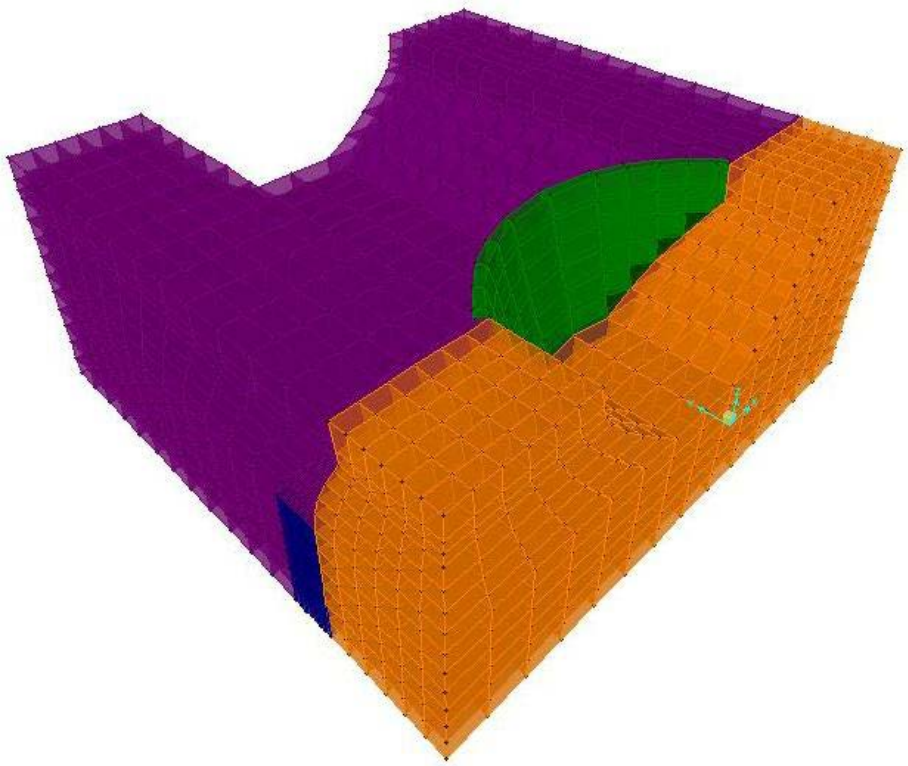


Figure 6. Model 4 three dimensional finite element model of arch dam-foundation

Static Analysis

Static analysis was done for empty reservoir, as a three dimensional rigid and elastic foundation conditions were taken into account. Displacements and principal stresses obtained from downstream and upstream faces were investigated throughout dam height.

Dynamic Analysis

Acceleration-time spectrum obtained by Housner was used to investigate behaviour of an arch dam to earthquake. Earthquake force were actted on dam west-east, north-south and up directions. % 5 damping ratio was used in calculations. First thirty seconds of earthquake takes into account since the time of solution analysis too much time. Linear analysis was conducted by Newmark method and step by step integration technique. 0.1 second was selected time step for integration. The analysis was done for empty reservoir situation. First six mods were taken into account natural frequency and mods of dam under hydrodynamic influence.

Linear Analysis of Arch Dams in Time-History

3. type of double curved arch dam was analyzed under several loadings. Three dimensional linear dynamic analysis was executed by taking into account different ground motions and self weight. After arch dam model was composed, identification loads, material properties of soil and dam concrete were defined. Analysis was conducted for different soil types, ground motion and empty reservoir condition. Modeling of foundation was created as sound or rigid rock and poor bearing soil. Empty reservoir condition was investigated to take into account self weight, different ground motion and soil types

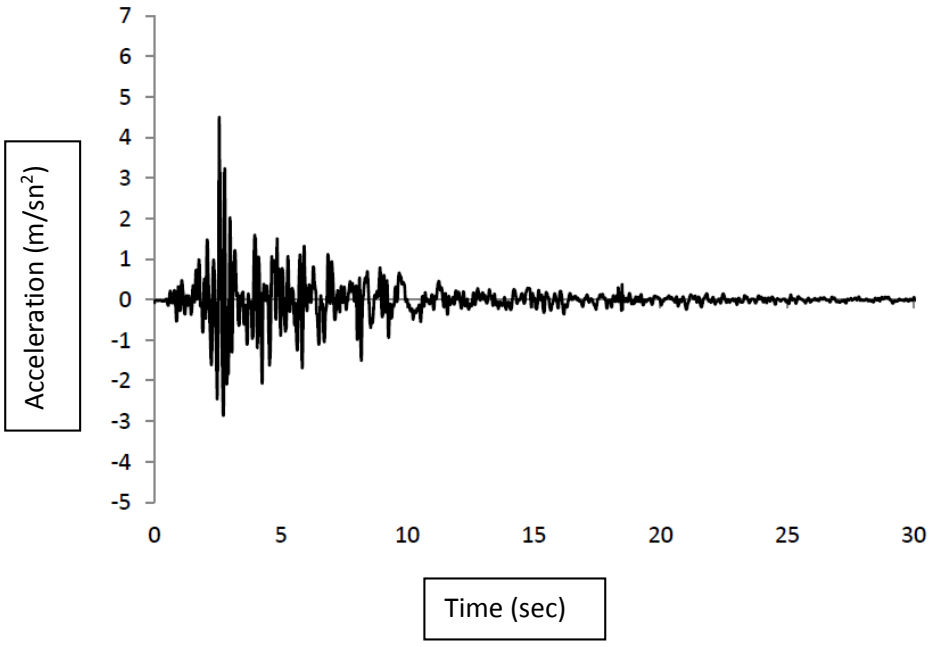
Figure7. Evaluated analysis results of nodal points on dam body shape

Table 1. Determined loading conditions according to different ground motion which used in dynamic analysis

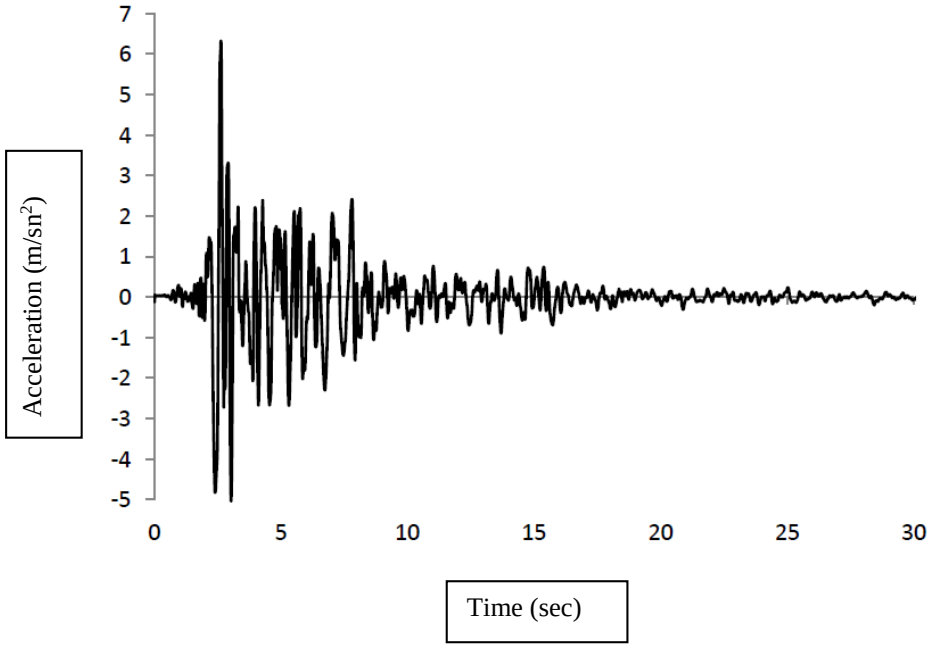
Loading Condition	Group Name	Dynamic Loading Groups
1	Near Fault	Diffirent Ground Motion
2	Far Field Fault 1	Diffirent Ground Motion
3	Far Field Fault 2	Diffirent Ground Motion

Table 2. Different ground motions and properties used in the linear analysis on time history

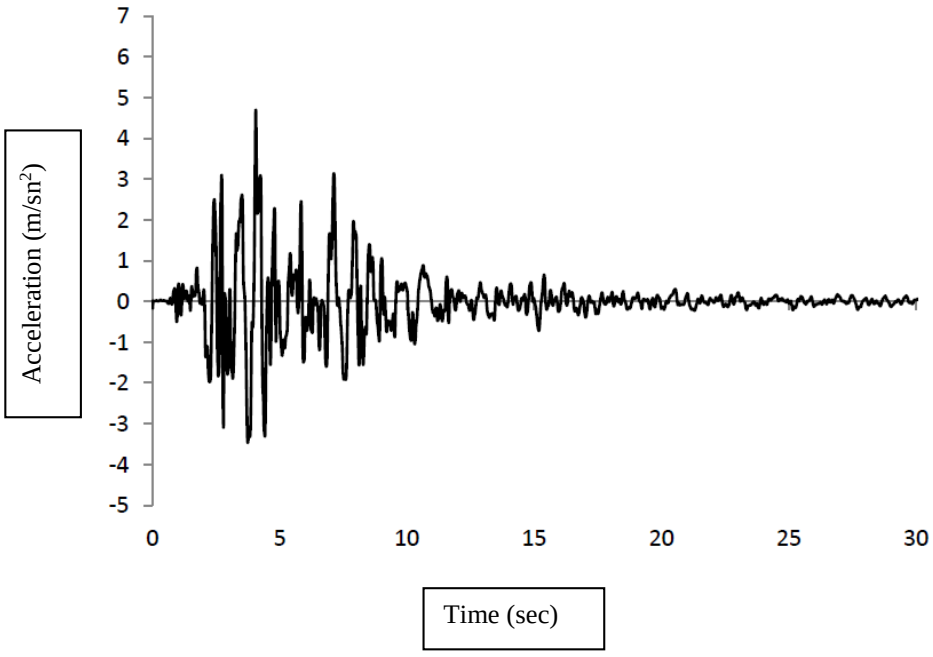
Faults	Components	Moment Magnitude	Ground Velocity (cm/s)	Ground Acceleration (g)	Focal Distance (km)
Near Fault	North-South	6.9	17.7	0.455	5.1
	East-West		55.2	0.644	
	Up		45.2	0.479	
Far Field Fault 1	North-South	6.9	5.6	0.115	24.2
	East-West		16.4	0.226	
	Up		16.6	0.323	
Far Field Fault 2	North-South	6.9	4.4	0.032	93.1
	East-West		17.3	0.124	
	Up		14.2	0.106	



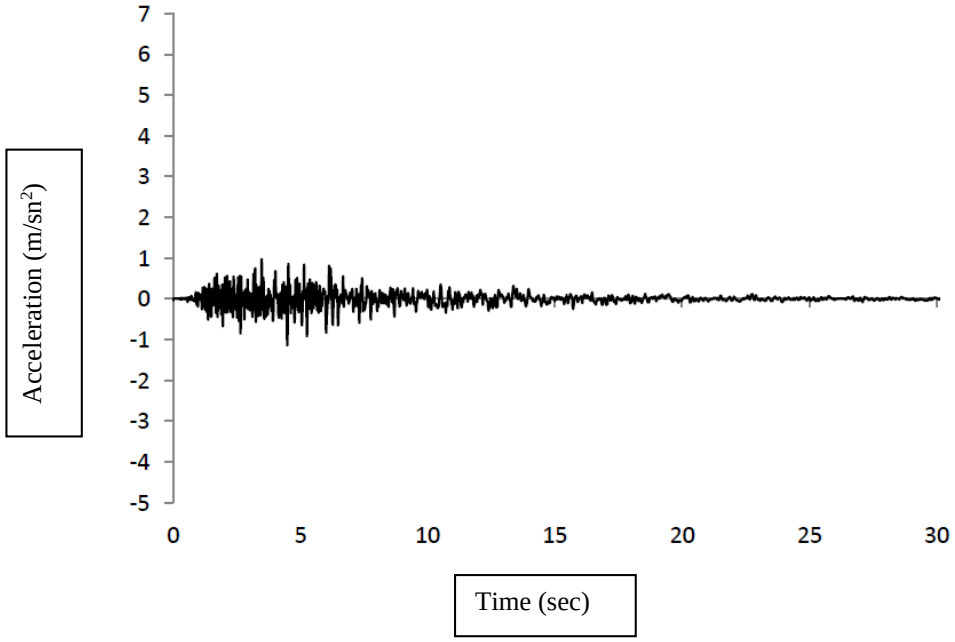
Graphic 1. Acceleration-Time graphic of west-east components of Loma Prieta Earthquake for near fault



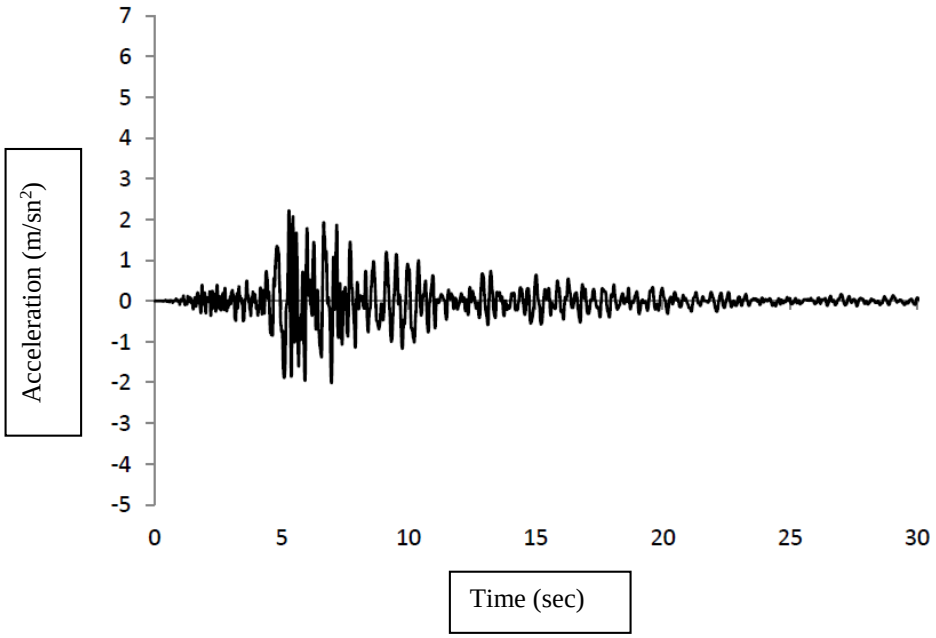
Graphic 2. Acceleration-Time graphic of north-south components of Loma Prieta Earthquake for near fault



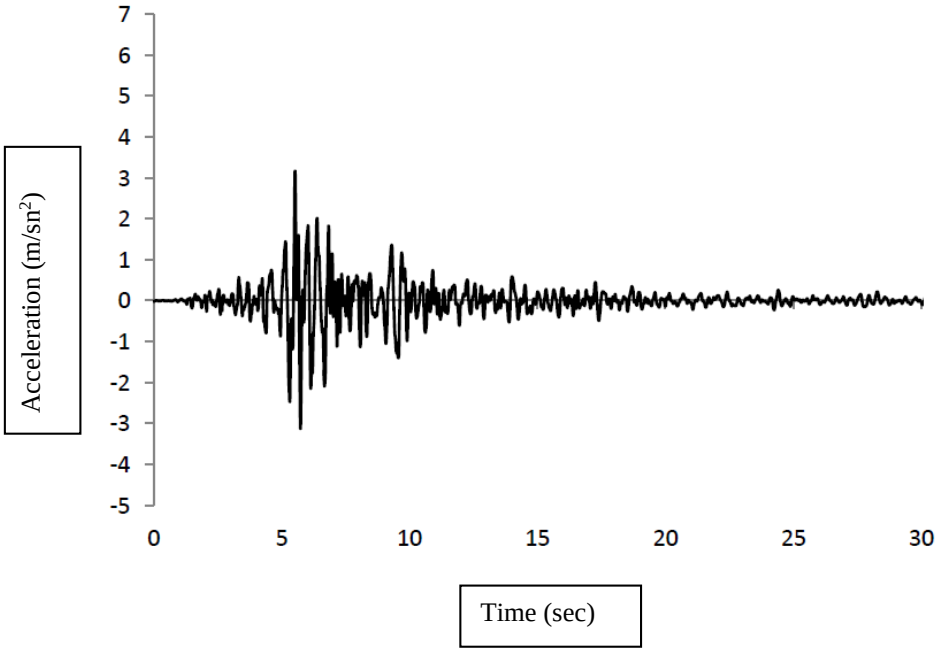
Graphic 3. Acceleration-Time graphic of up components of Loma Prieta Earthquake for near fault



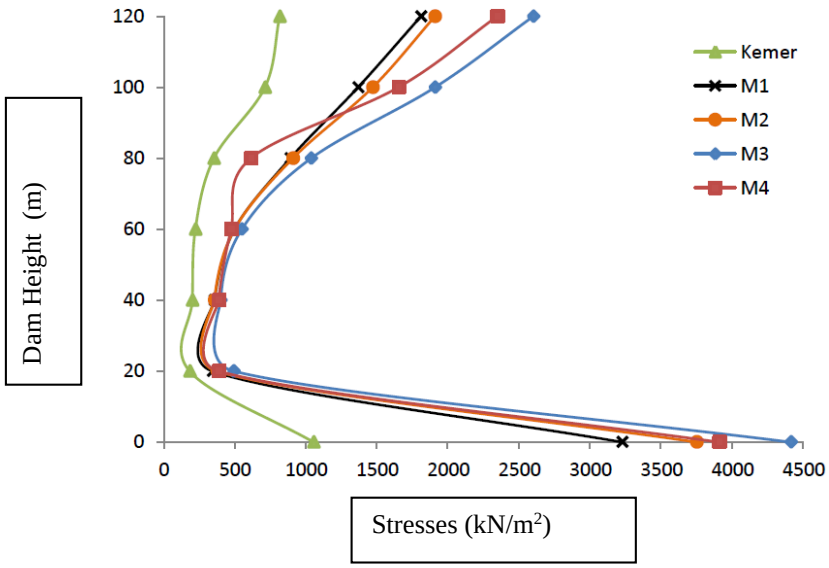
Graphic 4.Acceleration graphic of west-east component of Loma Prieta Earthquake for far field fault 1



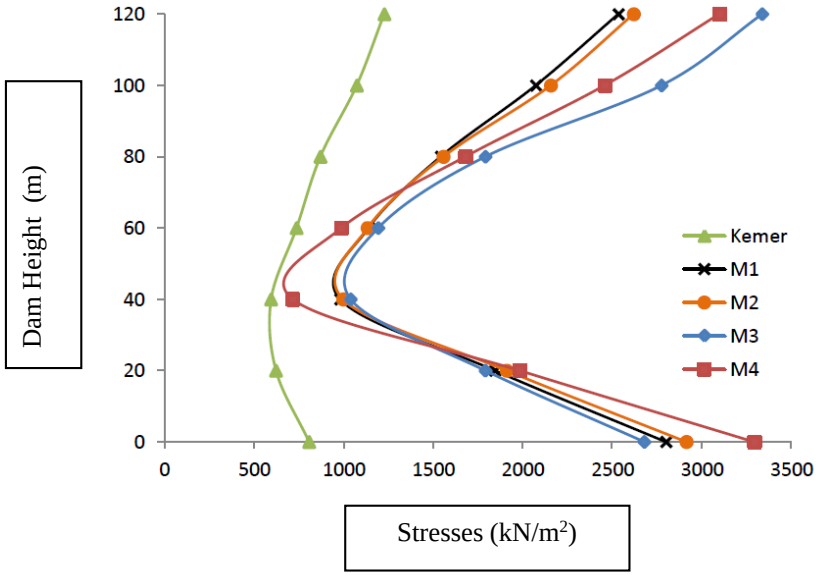
Graphic 5.Acceleration graphic of north-south component of Loma Prieta Earthquake for far field fault 1



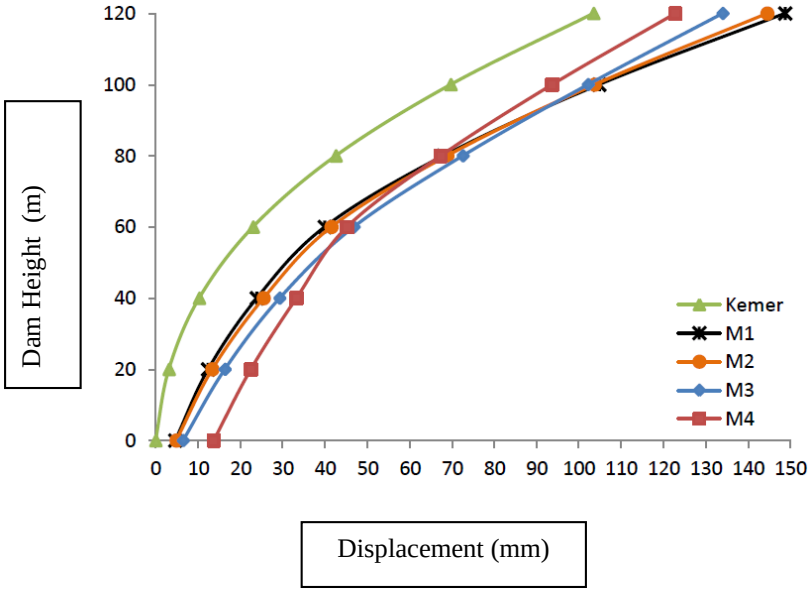
Graphic 6.Acceleration graphic of up component of Loma Prieta Earthquake for far field fault 1



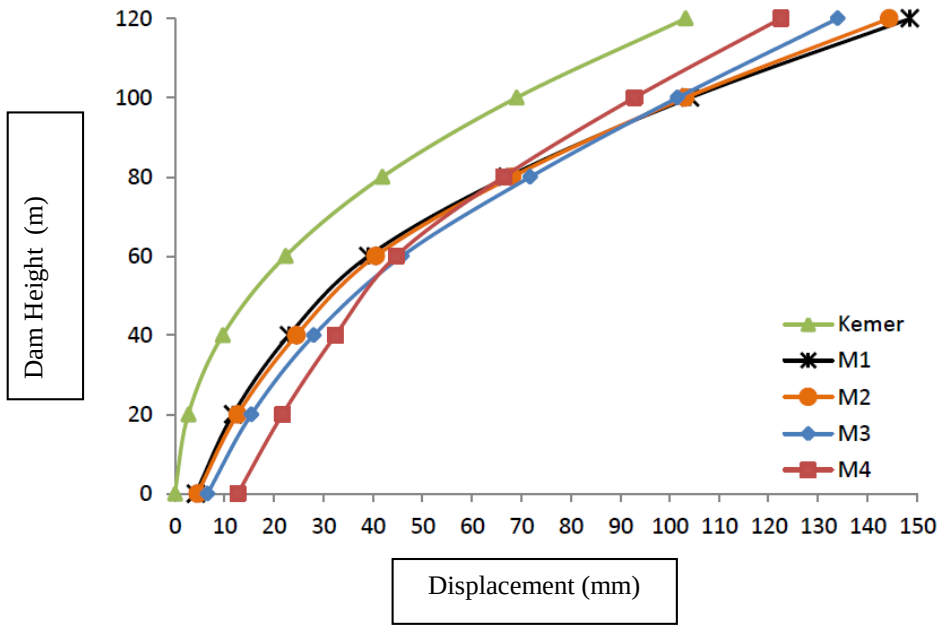
Graphic 7. Stresses changing throughout dam height on upstream face for empty reservoir condition



Graphic 8. Stresses changing throughout dam height on downstream face for empty reservoir condition



Graphic 9. Displacement changing throughout dam height on upstream face for empty reservoir condition



Graphic 10. Displacement changing throughout dam height on downstream face for empty reservoir condition

Results

Results of static analysis show that maximum displacements occured up direction. Maksimum displacement obtained from model 4. The worst unfavorable foundation and slopes conditions were designed at Model 4. The maximum tensile stress was occured at downstream side of Model 4's crest. Maksimum compression stress was occured approximately equal for all models. Maximum compression and tensile stress obtained from dynamic analsis is shown Model 3 which both slopes having different material properties. Tensile stress developed at downstream face of dam crest, compressive stress occured at upstream face of dam foundation. The biggest displacements took place at crest point in all static and dynamic analysis.

According to analysis, existence of soil affects dam behavior significantly. Therefore, dam-soil interaction must consider in static and dynamic analysis. Arch dam, which was projected according to linear analysis, must investageted to nonlinear analysis.

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EXPERIMENTAL INVESTIGATION OF DUCTILITY OF REINFORCED CONCRETE BEAMS STRENGTHENED WITH POLYPROPYLENE FIBERS

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Abstract: The purpose of this study is to research both the performance of the reinforced concrete beams without fiber and the performance of the reinforced concrete beams with fiber. For this purpose, the experimental load - displacement curves of beams were formed and the areas under these curves were compared. According to the results of this comparison, it is concluded that the reinforced concrete beams with polypropylene fiber are more ductile. The dimension of the used beam-samples for test in this study is 20x30 cm, their length is 200 cm and their scale is ½. The reinforced concrete reference-beams are produced as two items and the reinforced concrete beams with P-0.60 kg/m^3 polypropylene fiber are produced as three items.

Keywords: Polypropylene, Fiber-reinforced beams, Strengthening of the beams.

Introduction

The tensile strength and ductility of concrete is low. This weakness of concrete has emerged an idea “the concrete-strengthening with different fibrous materials”. For this purpose, different fibrous materials have been developed. One of these developed materials is a polypropylene fiber material. There are different studies about polypropylene fiber materials in the literature. These studies are given below in the following. Aktürk (2006) has researched the performance-characteristics of polypropylene fiber reinforced and self-compacting concretes. Altun (2006) has experimentally analyzed the effect of the steel fiber additive on the ultimate bearing capacity for the elements of reinforced concrete beams. Akkas (2010) has investigated the compressive strength-properties of polypropylene fiber reinforced concretes and half-lightweight concretes. Arazsu (2012) has researched the fresh and hardened concrete-properties of polypropylene fiber reinforced concretes. Açıkgenç (2012) has researched the strength and durability characteristics of polypropylene fiber reinforced concretes in the different mix proportion.

Materials and Methods

In this study, the polypropylene fibers are used to increase the tensile strength and ductility of the concrete. The reinforced concrete reference beams without fiber and the reinforced concrete beams with polypropylene fibers P-0.60 kg/m^3 were experimentally compared to each other in these experimental studies. The additive amount of polypropylene fibers P-0.60 kg/m^3 in this experimental study requires to be used at least 600 gr additive of polypropylene fibers for reinforced concrete beams in the size of 1m^3. Therefore, total 216 gr additive of polypropylene fibers was used for three items “reinforced concrete beams” in the size of 0.36 m^3. The load - displacement curves of reinforced concrete beams were obtained in these tests.

Properties of The Used Polypropylene Fibers In Tests

Polypropylene fibers are produced in a wide variety of dimensions. Their raw material is 100 % polypropylene. The produced varieties of these polypropylene fibers in length of 6 mm, 12 mm, 19 mm and 38 mm are less filamentous. The polypropylene fibers in length of 12 mm were used in this experimental study. The used fibers for research are provided by company İzmit BEKSA. These fibers are not produced in Turkey. They are currently produced by the company Dramix in Belgium. This company is represented by company BEKSA in Turkey.

Test Arrangement and Measuring Technique

The used experimental arrangement in this study is a bending test instrument. The load cell in capacity of 500 kN was used for this arrangement and the displacements were measured by 15- 20 cm LVDTs. The produced reinforced

concrete simple beams are supported at both ends and the weight is loaded as two items in the distance of L/3. The used LVDTs in test were placed as two items on the beam- supports and under the central part of the beam. (Fig. 1).

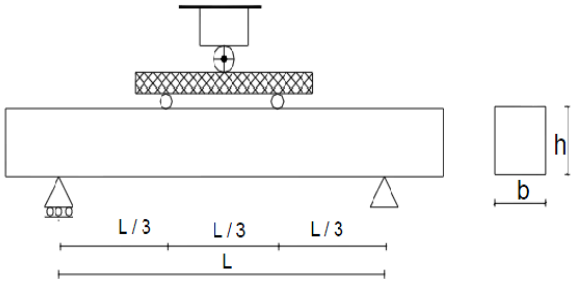

Fig. 1 Test Arrangement

Test Results

In this experimental study, two samples for reinforced concrete reference beam and three samples for reinforced concrete with P-0.60 kg/m^3 polypropylene fibers are produced. These produced beams were loaded with two items "P weight" from L/3 points and the loading has continued increasing 10 kN to the yield load from scratch. After yield load, the weight was loaded to form a deflection with the addition of 1cm. This loading is continued to collapse-load. Later the load - displacement curves were drawn with the program TDG CODA. The charts of obtained results were drawn with Excel program.

Showing of Average Values of Reinforced Concrete Reference-Beams (A,B)

The weight was loaded increasing 10 kg Newton from scratch to the reinforced concrete reference beams (A,B) and they began to crack on average 40.45 kN. The loading was continued and the yield load was reached at 167.10 kN. Maximum load and displacement was the value of 166.70 kN and 62.68 mm. According to the average of two concrete reference beams in this experimental study, the following chart was drawn (Fig. 2-4).

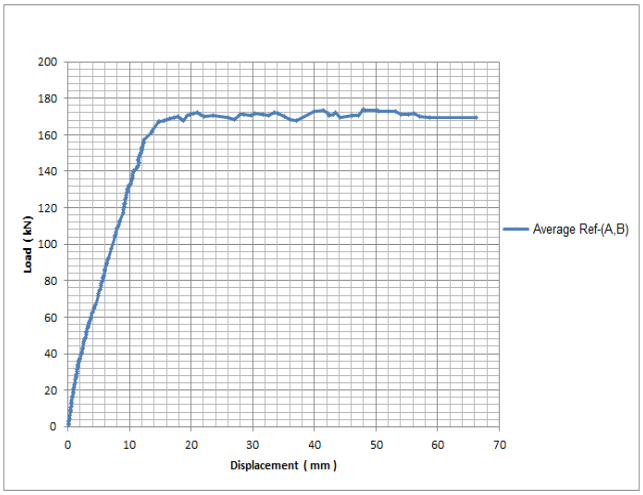

Fig. 2 The Average Load - Displacement Curve of The Reinforced Concrete Reference Beam (A,B)

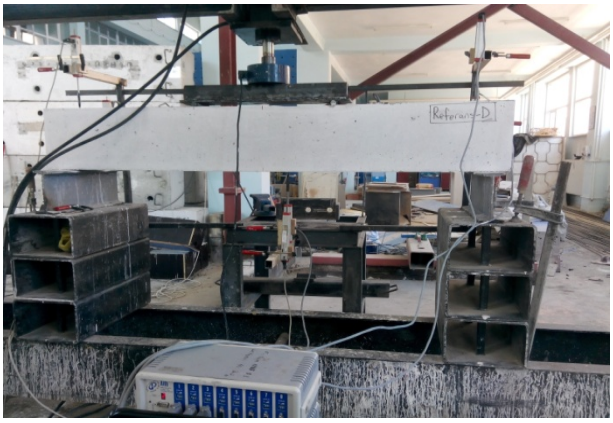

Fig. 3 The Situation of Reinforced Concrete Reference Beam (A) before loading

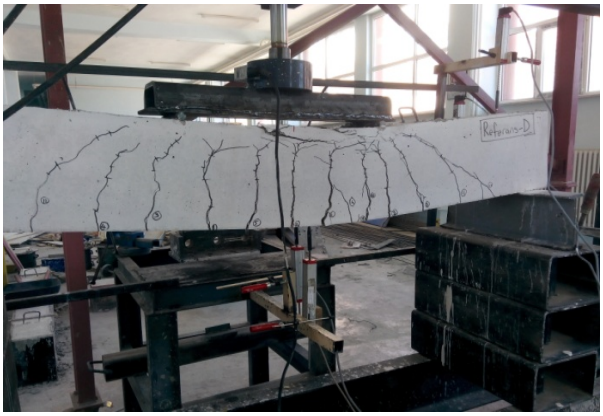

Fig. 4 The Collapse Situation of Reinforced Concrete Reference Beam (A)

Showing of Average Values of Reinforced Concrete Beams With Polypropylene Fiber P-0.60 kg/m^3 - (A,B,C)

The additive amount of polypropylene fibers P-0.60 kg/m3 in this experimental study requires to be used at least 600 gr additive of polypropylene fibers for reinforced concrete beams in the size of 1m^3. Therefore, total 216 gr additive of polypropylene fibers was used for three items "reinforced concrete beams" in the size of 0.36 m^3. The weight was loaded increasing 10 kg Newton from scratch to the reinforced concrete reference beams P-(A, B, C)- 0.60 kg/m^3 and they began to crack on average 50.73 kN. The loading was continued and the yield load was reached at 154.43 kN. Maximum load and displacement was the value of 170.67 kN and 62.00 mm. According to the average of three reinforced concrete beams-P-0.60 kg/m^3 in this experimental study, the following chart was drawn. (Fig. 5-7).

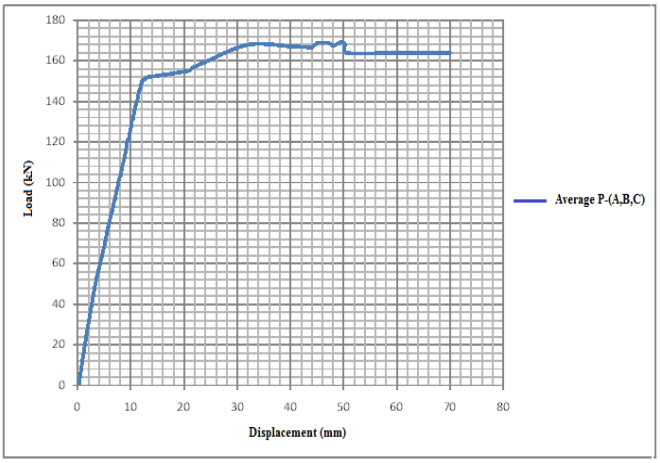

Fig. 5 The Average Load-Displacement Curve of The Reinforced concrete P–0.60 kg/m^3 Beam (A,B,C)

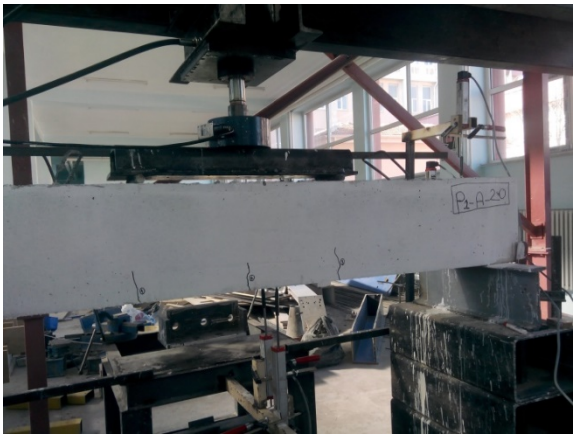

Fig. 6 The Situation of Reinforced Concrete P–0.60kg/m^3 Beam (A) before loading

Fig. 7 The Collapse Situation of Reinforced Concrete P–0.60 kg/m^3 Beam (A)

The chart comparison of P-0.60 kg/m^3 – (A,B,C) and reference (A,B) beams

In this study, three items "Reinforced concrete beams with polypropylene fiber P-0.60 kg/m^3" and two items "Reinforced concrete reference-beams" are produced. According to their average, the following charts were drawn. As shown in the following chart of these two beams, the yield-strength of reinforced concrete reference-beam is higher and more ductile than the yield-strength of reinforced concrete beam P-0.60 kg/m^3-(A,B,C). However, the maximum displacement values of results are close to each other (Fig. 8).

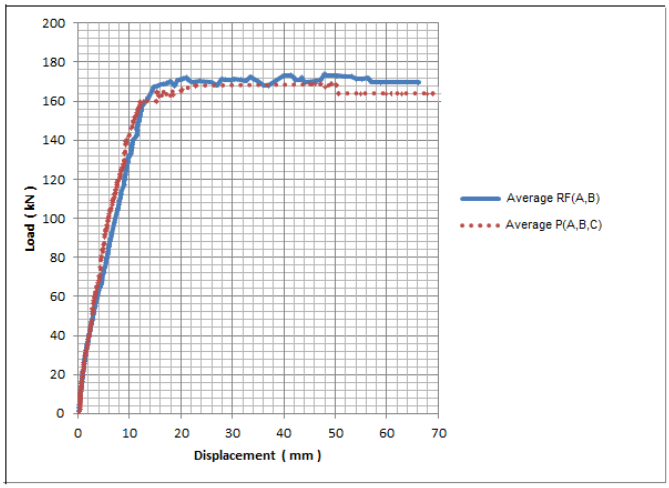

Fig. 8 The Average Load - Displacement Curve of P-0.60 kg/m^3– (A,B,C) and Reference (A,B) Beams

Conclusion

According to experimental research in this study, two items "reinforced concrete reference beams without fiber" and three items "reinforced concrete beams with polypropylene fiber P-0.60 kg/m^3" are produced. Dimensions of the produced reinforced concrete beams are 0.20x0.30 m^2, their length is 2m and their scale is ½. The reinforced concrete beams were loaded with two items weight from L/3 point in the experimental researches and the displacements were measured from the middle of beam. According to these measurements, load-displacement curves of reinforced concrete beams were drawn. Then energy absorption capacity and ductility of reinforced concrete beams are learned and the results were compared to each other. According to this comparison, energy absorption capacity of reinforced concrete reference beams is higher than energy absorption capacity of reinforced concrete beams with polypropylene fiber P-0.60 kg/m^3 and ductility of reinforced concrete reference beams is lower than ductility of reinforced concrete beams with polypropylene fiber P-0.60 kg/m^3. While the energy absorption capacity and ductility coefficient of reinforced concrete reference beams are in turn 9912 kNmm and the value of 4.71, the energy absorption capacity and ductility coefficient of reinforced concrete beams with polypropylene fiber P-0.60 kg/m^3 are 10076 kNmm and the value of 5.83. The energy absorption capacity of reinforced concrete reference beams with polypropylene fiber P-0.60 kg/m^3 is higher % 2 than energy absorption capacity of reinforced concrete reference beams and ductility of reinforced concrete beams with polypropylene fiber P-0.60 kg/m^3 is higher % 23 than ductility of reinforced concrete reference beams. According to these results, it is concluded that the reinforced concrete beams with polypropylene fiber P-0.60 kg/m^3 are more ductile and their earthquake performance is better.

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FRICTION AND WEAR PERFORMANCE OF HIGH DENSITY POLYETHYLENE / STYRENE - BUTADIENE RUBBER POLYMER BLENDS

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Abstract: In the present work, the friction and wear property of high density polyethylene / styrene - butadiene rubber polymer blends was studied. SBR addition in the HDPE was 5, 10, 15, and 20 wt. In this study indicate that HDPE / SBR polymer applied to the abrasion test indicate that road and load values to increase the effect of wear, but this effect by increasing the rate of SBR additives lead to a reduction in wear is observed that value as %. The result showed that the addition of fillers to the composite changed the friction coefficient and wear rate.

Keywords: Friction, high density polyethylene, polymer composites, SBR, wear

Introduction

Polymeric materials have been replacing metallic materials used as friction wear parts for many years. It is often found that, however, the single unmodified polymer could not satisfy the demands arising from situations where a combination of good mechanical and tribological properties is required [Huang, 20071]. Tribology is the science that deals with design, friction, wear and lubrication of interacting surfaces in relative motion [Institute of Composite Materials, 1998]. A scientific understanding of the mechanism of friction and wear is still lacking, because wear is complex phenomenon and its mechanism depends on many parameters like the chemical and physical properties of polymer, composition, load, velocity etc. [Chen, 2006]. Wear and friction properties of the polymer composites are investigated in tribological field.

Table 1. Mechanical properties of HDPE-SBR polymer composites [Ersoy, 2013]

Samples	Elasticity Modulus (MPa)	Yield Strength (MPa)	Tensile Strength (MPa)	Elongation at Break (%)	Hardness (Shore D) (m^2)	Izod Impact Strength (kJ)
%100 HDPE	314.596	25.46	25.814	274.132	55.9	17.76
HDPE/SBR (%90-10)	263.052	20.042	20.792	15.172	53.4	45.78
HDPE/SBR (%80-20)	206.464	17.276	18.208	16.604	50.7	53.44
HDPE/SBR (%70-30)	199.626	15.074	15.992	17.336	44	58.06
HDPE/SBR (%60-40)	160.326	11.518	12.366	18.344	39.8	60.48

Methods

In this study used HDPE as YY (I 668 UV) and SBR polymer and their compose blends. Its specific gravity is 0.938 g/cm3. melt flow rate (190 ºC /5.0 kg) is 1.0 g10/min. These were composed at 10 min.. 180-220 ºC at 20-30 bar pressure and a rotation rate of 30 rpm by Microsanco-rotating twin-screw extruder. Injection temperature was 180-220 ºC. 110-130 bar. 10 s. The composite dried at 105 ºC for 24 hours after extrusion. These composite was produced five different ratio as 10. 20. 30 and 40 of percent of SBR fillers. Mechanical properties of HDPE-SBR polymer composites were at Tab. 1 [Ersoy, 2013].

Static and dynamic coefficient of friction test was done according to the ISO 8295 method. The dimensions of the tested specimens were 80x200x4 mm and the dimensions of the sled specimens were 63x63x4 mm. Speed was selected as 100 mm/min. The static coefficient of friction was determinate with standard dynamic frictional force using the equation.

The wear tests were done according to the DIN 53 516 method with Devotrans DA5 abrasion test equipment. The friction coefficients and wear rates reported in the present study were the averages of at three

measurements. The thickness of the test specimens was 7.0 mm and diameter was 15.5 mm. The mass loss of the specimen was measured after the wear test in order to calculate the specific wear rate.

Results

Obviously the tribological processes involved in this investigation are complex. The effects of applied load sliding distance and fillers content on the tribological behaviors of HDPE and its composites were examined. The values of sliding distance-wear loss relationship were obtained and are shown in figure 1 where it seems that the wear loss for various specimens sliding distance against the sand paper (#60) under 10 N load and 0.32 m/s abrasion speed which inhere to applied load-wear loss relationship (Fig. 1).

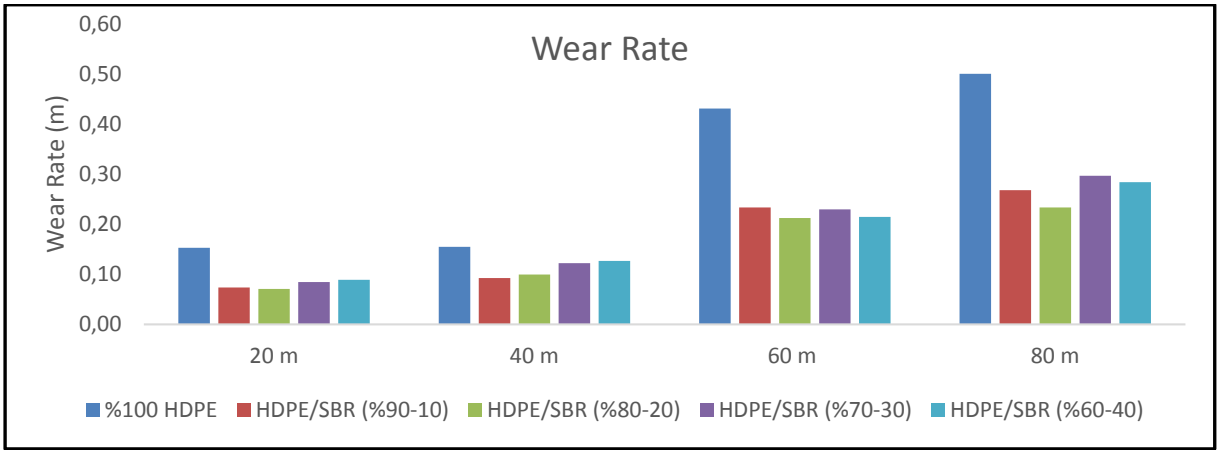

Figure 1. Effect of sliding distance (m) in wear rate.

The process was more than 40 m and the load was more than 10 N. the wear loss began to decrease slightly. At Fig. 1 which shows wear rate of polymer composite SBR contribution has led to decrease. SBR contribute has critical load on wear rate of HDPE. HDPE/SBR has a low mechanical strength which are easily deformed. The contact area and wear loss of the counterpart are proportional to applied load. But other side. the less deformation of the composite. The smaller friction force and wear loss of the friction counterpart is due to the increase contact area between the friction counterparts.

Applied load-wear loss relationship of HDPE polymer composites which is shown at Fig 2. According to the graphic; SBR contribute cause to decrease of the pure HDPE which could be attributed to the good adhesion between elastomers and polymer matrix. At graphic; 5N load had not effect on wear rate for all samples.

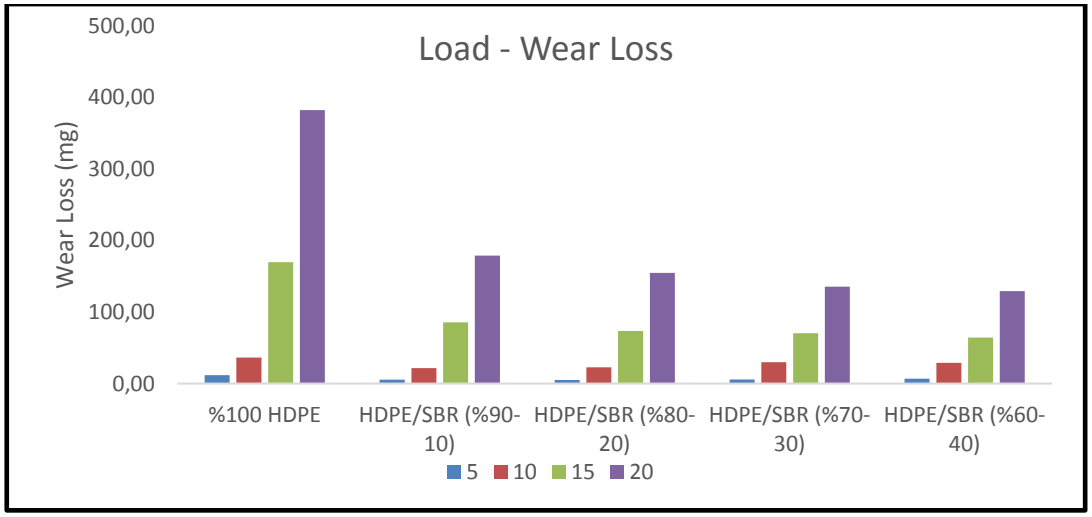

Figure 2. Applied load-wear loss relationship of HDPE polymer composites

They were examined 10 N loading. Here we identified that SBR contribute cause to decrease to wear rate. While 15 N loading had to increase of pure HDPE wear rate. But the effect was limited because SBR contribute failed suddenly this factor. At least 20 N loading increases to pure HDPE wear rate where this effect peak to very

high. SBR contribute led to increase same. but this rising was not as pure HDPE. The low level of filler may decrease the hardness of the matrix and bonding strength between the elastomer and polymer matrix. SBR contribute being pulled out and reduced the wear rate. Therefore. SBR was suitable for the high load tribological application.

According to the results of the wear rate of HDPE/SBR polymer composites at different loads and sliding distances.

SBR elastomer is soft and same is a polymer with viscoelasticity and very weak intermolecular forces generally having low Young's modulus and high failure strain compared with other materials. In these composites. the adhesive would be good on HDPE surface. In this case HDPE / SBR blend which could increase the wear rate of the composites. So. a high level of the filler led to decrease to wear rate of the composites. SBR contribute was suitable for tribological application for HDPE matrix.

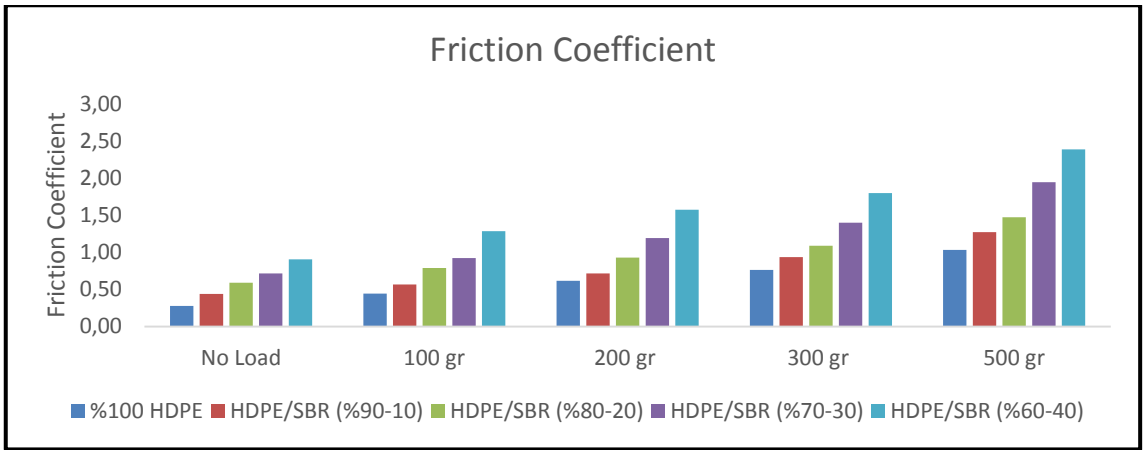

Figure 3. Friction coefficient for various specimens sliding under load.

Fig. 3 shows that the friction coefficient for various specimens sliding under load and in this step was applied to different speed. It is seen that the static friction coefficients of the HDPE/SBR polymer composites were upper than that of the pure HDPE generally. Firstly unload force was applied to composite and the friction coefficient is increase. These increase was up with SBR contribute. This situation has continued to increase with the increase of load similarly. Based on these result the loading had a great effect on the static and dynamic friction coefficient of the composite. As the load increases the friction coefficient of all kinds of composites increases. The bonding strengths between the HDPE matrix and SBR elastomers fillers changed with the content of the fillers which accounted for the differences in the tribological properties of the HDPE filled with the varied content fillers. The tribological properties of HDPE composites blend SBR and its variety was studied at different loads and distance under dry sliding.

Conclusion

The toughness of the composites resulted from the strong interfacial adhesion between elastomer contribute and high density polyethylene matrix. The wear loss of HDPE and its composites with decreasing load force and distance. With the addition of fillers to the composite the wear rate and friction coefficient significantly and clearly changed. The composites filled with a low level content of fillers showed augment to wear rate. While the composite with a high level content of fillers had lower wear rate.The sliding distance and applied load had a great effect on the wear rate of composites. The applied load is a more significant parameter than the sliding speed. The bonding strengths between the polymer matrix filler rate and hardness which accounted for the differences in the tribological properties of the composite filled with the varied content fillers. The results showed that the coefficients of friction reduce linearly with the load increase for HDPE and its composites.

Acknowledgement

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LOW COST WIRELESS SENSOR NETWORKS FOR ENVIRONMENT MONITORING

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Abstract: Wireless Sensor Network (WSN) is one of the emerging technologies which combine sensors and tiny embedded devices over a wireless communication medium nowadays. WSNs gather information from the environment by measuring mechanical, thermal, biological, chemical, optical or magnetic incidents and transmit the collected information from sensor nodes to a sink node. However there are many sensors nodes which can be commercially sold in the markets, these nodes cost high prices and low cost and easy to build up sensor nodes are needed in low budget applications. The aim of this study is to create a low cost wireless sensor network for environment monitoring by using Arduino Platform. In accordance to this aim, Arduino Uno R3 modules are used as wireless sensor network motes. Moreover, to collect data from nodes and communicate between our sensor nodes, a low cost radio transceiver called NRF24L01+ is used for the wireless communication. In to monitor environment, four kinds of sensors (temperature, humidity, carbon monoxide and methane) suitable for Arduino platform selected. In addition, the collected sensors data is displayed to users with a developed windows application by using Visual Studio.Net Platform.

Keywords: Wireless Sensor Networks, Sensor Motes, Arduino.

Özet: Kablosuz Algılayıcı Ağlar (KAA) almaç (sensör) ve küçük boyutlu gömülü aygıtları kablosuz bir iletişim ortamında birleştiren ve günümüzde gelişmekte olan teknolojilerden biridir. KAA mekanik, termal, biyolojik, optik veya manyetik olayları ölçerek ortamdan bilgi toplarlar ve topladıkları bu bilgileri kablosuz iletişim ortamı aracılığıyla yönetici aygıta aktarırlar. Günümüzde çok sayıda ticari olarak satılmakta olan kablosuz algılayıcı aygıt olmasına rağmen ticari olarak bu cihazların satın alma maliyetleri yüksek ve düşük maliyetli ve kolay oluşturulabilir kablosuz algılayıcı aygıtlara ihtiyaç vardır. Bu çalışmanın amacı, çevrenin izlenmesi için Arduino platformu kullanılarak düşük maliyetli kablosuz algılayıcı aygıtlardan oluşan bir ağ oluşturulmasıdır. Bu amaç doğrultusunda, Kablosuz algılayıcı aygıtları oluşturmak için Arduino Uno R3 modülleri kullanılmıştır. Aygıtların kablosuz olarak birbirleri arasında iletişim kurması ve aygıtlardan gelen verilerin toplanması amacıyla, düşük maliyetli NRF24L01+ radyo modülü kullanılmıştır. Çevrenin izlenebilmesi için dört çeşit (sıcaklık, nem, karbon monoksit ve metan) Arduino uyumlu almaç seçilmiştir. Almaçlardan toplanan bilgilerin kullanıcılara gösterilmesi amacıyla Visual Studio.Net platformunda bir bilgisayar programı geliştirilmiştir.

Anahtar Kelimeler: Kablosuz Algılayıcı Ağlar, Sensör Aygıtları, Arduino.

Introduction

In recent years, Wireless Sensor Networks (WSNs) are getting popular in observing the physical world, monitoring the hostile environment and tracking systems. WSN implementations are used in various applications in the literature for instance monitoring habitat, volcanic eruption, battlefield surveillance, vehicle tracking and detection, and monitoring inaccessible or wild environments (Akyildiz, I.F. et al., 2002). WSNs gather information from the environment by measuring mechanical, thermal, biological, chemical, optical, and magnetic phenomena (Yick J et al., 2008).

A WSNs consist of sensor nodes and one or more manager nodes (Hussain F. B., 2008). The number of the sensor nodes varies based on the WSN applications. There are two main steps in WSNs. First, sensor nodes sense the environment with their sensors. After the sensing process the collected sensor data is delivered from the sensors nodes and directly sends to the sink nodes. The network topologies are depended on the WSN applications. A WSN example is given in Figure 1.

A sensor node device also known as sensor mote is a node in a sensor network that is capable of performing some processing, gathering sensory information and communicating with other connected nodes in the network (Wikipedia, 2011). A wireless sensor mote consist of a power unit, communication subsystems (receiver and transmitter), storage and processing resources, analog to digital converter (ADC) and sensing units (Kalaycı, T.E., 2009), as shown in Figure 2. The sensing unit observes the environment. After that the collected analog data are converted to digital format by ADC and analyzed by a processor then transmitted to nearby sensor nodes.

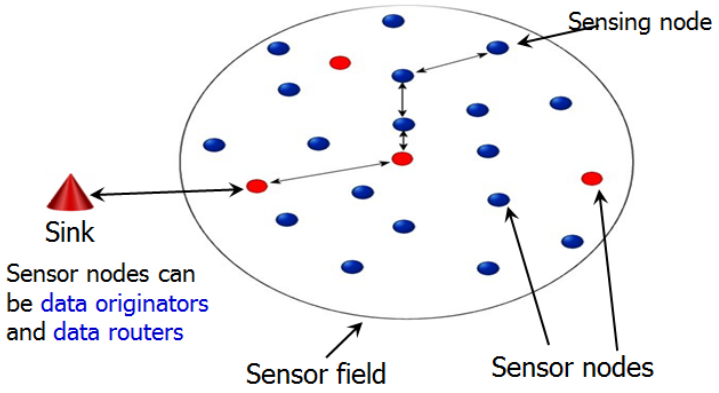


Figure 1: A WSN Example.

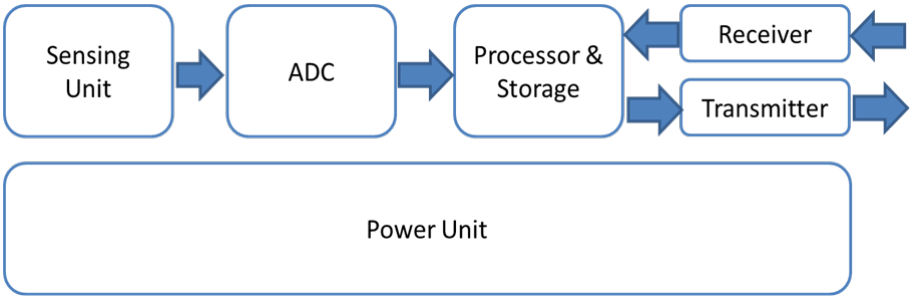


Figure 2: Components of a sensor node.

Nowadays, well-known semiconductor producers develop various types of microcontrollers suitable for WSN motes. However, there are many sensors motes which can be commercially sold in the markets some of these motes cost high prices. Because of the higher prices researchers and electronic prototype developers looking for a low cost and easy to build up sensor nodes. Some of the sensor mote examples are given in Table 1.

Table1: Examples of some commercially sold sensor motes in the internet.

Name	Manufacturer	Price	Release	Device
G-Node G301	SOWNet Technologies	68 euros	2010	TI MSP430F2418
MTM-CM3000-MSP	AdvanticSys	80 euros	2011	TI MSP430F1611
TMote Sky/TelosB	MEMSIC	N/A	2005	TI MSP430F1611
Waspmote (starter kit)	Libelium	199 euros	2011	Atmel ATmega1281
MICA	Memsic	N/A	2003	Atmel ATMega 128L

The aim of this study is to create a low cost WSN for environment monitoring by using Arduino Platform. In accordance to this aim, Arduino Uno R3 modules are used as WSN motes with NRF24L01+ wireless modules for the

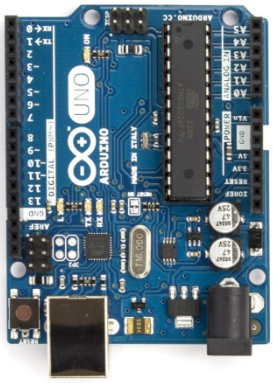
wireless communication. In order to monitor environment four kinds of sensors (temperature, humidity, carbon monoxide and methane) suitable for Arduino platform selected.

The Study

The main idea of our study is to set up sensor nodes for environment monitoring system. For this aim, Arduino Platform is selected to develop our sensor nodes. Arduino is an open source prototyping platform for developers. Arduino provides easy to use hardware and software for developers, supports rapid development platform for beginners and flexible enough for advanced users (Arduino Web Site, 2015). Moreover, Arduino runs on Windows, Linux and Mac operating system which allows cross-platform development. These properties make the Arduino platform popular in electronic applications.

In the first step, Arduino Uno R3 kit is selected for the sensor mote microcontroller. Arduino Uno R3 board is using ATmega328 microcontroller with 16MHz clock speed. Technical details about Arduino Uno R3 development kit is given in Table 2.

Table 2: Properties of Arduino Uno R3 development kit (Arduino Web Site, 2015).



Microcontroller	ATmega328
Operating Voltage	5V
Input Voltage	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328)
SRAM	2 KB (ATmega328)
EEPROM	1 KB (ATmega328)
Clock Speed	16 MHz
Weight	25 g

Arduino Uno kit does not have any wireless communication module in stock. In order to support wireless data transmission we prefer NRF24L01 RF Transceiver Module suitable with the Arduino platform. NRF24L01 module supports 2.4 GHz wireless data transmission with low energy consumption (Semiconductor, 2009). The properties of the 2.4 GHz NRF24L01 transceiver module is given in Table 3.

Table 3: Properties of the 2.4 GHz NRF24L01 RF Transceiver Module (Semiconductor, 2009).

□Power supply :	1.9V~3.6V
□Working current:	13.5mA at 2Mbps / 11.3mA at 0dBm output power
□Sensitivity :	-85dBm at 1Mbps
□Emission distance	:70~100 meter at 256kbps
□Data rate :	256Kbps / 2Mbps
□Communication mode :	Enhanced ShockBurst TM / ShockBurst TM
□Working mode :	Power Down Mode / Standby Mode / RX Mode / TX Mode
□Temperatures :	Operating:-40°C ~ 85°C / Storage:-40°C ~ 125°C

Sensor selection is the other important task for environment monitoring applications. For this purpose, at the first glance we decided to sense temperature ,humidity values, methane and carbon monoxide values. In the second step, Arduino suitable sensors are supplied. MQ-4 Methane gas sensor module used for methane and lpg gas detections as shown in Figure 3a. MQ-7 Carbon monoxide sensor module is used for air quality and CO detections as shown in Figure 3b. DHT11 sensor is used for temperature and humidity monitoring. DHT11 supports 0 to +50 °C temperature measurement range and -/+5.0%RH humidity measurement with low power consumption as shown in Figure 3c (DTH11 datasheet, 2015).

a) MQ-4: Methane sensor	b) MQ-7: Carbon Monoxide Sensor	c) DHT11: temperature and Humidity sensor

Figure 3: Arduino suitable sensors.

In the third step we combine these modules to each other and make our first prototype as our sensor mote as shown in the Figure 4. NRF24L01 module works with 3.3V DC voltage and supports 2Mbps data rate at 2.4GHz ISM band (Semiconductor, 2009). NRF24L01 module supports 125 different channels between 2.4GHz and 2.525 GHz frequencies and each channel has 6 data pipes for data communication (Semiconductor, 2009).

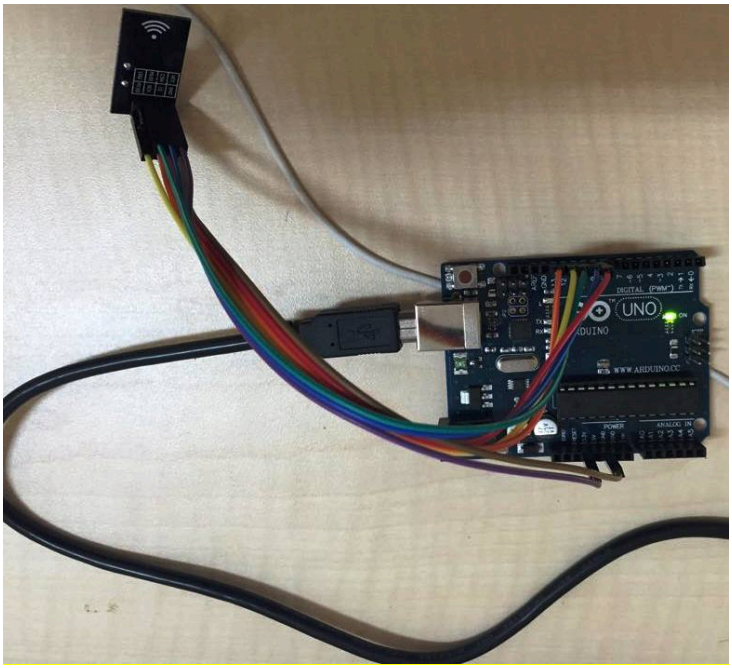


Figure 4. Arduino Uno R3 with NRF24L01 module

There are several libraries for Arduino wireless applications. Ono of this called MySensor library developed by Alexander Budnik and his team mates is used in our study (MySensor, 2015). MySensor library allows Arduino users to build up wireless networks with Arduino modules. MySensor library allows 64516 sensor nodes in a network in theory as far enough four our experiments.

Experimental Results

Experimental studies are done in the Embedded Laboratory of Dokuz Eylül University, Computer Engineering Department. In the first experiment we build two sensor motes and test our NRF24L01 wireless modules radio signal ranges for data transmission. One of these modules work in a sender and the other one works in receiver mode.

Radio signal test are done in two different scenarios. In the first scenario range test are done in open area without any obstacles. Two sensor nodes are used for this test. One of the sensor nodes work as a sender and the other one is in receiver node. The NRF24L01 modules can transmit data up to 75 meters in open area tests. In the second scenario we test the RF modules in a closed place, its range is highly reduces and the data cannot be transmitted far than 25 meters behind 50 cm concrete wall. The signal strength reduction is too much which means you cannot place sensor nodes far than 25 meters between them that makes our sensor network coverage in a 50m diameter circular area. This range is not enough for wide area environment monitoring applications. In order to widen our RF signal coverage area of our network we need to implement multi hopping wireless sensor networks.

In the second part of our experiment a multi-hop wireless sensor network is implemented to cover wide areas. In order to achieve this issue, four new sensor nodes are added into sensor network. The Wireless sensor network schema is given in the Figure 5.

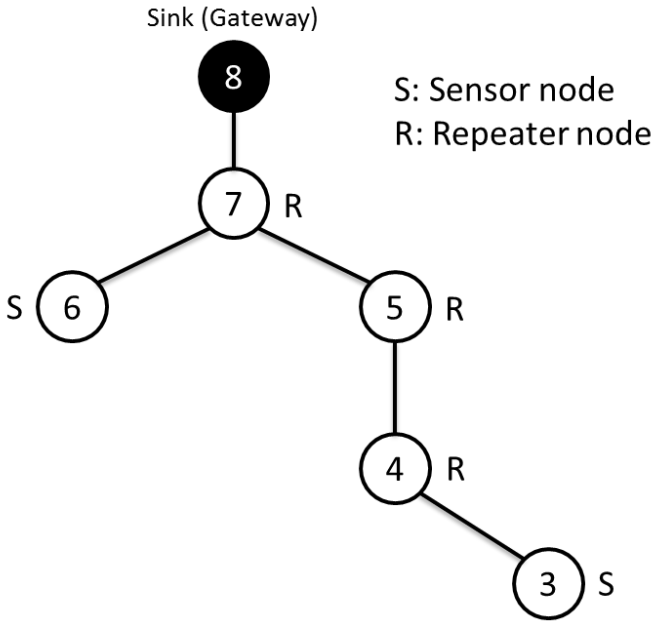
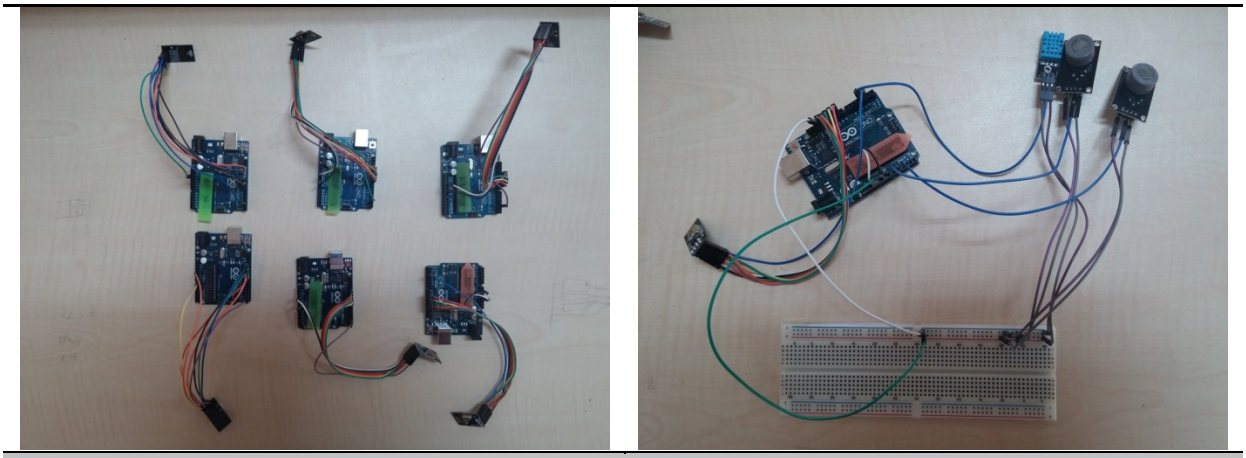


Figure 5: Multi-hopping Wireless Sensor Network schema

The WSN consist of 6 sensor nodes. The numbers given in Figure 5 represent the sensor identification numbers (IDs). Each sensor node in the network has a unique ID number. ID numbers are static and given to each sensor node before the adding them into network. Moreover each node knows its higher nodes sensor ID for data transmission. Nodes with ID 3 and 6 are working as sensor nodes which collect data from environment and transmit its sensor data to its higher node. Node 8 is the sink node, all the sensor data coming from sensor nodes are collected from sink node. Sink node is also connected by a computer via USB port to collect and monitor the data flow coming from the WSN. Nodes 4, 5 and 7 are used as repeater nodes which are used for collecting sensor data from far nodes to the sink. Repeater nodes can also support multiple sensor nodes and transmit their data. The developed sensor nodes are given in Figure 6a.

In the third part of our experiment temperature humidity and gas sensors are tested for suitable for environment monitoring applications. The sensor node with the DTH11, MQ-4 and MQ-7 sensors is given in Figure 6b. DHT11 sensor supports 0 to +50 °C temperature measurement range. The accuracy of the sensor is -/+5.0%RH humidity for -/+2 °C for temperature (DHT11 datasheet, 2015). Response time of the sensor is lower than 5 seconds with low power

consumption. However, the properties of DHT11 is adequate for environment monitoring, DHT22 is recommended for more sensitive applications. The MQ-7 can detect carbon monoxide gas concentrations between 20 to 2000ppm (MQ sensors datasheets, 2015). The MQ-4 methane gas sensor can detect natural gas concentrations between 200 to 10000ppm. Both MQ-7 and MQ-4 gas sensors are sensitive enough for monitoring applications (MQ sensors datasheets, 2015).



a) Wireless sensor motes

b) The sensor node with with the DTH11, MQ-4 and MQ-7 sensors

Figure 6: Wireless sensor motes and sensors.

In order to visualize environment monitoring application a computer program is developed to monitor sensors data collected from the WSN. The program is a windows application developed in C# programing language in Visual Studio.net 2013.The screenshot of the developed WSN monitoring program is shown in Figure 7.

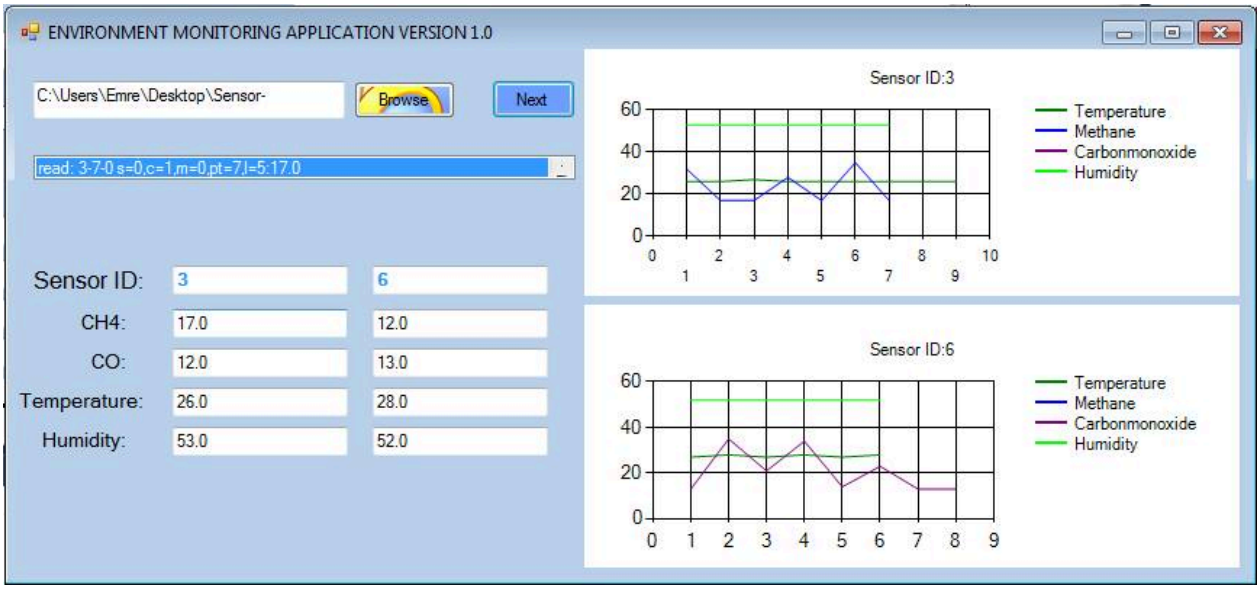


Figure 7: Environment monitoring application.

In the last part, we calculate the cost of our sensor mote. The total cost of a wireless sensor mote is about 12 American dollars with all sensors and other parts which can be affordable for various environment monitoring applications.

Conclusions

WSNs are one of the significant topics in the literature. Real world implementations of WSN and sensor motes are discussed compared in this article. However, there are many sensors nodes which can be commercially sold in the internet most of them have high prices and there is a need for low cost and easy to build up sensor nodes. In this study, low cost WSN network design and implementation is presented for environment monitoring applications. For this aim, a low cost alternative sensor mote is developed by using Arduino platform for environment monitoring system using four different sensor parameters. In order to enlarge sensing filed of the WSN, multi-hop based sensor network application is implemented. Moreover, environment monitoring application with our sensor motes is implemented and a windows application is developed to monitor sensor's data collected from the WSN. The cost of the sensor mote is suitable for small budgets and prototype studies. In order to enlarge sensing filed of the WSN, multi-hop based sensor network application is implemented.

Energy efficiency is one of the most important tasks for WSNs. In the next studies, in order to extend sensor network life time, we are going to focus on energy consumption of sensor motes and network traffic.

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PANEL COINTEGRATION ANALYSIS OF INTERNATIONAL TOURISM DEMAND: SAMPLE OF ANTALYA

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Abstract: This paper aimed to find the short-run and long-run relationships between international tourism demand to Antalya with economic variables such as income (GDP) and tourism price. Seasonally adjusted quarterly tourist arrivals data were used for 36 countries over the period 1996Q1 – 2014Q4. Firstly, panel unit root test such as Levin, Lin and Chu (LLC) (2002) panel unit root test, Maddala and Wu (1999) and Choi (2001) panel unit root test were used. Then the panel cointegration test based on Kao (1999) panel cointegration test and Pedroni (1999) panel cointegration test were used to test cointegration relationship among the variables in the long-run. Also we used a new technique of estimating dynamic heterogeneous panels, which is developed by Pesaran, Shin and Smith (1999), for the international tourism demand model. Pooled Mean Group (PMG) estimator is particularly convenient for panels with large T and N. The PMG estimator allows the intercepts, short-run coefficients and error variances to differ across groups while constrains the long run coefficients to be identical. The long-run results of this study show that growth in income (GDP) of the countries concerned has positive effect on international visitor arrivals to Antalya. However, tourism price was not found as determinants of international tourism demand in Antalya since the tourism price parameter is not statistically significant. Also error correction coefficient is negative and statistically significant. This findings show an existence of long-run relationship.

Keywords: Panel cointegration analysis, Pooled Mean Group Estimator, Antalya, international tourism demand

Introduction

With its rapid growth, tourism has become one of the most important industries in the world, and thus tourism incomes have begun to take an important role in the economy. The number of tourists in the worldwide have been a continuous increase from the 1950s until the nowadays. As regards The United Nations World Tourism Organization (UNWTO)'s long-run estimate *Tourism Towards 2030*, international tourist arrivals worldwide are expected to increase by 3.3% a year between 2010 and 2030 to achieve 1.4 billion by 2020 and 1.8 billion by 2030. In 2014 the number of international tourists increased to 1133 million. Besides, international tourism incomes reached 1245 billion dollars worldwide in 2014, up from 1197 billion dollars in 2013, equalled to an enhance of 3.7% in real terms (WTO, 2015, p.2-3).

With the enactment of the Law for the Encouragement of Tourism in 1982, tourism sector has developed rapidly in Turkey as well as in the world and has made great contributions to economic development of Turkey. According to the Ministry of Culture and Tourism, the number of international tourists visiting Turkey was ranked 20th in the world in 2000 followed by 6th in 2014. Also tourism income of Turkey achieved 34 billion in 2014, up from 32 billion in 2013, corresponding to an increase of 6.2%. Thus the share of tourism income in GDP has been 4.3% (TURSAB, 2015).

Table 1 International Tourist Arrivals

	Million		Change (%)	
Rank	**2013**	**2014**	**13\12**	**14\13**
1 France	83.6	83.7	2.0	0.1
2 United States	70.0	74.8	5.0	6.8
3 Spain	60.7	65.0	5.6	7.1
4 China	55.7	55.6	-3.5	-0.1
5 Italy	47.7	48.6	2.9	1.8
6 Turkey	37.8	39.8	5.9	5.3
7 Germany	31.5	33.0	3.7	4.6
8 United Kingdom	31.1	32.6	6.1	5.0
9 Russian Federation	28.4	29.8	10.2	5.3
10 Mexico	24.2	29.1	3.2	20.5

Source: World Tourism Organization (UNWTO)

Table 2 International Tourism Receipts

	Billion (US$)		Change US$ (%)	
Rank	**2013**	**2014**	**13\12**	**14\13**
1 United States	172.9	177.2	7.0	2.5
2 Spain	62.6	65.2	7.6	4.2
3 China	51.7	56.9	3.3	10.2
4 France	56.7	55.4	5.6	-2.3
5 Macao (China)	51.8	50.8	18.1	-1.9
6 Italy	43.9	45.5	6.6	3.7
7 United Kingdom	41.0	45.3	12.1	10.3
8 Germany	41.3	43.3	8.2	5.0
9 Thailand	41.8	38.4	23.4	-8.0
10 Hong-Kong (China)	38.9	38.4	17.7	-1.4

Source: World Tourism Organization (UNWTO)

The one of the world's most tourist attracting brand city, Antalya, with the number of visitors exceeding 12 million in 2014 without a doubt has largest share in Turkey's tourism. Besides, according to the data of Antalya Provincial Directorate of Culture and Tourism and The Ministry of Culture and Tourism; approximately 34% of foreign visitors coming to Turkey in 2014 consisted of foreign visitors coming to Antalya, and thus Antalya has been able to provide a large part of the total tourism income of Turkey with its tourism income alone and proven its role as a locomotive in the Turkish tourism. To increase international tourism demand to Antalya, factors affecting this demand should be taken into consideration. In this study, the international tourism demand for Antalya, the major contributor to Turkish tourism, is modelled with the aim of increasing tourism incomes, aligning supply and demand and shaping future investments in the sector. In this context, we estimated the short-run and long-run relationships between international tourism demand to Antalya with economic variables such as GDP and tourism price. Seasonally adjusted quarterly tourist arrivals data were used for 36 countries with available data over the period 1996Q1 – 2014Q4. In addition, we used a new technique of estimating dynamic heterogeneous panels (PMG estimator), developed by Pesaran, Shin and Smith (1999), for the international tourism demand model of Antalya because this estimator is particularly convenient for panels with large T and N.

The remaining of the paper is organized as follows. Firstly, the literature on modelling tourism demand was reviewed. Afterwards, Section 2 gives details on data and the model specification, and also this part explains methodology. Section 3 presents the empirical results from the panel cointegration estimations of the international tourism demand to Antalya. Finally, Section 4 provides concluding remarks.

There are a lot of studies related to international tourism demand in the literature and some of studies were presented Table 3. In the literature, time series data or cross sectional data generally were used though there are a lot of advantages in using panel data, such as giving more effective estimation results compared to time series data and cross sectional data.

Table 3 Literature Review

Author(s)/Year	Country	Model	Methodology	Results
Garin-Munoz and Amaral (2000)	Spain (1985-1995)	Number of Tourist, income per capita, exchange rate and real price	Panel Data Analysis	The estimated elasticises are 1.40 for income, 0.50 for exchange rate, and -0.30 for real prices. The negative effect of the Gulf War is also detected, with a coefficient of -0.15.
Aktürk and Küçüközmen (2006)	Turkey (1980-2004)	Number of Tourist, tourism price, substitute tourism price, income, dummy variables	Autoregressive Distributed Lag Model (ARDL)	This study analysis the tourism demand of Turkey from the arrivals of twenty OECD countries for the period of 1980-2004.
Salleh, Othman and Ramachandron (2007)	Malaysia	Number of Tourist, tourism price, substitute tourism price, transportation cost., income, exchange rate, dummy variables	ARDL Bound Test	Most of the variables are significant for tourism demand for Malaysia in the long-run as well as in the short-run.
Chaitip, Chaiboonsri, Rangaswamy (2008)	India (2002-2007)	Number of Tourist, income, transportation cost., exchange rate	Panel Unit Root and Panel Cointegration Test	Positive relationship between tourist arrivals and national income of tourist generating countries and a negative relationship between tourist arrivals and exchange rate
Seetaram (2010)	Australia (1991–2007)	Number of Tourist, income, transportation cost., exchange rate	Arellano-Bond Dynamic Panel Model	Demand is inelastic with respect to its determinants in the short run and elastic in the long run.
Chaiboonsri, Sriboonjit, Sriwichailamphan, Chaitip and Sriboonchitta (2010)	Thailand (1986-2007)	Number of Tourist, income, transportation cost., exchange rate	Ordinary Least Square (OLS), Dynamic OLS (DOLS) and Full Modified OLS (FMOLS) Estimators	Positive relationship between tourist arrivals and national income of tourist generating countries and a negative relationship between tourist arrivals and exchange rate and transportation cost.
Jintranun, Sriboonchitta Calkins and Chaiboonsri (2011)	Thailand (1997Q1-2010Q3)	Number of Tourist, GDP, Consumer Price Index (CPI), Exchange Rate (ER), transportation cost., seasonal dummies	Generalized Method of Moment (GMM)	In the long-run, positive relationship between tourist arrivals and In(GDP), In(CPI) and In(Cost) and a negative relationship between tourist arrivals and In(ER).
Aksakal and Arıcıgil Çilan (2015)	Turkey (1990-2010)	Number of Tourist, income, transportation cost., exchange rate, lagged tourist numbers	OLS and Seemingly Unrelated Regression (SUR)	Parameter estimates of SUR model are more efficient than classical regression model parameter estimates.

The Study

Data and Model

The selection of variable was determined by a review of previous empirical studies on international tourism demand analysis. Over 50 studies on the demand for tourism by Crouch (1994), Lim (1997) and Li et al. (2005) total tourist arrivals as a representative for tourism demand were used (Song et al., 2010, p.65). In this study, international tourism demand was measured in terms of the number of tourist arrivals. The number of tourists arriving to Antalya was obtained from Turkey Statistical Institute (TSI) website. Crouch (1994) has revealed that income and tourism price is most important variable explaining the demand for tourism. In this context, international tourism demand of Antalya relationship with Gross Domestic Product (GDP) of the countries concerned and the price of Turkey (TP) in comparison with the country concerned were analysed. These variables were obtained from Organisation for Economic Co-operation and Development (OECD) Statistic website. Tourism price variable was calculated as follows (Song et al., 2010, p.71).

$TP = \frac{CPI_{Turt}/EX_{Turt}}{CPI_{it}/EX_{it}}$
CPI_{Tur}: Consumer price index of Turkey (setting year 2010=100)
CPI_i: Consumer price index of origin country (setting year 2010=100)
EX_{Tur}: Exchange rate of Turkey
EX_i: Exchange rate of origin country
i: Countries
t: Time

Since variance of series was found higher due to seasonality, the seasonality should be neglected. Otherwise we could obtain incorrect results (Kutlar, 2000, s.49). For this reason we used seasonally adjusted quarterly tourist arrivals data for 36 countries over the period 1996Q1 – 2014Q4. For international tourism demand, the origin countries' income and tourism price have been considered as explanatory factors.
The international tourism demand model can be explained as follows

$$TA_{it} = f(GDP_{it}, TP_{it})$$

where:
TA_{it} = a measure of tourism demand at time t for country i,
GDP_{it} = a measure of income of the tourist-generating country at time t;
TP_{it} = a measure of tourism price of goods and services at time t for country i.
$i = 1, 2, \dots, 36$ (the number of country arrival to Antalya)
$t = 1, 2, \dots, 76$ (time series data)

This study focused on the PMG (1999) estimation of dynamic heterogeneous panels. The PMG estimator for estimated international tourism demand function has not been used in the earlier studies. The cointegration analysis of panel data consisted of three steps: First, a panel unit root was tested according to LLC (2002) panel unit root test and Maddala and Wu (1999) and Choi (2001) panel unit root test. Second, we checked whether there was a cointegration relationship using the heterogeneous panel cointegration test developed by Pedroni (1999) and Kao (1999). Finally, short-run and long-run relationship between international tourism demand of Antalya and economic variables were estimated using the PMG (1999) estimator for heterogeneous cointegrated panels for large T and N.

Methodology
While econometric analysis is being carried out to achieve the correct result, one of the most important issues to be considered is that the time series is stationary. Panel unit root tests should be performed to verify whether the data are stationary. Otherwise problem with spurious regression could be faced. Panel unit root tests statistically have higher power than time series unit root tests (Im, Pesaran and Shin, 1997; Maddala and Wu, 1999; Hadri, 2000; Levin, Lin and Chu, 2002). In the present study, we used LLC (2002), Maddala and Wu (1999) and Choi (2001) panel unit root test. In these tests, establishment of hypothesis test and calculation of the test statistics are based on the Dickey-Fuller (1979) and Augmented Dickey- Fuller unit root test (Şak, 2006, s.42). Levin, Lin and Chu (2002) have improved a procedure using panel data to test the null hypothesis that each individual time series contains a unit root against the alternative hypothesis that each time series is stationary. Maddala and Wu (1999) recommended the use of the Fisher test depending upon combining the P-values of the test statistics for unit root in cross-sectional unit. Fisher-Type Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) statistics panel unit root test (Maddala and Wu (1999) and Choi (2001)) have non-stationary as null hypothesis that panel data has unit root (Chaitip, Chaiboonsri and Rangaswamy, 2008, s.103-104).

If time series variables are non-stationary in their levels and their first differences are stationary, they are cointegrated in the long-run. Then if they are cointegrated in long-run, cointegration relationship between international tourism demand and economic variables should be found according to panel cointegration test such as proposed by Pedroni (1999) and Kao (1999). Pedroni (1999) panel cointegration test is based on the null hypothesis of no cointegration. Moreover, this test allows not only the dynamics and fixed effects to differ across groups of the panel, but also that they allow the co-integrating vector to differ across. Pedroni (1999) has proposed seven different tests. Of these seven statistics, four are based on pooling along what is commonly referred to as the within-dimension, and three are based on pooling along what is commonly referred to as the between-dimension (Pedroni, 1999, p.655-657). Kao (1999) panel cointegration test is based on the null hypothesis of no cointegration and he uses both DF and ADF to test for cointegration in panel (Kao, 1999, p.6).

If there is a cointegration relationship among the variables, short-run and long-run parameters can be find by using three different approaches used in panels with large T and N. First approach is Dynamic Fixed Effect (DFE) that allows the intercepts to differ across groups while constrains the other coefficients to be identical. If the slope coefficients are in fact not identical, however, the DFE approach could give inconsistent and potentially misleading results. Another approach is Mean Group (MG) Estimator (proposed by Pesaran and Smith (1995)) that allows the all coefficients to differ across groups and averages estimation results of each group. The recent approach is the PMG Estimator (proposed by Pesaran, Shin and Smith (1999)) that allows the intercepts, short-run coefficients and error variances to differ across groups while constrains the long run coefficients to be identical. Also to make a selection between the two estimators Hausman test is used. The Hausman test is testing the homogeneity of the long-run coefficient. In this study, the PMG (1999) estimator was preferred according to Hausman test (Blackburne, Frank, 2007, p.1999). The PMG (1999) approach explained as follows.

The international tourism demand model of Antalya is estimated on the base of quarterly data using panel data series. We assume that the long-run the international tourism demand model is

$$lnTS_{it} = \gamma_{0i} + \gamma_{1i} lnGSYIH_{it} + \gamma_{2i} lnGF_{it} + \mu_i + u_{it} \quad i = 1,2,\dots,N, \;\; t = 1,2,\dots,T \tag{1}$$

where $lnTS_{it}$, is logarithm of number of tourists arriving to Antalya; $lnGSYIH_{it}$ is logarithm of income (GDP) of the countries concerned; $lnGF_{it}$ ise is logarithm of the price of Turkey (TP) in comparison with the country concerned; μ_i is an individual effect and u_{it} is an error term. We will assume that all these variables are I(1) and cointegrated for individual countries, making the error term an I(0) process for all i. Taking the maximum lag equal to one, the ARDL(1,1,1) equation is given by

$$lnTS_{it} = \alpha_{10i} lnGSYIH_{it} + \alpha_{11i} lnGSYIH_{it-1} + \alpha_{20i} lnGF_{it} + \alpha_{21i} lnGF_{it-1} + \lambda_i lnTS_{it-1} + \mu_i + \varepsilon_{it} \tag{2}$$

The error correction equation is

$$\Delta lnTS_{it} = \phi_i (lnTS_{it-1} - \gamma_{0i} - \gamma_{1i} lnGSYIH_{it} - \gamma_{2i} lnGF_{it}) - \alpha_{11i} \Delta lnGSYIH_{it-1} + \alpha_{21i} \Delta lnGF_{it-1} + \varepsilon_{it} \tag{3}$$

where:

$$\phi_i = -(1-\lambda_i), \gamma_{0i} = \frac{\mu_i}{1-\lambda_i}, \gamma_{1i} = \frac{\alpha_{10i}+\alpha_{11i}}{1-\lambda_i}, \gamma_{2i} = \frac{\alpha_{20i}+\alpha_{21i}}{1-\lambda_i} .$$

The parameter ϕ_i is error correcting speed of adjustment term. One would expect this parameter to be significantly negative if the variables show a return to a long-run equilibrium. We are first of all interested in the nature of the long-run relationship between the international tourism demand and economic variables, the long-run coefficients (γ_{1i} and γ_{2i}) (Blackburne, Frank, 2007, p.202).

Findings

Panel Unit Root Test Results (The empirical results of panel unit root test)

This study estimated Eq. (1-3) using the Pooled Mean Group Estimator for 36 countries over the period 1996Q1 – 2014Q4. In this study, we used firstly the panel unit root test of the variables by Levin, Lin and Chu (2002), Maddala and Wu (1999) and Choi (2001). Table 4 presents the results of the panel unit root test based on Levin, Lin and Chu (2002), Maddala and Wu (1999) and Choi (2001) (Fisher ADP and Fisher PP) panel unit root test for all variables used in modelling international tourism demand of Antalya.

Table 4: Panel unit root tets

Fisher ADF Test			*H_0: All panels contain unit roots* *H_A: At least one panel is stationary*		
Seris LnTA	Statistic	*P*-value	Series ΔLnTA	Statistic	*P*-value
P	13.21	1.000	P	6464.94	0.000
Z	6.72	1.000	Z	-75.16	0.000
Series LnGDP	Statistic	*P*-value	Series ΔLnGDP	Statistic	*P*-value
P	1.73	1.000	P	1077.93	0.000
Z	14.29	1.000	Z	-24.41	0.000
Series LnTP	Statistic	*P*-value	Series ΔLnTP	Statistic	*P*-value
P	62.39	0.783	P	2697.57	0.000
Z	0.077	0.531	Z	-49.49	0.000
Fisher, Philips & Perron Test			*H_0: All panels contain unit roots* *H_A: At least one panel is stationary*		
Series LnTA	Statistic	*P*-value	Series ΔLnTA	Statistic	*P*-value
P	15.98	1.000	P	9482.07	0.000
Z	6.42	1.000	Z	-96.00	0.000
Series LnGDP	Statistic	*P*-value	Series ΔLnGDP	Statistic	*P*-value
P	0.87	1.000	P	1436.57	0.000
Z	17.66	1.000	Z	-30.73	0.000
Series LnTP	Statistic	*P*-value	Series ΔLnTP	Statistic	*P*-value
P	78.69	0.276	P	3742.99	0.000
Z	-0.34	0.369	Z	-58.06	0.000
P: Fisher chi-squared statistic, Z: Choi normal statistic, Automatic lag length selection based on SIC					
Levin, Lin & Chu unit root test			*H_0: Panels contain unit roots* *H_A: Panels are stationary*		
Series	*t*	*P*-value	Series	*t*	*P*-value
LnTA	4.34	1.000	ΔLnTA	-56.89	0.000
LnGDP	15.58	1.000	ΔLnGDP	-20.44	0.000
LnTP	0.27	0.607	ΔLnTP	-44.86	0.000
*: Rejected null at .10 level **: Rejected null at .05 level ***: Rejected null at .01 level					

The LLC (2002), Fisher ADF and Fisher PP panel unit root test results indicate that LnTA, LnGDP and LnTP series are at the level of insignificance for accepting the null of a unit root (p-value>0.05). Since the series are not stationary at level (I(0)), the effects of the shock occurring is permanent. To resolve this problem, the first difference of the series should be taken and the panel unit root test should be performed again. The results from this panel unit root test all significantly reject the null hypothesis ($p = 0.000 < 0.05$) for all series (LnGDP, LnGDP and LnTP). After the first difference had been taken in all series the series had become stationary. Then we used panel cointegration test to determine if there is a long-run relationship.

Panel Cointegration Results (The empirical results of panel cointegration test)
Table 5 present the results of panel cointegration test of the modelling international tourism demand of Antalya based on Pedroni (1999) and Kao (1999) panel cointegration test.

Table 5: Panel cointegration tests

Pedroni Test			*H_0: No cointegration*	
	Statistic	*P*-value	Weighted statistic	*P*-value
Panel v	0.082	0.467	-3.045	0.998
Panel rho	-27.10***	0.000	-26.789	0.000
Panel PP	-26.85***	0.000	-26.637	0.000
Panel ADF	-25.89***	0.000	-26.384	0.000
	Statistic	*P*-value		
Group rho	-25.848***	0.000		
Group PP	-29.542***	0.000		
Group ADF	-27.051***	0.000		
Trend assumption: Deterministic intercept and trend				
Automatic lag length selection based on SIC				
Newey-West automatic bandwidth selection and Bartlett kernel				

Kao Test		*H_0: No cointegration*
	t-Statistic	*P*-value
ADF	3.843**	0.001
Automatic lag length selection based on SIC		
Newey-West automatic bandwidth selection and Bartlett kernel		

*: Rejected null at .10 level
**: Rejected null at .05 level
***: Rejected null at .01 level

In Table 5 firstly we consider Pedroni (1999) panel cointegration test results. Six of seven tests (except panel-v statistic) reject the null hypothesis (no cointegration). Hence, it can be found out that the international tourism demand of Antalya and economic variables move together in the long run. Also Kao (1999) panel cointegration test result indicate that all variables used in this model are significant at the reject of the null hypothesis (no cointegration) at %1 level of significance (p-value=0.00). The empirical results of panel cointegration test show that all variables were used in the modelling international tourism demand of Antalya has cointegration (relationship) with each other. Finally, the coefficients of Antalya international tourism demand will be estimated to find short-run and long-run relationship.

Long run and Short Run Estimation Results
To estimate the coefficient of the short-run and long-run, the MG (1995) and the PMG (1999) estimators were used. These estimators are particularly convenient for panels with large T and N. The error correction speed of adjustment parameter and the long-run coefficients are of essential interest. Table 6 shows the results of the short-run and long-run relationship for the modelling international tourism demand of Antalya based on the MG (1995) and the PMG (1999) estimators. The Hausman test is used to decide which estimator will be used.

Table 6: PMG and MG Estimation Results ARDL(1,1,1)

N=36			Obs.= 2700	
T=72			Average T= 75	
			Log Likelihood= -1501.22	
Long-run Estimation for full sample				
	Coef.(PMG)	*P*-value	Coef.(MG)	*P*-value
LnGDP	3.3732***	0.000	3.1543***	0.000
LnTP	-0.0043	0.963	0.1968	0.352
Short-run Estimation for full sample				
	Coef.(PMG)	*P*-value	Coef.(MG)	*P*-value
ECM	-0.4955***	0.000	-0.6506***	0.000
Δ LnGDP	-1.6549	0.296	-2.0125	0.198
Δ LnTP	0.0656	0.663	-0.0253	0.876
Cons.	-18.0766***	0.000	-19.0291***	0.000

*: Rejected null at .10 level
**: Rejected null at .05 level
***: Rejected null at .01 level

According to both the MG (1995) and the PMG (1999) estimators, the coefficient of LnGDP is statistically significant at the 1% significance level, and the effect is positive as expected by the tourism demand theory. When GDP of the countries concerned increased %1, the international tourism demand to Antalya increased about %3-3.5. However, the coefficient of LnTP is statistically insignificant at the 10% significance level. In addition the speed of adjustment parameters are consistently negative and significant (-0.4955 for the PMG estimator and -0.6506 for the MG estimator). This findings show an existence of long-run relationship. Short-run coefficients of this model are statistically insignificant at the 10% significance level.

Table 7: Hausman test for long-run homogeneity

	Coefficients			
	(b) MG	(B) PMG	(b-B) Differ.	sqrt[diag(V_b-V_B)] S.E.
LnGDP	3.1543	3.3732	-0.218	0.394
LnTP	0.1968	-0.0043	0.201	0.190

b: consistent under H_0 and H_A; obtained from MG estimation
B: inconsistent under H_A, efficient under H_0; obtained from PMG estimation

H_0: difference in coefficients not systematic
Chi2(5)=(b-B)'[(V_b-V_B)^(-1)](b-B)=1.20
Prob>Chi2=0.5485

Hausman test is applied for testing the differences (long-run homogeneity) between the MG (1995) and the PMG (1999) estimators. The Hausman test statistic is 1.20 ($p = 0.5485 > 0.05$) that PMG (1999) estimator, the efficient and consistent estimator under the null hypothesis, is preferred. Estimation results obtained by the PMG (1999) estimator are given in Table 8.

Table 8: PMG Estimation Results ARDL(1,1,1)

N=36			Obs.=2700	
T=76			Average T=75	
			Log Likelihood=-1501.21	
Long-run Estimation for full sample				
	Coef.	Std. Error	z	*P*-value
LnGDP	3.373***	0.139	24.53	0.000
LnTP	-0.0042	0.093	0.27	0.784
Short-run Estimation for full sample				
	Coef.	Std. Error	z	*P*-value
ECM	-0.4955***	0.037	-13.34	0.000
Δ LnGDP	-1.6548	1.585	-1.04	0.296
Δ LnTP	0.0655	0.150	0.44	0.663
Cons.	-18.077	1.490	-12.13	0.000
Error correction coefficients for each country				

	Coef.	Std. Error	z	*P*-value
Russia	-0.932	0.115	-8.09	0.000
Iceland	-0.844	0.111	-7.56	0.000
Japan	-0.831	0.118	-7.00	0.000
United Kingdom	-0.739	0.102	-7.23	0.000
Mexico	-0.736	0.112	-6.54	0.000
Slovenia	-0.734	0.106	-6.94	0.000
Sweden	-0.707	0.064	-2.89	0.000
Australia	-0.699	0.109	-6.41	0.000
Ireland	-0.688	0.115	-5.98	0.000
Brazil	-0.687	0.108	-6.35	0.000
Hungary	-0.651	0.107	-6.06	0.000
Germany	-0.641	0.108	-5.92	0.000
Spain	-0.638	0.106	-5.99	0.000
Canada	-0.631	0.111	-5.66	0.000
Luxemburg	-0.583	0.097	-5.96	0.000
Poland	-0.580	0.103	-5.62	0.000
New Zealand	-0.571	0.108	-5.27	0.000
Italy	-0.568	0.093	-6.07	0.000
Error correction coefficients for each country				
	Coef.	Std. Error	z	*P*-value
ABD	-0.520	0.096	-5.41	0.000
Slovak Republic	-0.414	0.093	-4.42	0.000
Norway	-0.389	0.089	-4.39	0.000
France	-0.387	0.088	-4.38	0.000
Korea	-0.361	0.083	-4.30	0.000
Czech Republic	-0.350	0.080	-4.36	0.000
Chile	-0.349	0.091	-3.81	0.000
Indonesia	-0.334	0.082	-4.07	0.000
Finland	-0.295	0.066	-4.47	0.000
South Africa	-0.295	0.082	-3.58	0.000
Austria	-0.283	0.084	-3.38	0.000
Belgium	-0.277	0.072	-3.81	0.000
Switzerland	-0.226	0.069	-3.25	0.000
Greece	-0.205	0.069	-2.97	0.000
Holland	-0.204	0.059	-3.44	0.000
Portugal	-0.191	0.75	-2.55	0.000
Denmark	-0.159	0.064	-2.49	0.000
Israel	-0.132	0.056	-2.35	0.000

*: Rejected null at .10 level
**: Rejected null at .05 level
***: Rejected null at .01 level

According to PMG (1999) estimation results in Table 8, error correction coefficient (-0.4955) is negative and statistically significant (p-value 0.000) at the 1% significance level. This findings show an existence of long-run relationship. The error correction coefficient corresponds to speed of reaching equilibrium in the long run. Since error correction coefficient -0.4955 was found; the emerging imbalances will be corrected after two seasons. Also error correction coefficients are statistically significant at the %1 significance level for all countries and error correction coefficients of Russia, Iceland, Japan, United Kingdom, Mexico, Slovenia, Sweden, Australia, Ireland, Brazil, Hungary, Germany, Spain and Canada were found quite high. This case indicates that the speed of reaching equilibrium is very high in the long-run. However, short-run coefficients of this model are statistically insignificant at the 10% significance level. In the long run, PMG (1999) estimation results show that the coefficient of LnGDP is statistically significant at the 1% significance level, and the effect is positive as expected by the tourism demand theory. When GDP of the countries concerned increased %1, the international tourism demand to Antalya increased about %3.5. However, the coefficient of LnTP is statistically insignificant at the 10% significance level.

Conclusions

In this study, we used seasonally adjusted quarterly tourist arrivals data were used for 36 countries over the period 1996Q1 – 2014Q4 and we estimated the short-run and long-run relationships between international tourism demand to Antalya with economic variables such as GDP and tourism price using panel cointegration analysis.

The cointegration analysis of panel data consisted of three steps: First, a panel unit root was tested according to LLC (2002) panel unit root test and Maddala and Wu (1999) and Choi (2001) panel unit root test. Second, we checked whether there was a cointegration relationship using the heterogeneous panel cointegration test developed by Pedroni (1999) and Kao (1999) because all series were found stationary at first difference I(1). The PMG (1999) estimator, the efficient and consistent estimator under the null hypothesis, was preferred according to Hausman test. Finally, since the series were cointegrated in the long run, short-run and long-run relationship between international tourism demand of Antalya and economic variables were estimated using the PMG (1999) estimator for heterogeneous cointegrated panels for large T and N. The PMG (1999) estimator allows the intercepts, short-run coefficients and error variances to differ across groups while constrains the long run coefficients to be identical.

According to PMG (1999) estimator, the long-run results of this study show that growth in income (GDP) of the countries concerned has positive effect on international visitor arrivals to Antalya. However, tourism price was not found as determinants of international tourism demand in Antalya because the tourism price parameter is not statistically significant. Also error correction coefficient (-0.4955) is negative and statistically significant (p-value 0.000) at the 1% significance level. This findings show an existence of long-run relationship. The error correction coefficient corresponds to speed of reaching equilibrium in the long run. Since error correction coefficient -0.4955 was found; the emerging imbalances will be corrected after two seasons. In addition to, error correction coefficients are statistically significant at the %1 significance level for all countries and error correction coefficients of Russia, Iceland, Japan, United Kingdom, Mexico, Slovenia, Sweden, Australia, Ireland, Brazil, Hungary, Germany, Spain and Canada were found quite high. This case indicates that the speed of reaching equilibrium is very high in the long-run. However, short-run coefficients of this model are statistically insignificant at the 10% significance level.

The predictive results are thought to contribute to the strategies that will be developed for sustainability of tourism demand towards Antalya the brand in the international tourism. Moreover, the analysis and results, which were obtained in this study, can be used by travel planners to draw the future tourism road-map of Antalya for their specific purposes.

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POSITION OPTIMISATION OF GE DETECTORS IN NUCLEAR RESONANCE FLUORESCENCE (NRF) EXPERIMENT BY USING MONTE CARLO METHOD

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Abstract: Nuclear resonance fluorescence (NRF) supplies good information to study nuclear structure of isotopes. The main perquisite for excitation to occur, the incoming photon must have energy equal to one of the excited states of absorbing nucleus. After absorption of the photon, nucleus will have a transition to the excited state pertaining to photon energy and then the excited nucleus will decay back to the ground state by emitting a gamma ray that has energy equal to that excited state. This process is called nuclear resonance fluorescence (NRF). In this study, we estimated the optimum detector position by considering maximum photon-detector interaction and counted photon amount. It can be concluded that maximum photon fluence is recorded at the under of the NRF target.

Key words: Monte Carlo Simulation, Nuclear Resonance Fluorescence (NRF)

Introduction

Nuclear resonance fluorescence (NRF) is recognized as an effective method that provides reqired information for the researches on the dipole excitations of nucleus (Kneissl, 1996). Main developments in recent years of high-efficiency germanium detectors (HPGe) with great energy resolution, in connection with high-intensity bremsstrahlung photon beams, has provided the essential tools to study about electric dipole strength distributions. Moreover, nuclear resonance fluorescence (NRF) means the process of resonant excitation of definite nuclear states of a target nucleus by absorption of radiation. A simplified simulation of an NRF experiment shown in below.

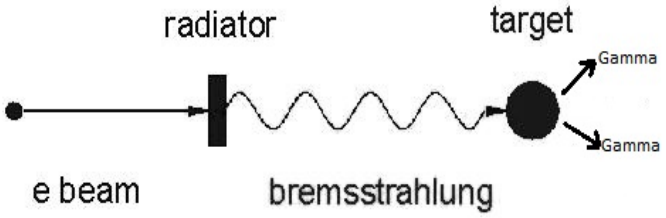

Figure 1 NRF Experiment

In recent years Monte Carlo (MC) simulations has been used frequently on NRF experiments (Jordan, 2005). As the basis of the current work was done by simulation program, it's function was to simulate the photon transport in a material environment. In this study, we used the MCNP4C program which developed in Los Alamos National laboratory. MCNP is capable to simulate with neutron, gamma and secondary gamma rays production and transport which occur as a result of neutron interactions (Hançerlioğulları, 2006). Material assignments and defining the geometry have an important place in MC simulation. In this study we defined the each material and experimental tools before

simulation. As a procedure in simulation, an electron beam having a certain energy directed onto a radiator which has a certain thickness and assigned material (Rodenas, 2007). In this study we used 10 MeV electron-beam which interacted with radiator that composed of 2 mm Tantalum target. Calculations were separately carried out for 2 sample material. After this interaction bremsstrahlung photons directed onto a Uranium-238 and Cobalt-57samples shown in figure 1. Detectors that defined and positioned around sample counted the photon amount in five different point. A scheme of simulation with experimental tools is shown in figure 2.

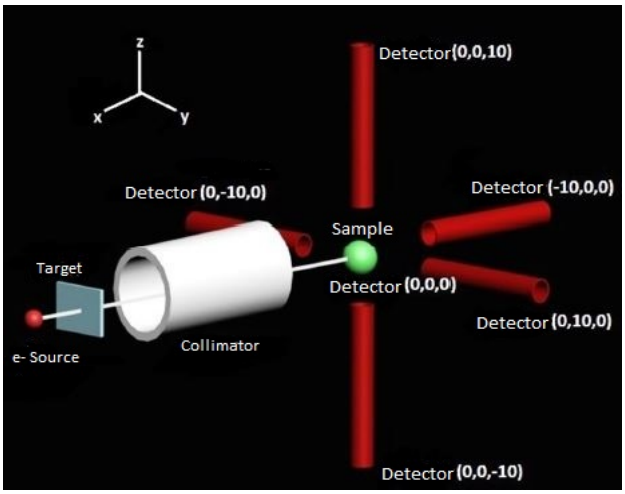

Figure 2 Experimental tools and detector positions

We can see from the table 1. that positions of the detectors located around sample in five different points. According to the coordinate axes as (x,y,z) five different points selected as (-10,0,0) (0,10,0) (0,-10,0) (0,0,10) (0,0,-10). In the coordinate axes the distance is given by cm. After the running program, detectors which located around Uranium-238 and Cobalt-57 sample started to count the scattered photons from nucleus with NRF process.

The Study

In recent years, MC studies has been used frequently in studies and researches on detection. Especially some studies also performed about relationship between detector position and detector efficiency (Baas, 2006). Since MC allow the detection at every selected point around target, we located the detectors on some points which definitely 10 cm from target in x,y and z directions. In this study we used the F4 tally for MCNP4C to achieve the average flux in a detector volume. The efficiency of the modeled detector is calculated. To obtain optimum detector position, we calculated each detector's total flux rates that in which point scattered photons are counted more.

Findings

The aim of this study was to find the maximum total flux from five detectors positioned around the target material. First simulation calculation was made for Uranium-238 sample and after that the same simulation calculation was made for Cobalt-57 sample. Total fluxes in the detector volumes which located in five different point for uranium-238 sample are shown in table 3.

Table 1: Total Photon flux rates by location (Uranium-238)

Location	Rate (%)	Axis Name
-10,0,0	12.73	-x
0,10,0	21.71	y
0,-10,0	21.89	-y
0,0,10	21.68	z
0,0,-10	21.99	-z

Table 2: Total Photon flux rates by location (Cobalt-57)

Location	Rate (%)	Axis Name
-10,0,0	12.73	-x
0,10,0	21.71	y
0,-10,0	21.89	-y
0,0,10	21.68	z
0,0,-10	21.99	-z

Conclusions

In this study we simulated the NRF experiment by using two different sample in MC code. It was found from this work that in both calculations maximum photon count obtained in –z (0,0,-10) point. However, figure 2 shows that -z point is perpendicular the electron beam line and underside of the sample target. We can see that scattering from the sample is much more to the underside of sample. This study shows that we can use -z point in future studies if only one detector location is needed while studying with MC. Of course, it can be also calculated more detailed locations around the –z point by considering changes with angles.

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THE HEALTH INFORMATION PROFESSIONAL IN EHEALTH:ETHICAL CONSIDERATIONS FOR AN INTERJURISTICAL SETTING

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Abstract: Issues such as privacy, security, quality, etc. have received considerable attention in discussions of eHealth; however little attention has been paid to the fact that eHealth situates health information professionals (HIPs) in an ethical and legal context that differs importantly from that of traditional health care. In traditional health care HIP services are pragmatically useful but not inherently necessary; in eHealth, however, HIPs are not only the interface between physicians and patients but the instrumental facilitators of eHealth itself. With this, their professional standing acquires a fiduciary parameter it did not have before, and older models of the ethics of health information professionals are no longer wholly sufficient to provide guidance. Matters are complicated further by the inter-jurisdictional parameters of eHealth, which introduce dimensions that do not exist in the traditional intra-jurisdictional setting. This paper outlines the issues and sketches a possible approach for addressing the situation.
Keywords: eHealth, ethics, health information professionals

Introduction

eHealth is a quintessential paradigm of technology transfer and, according to common perception, it does not raise new ethical or legal issues for health information professionals (HIPs). Privacy, security and confidentiality—which are of special concern for HIPs in eHealth—had already been identified as ethically and legally important issues when electronic diagnostic and imaging technologies first came on the scene, and the role of HIPs in this regard had been carefully considered. Likewise, the ethical and legal issues surrounding electronic health records (EHRs) and of the communication technologies that are integral to eHealth were also subjected to intensive ethical and legal scrutiny when they were first introduced, and the ethical position of HIPs had been carefully outlined in relevant regulations and codes of ethics. Any new issues that have arisen with eHealth—so the argument— are merely the result of the increased complexity of the electronic devices, tools and methods of communication that have come into play, and therefore involve only technical matters. The ethical and legal fundamentals that have guided HIPs in the past have remained essentially the same; therefore there is no need to subject the ethical position and role of HIPs to special scrutiny.

The Changing Ethical Framework of eHealth

This understanding, however, fails to appreciate the fundamental changes in the overall ethics of health care that have been brought about by eHealth and the implications these changes have for both physicians and health care professionals. For instance, the fiduciary physician-patient relationship, which is definitive of medicine, became divorced from the direct physician-patient interaction that grounded it in the traditional setting and became grounded in a virtual rather than a real interaction; the EHR, which hitherto had been a pragmatic device that could in principle be dispensed with, (Gunter and Terry, 2005; Patel, Jamoom, Hsiao, Furukawa and Buntin, 2013; Xieali et al., 2013) became an indispensable tool without which physicians could not function; and HIPs, rather than being mere service providers, became integral causal player without whom the physician-patient relationship could not arise and eHealth itself could not come into existence. The ethical implications of these changes became especially noteworthy when eHealth began to cross jurisdictional boundaries.

What all of this this means for physicians has already been explored elsewhere. (Kluge, 2014) The focus of this discussion is the implications for HIPs. Among other things, it will be argued that HIPs acquired a fiduciary relationship towards patients they did not have before, that this relationship has human rights implications, and that the relationship between HIPs and their corporate employers has to be reassessed in order to provide a complete picture.

EHRs, Communication Technology and eHealth

To fully appreciate what is at stake, it may be appropriate to begin with the fundamental role of EHRs in eHealth and the implications this has for the ethical status of HIPs.

EHRs themselves may be viewed either materially or informatically. Viewed materially, they are sets of electronic patterns that capture multimedia data and that can be transmitted, received, stored, retrieved, linked or otherwise manipulated for various purposes, the primary one being to provide health care. From this perspective, the issues that are associated with EHRs are purely technical in nature. They include such things as technical standards and product suitability, quality, reliability, security, usability, etc. (International Standards Organization, 18308 and 20514) Any legal or ethical concerns that might arise when viewed from this perspective are inherently technical in nature and essentially centre in contractual considerations. (United Nations, 1980)

By contrast, when viewed informatically, EHRs are sets of health data that can be linked to specific patients because of the relationship in which they stand to the patients. Another way of putting this is to say that, informatically speaking, EHRs are patient-relative data-spaces that function as the informatic and epistemic foundations of the patient profiles that are developed by health care professionals (HCPs) and that are used to develop diagnoses and make treatment decisions. (Kluge, 2001)

The Existential Role of EHRs in eHealth

In contrast to traditional health care, in eHealth EHRs and communication technology are not simply tools that physicians may or may not use, where failure to use them only has quality-of-service implications. In eHealth, neither diagnostic nor therapeutic work is possible without them and physicians cannot function as physicians. However, it is HIPs whose work underwrites the possibility of EHRs and of the technology that maintains and transmits them—and with this, HIPs have become integrally involved in the physician-patient interaction itself: not as a matter of choice or quality improvement but as a matter of existential necessity. Therefore while in traditional health care the basic relationship was a dyad consisting of physician and patient, in eHealth it has become a triad consisting of physician, patient and HIP. The fact that HIPs do not provide therapeutic services in eHealth is ethically irrelevant. What is important is that HIPs are the causal agents who make the physician-patient interaction itself possible in the first place.

The point is worth repeating. The use of EHRs is not a matter of pragmatic convenience or of professional excellence in eHealth, as it is in traditional health care. Traditional health care proceeds perfectly fine without EHRs, and the physician-patient relationship does not depend on them for its inception. With eHealth, however, EHRs have become a matter of causal necessity. Without them, there cannot be any diagnostic or therapeutic physician-patient interaction, and the physician-patient relationship cannot even come into existence. Moreover, not only EHRs but also the communication framework that makes diagnosis and treatment possible —in a word, the whole framework of eHealth itself—depends on HIPs. With this, HIPs ceased to be merely technical agents and their ethical status acquired a fiduciary element towards patients that in important ways is analogous to that of physicians.

Privacy Rights, Human Rights and eHealth

The use of EHRs in eHealth immediately entrains privacy considerations, and when combined with the causal role of HIPs that was just pointed out, this immediately changes the strength of HIPs' privacy obligations.

Privacy and, correlatively, confidentiality concerns are of course as old as Hippocrates, (Higgins, 1989) and have been addressed in medical codes of ethics as long as such codes have existed. The codes have always emphasized privacy and confidentiality, and have always taken special care to extend this to patient records when patient records were first formally kept for therapeutic purposes. (Kahn, 1970; Siegler, 2010)

Although traditional, privacy rights were first explicitly enunciated on an international and interjurisdictional scale in 1948 in Article 12 of the Universal Declaration of Human Rights. (United Nations, 1948) The Declaration stipulates that "No one shall be subjected to arbitrary interference with his privacy, family, home or correspondence, nor to attacks upon his honour and reputation. Everyone has the right to the protection of the law against such interference or attacks." Privacy rights, therefore, being fundamentally grounded in the domain of human rights, are independent of national juridical provisions, international trade agreements or institutional guidelines.

It is this that changes the picture for HIPs in eHealth. Reason suggests that persons who are instrumentally involved in the violation of a right cannot escape responsibility merely because they are not directly and personally engaged in the act itself. The instrumental, facilitating and enabling involvement as distinct from merely providing the tools is sufficient to trigger complicity. This is not simply a matter of logic or ethics but also finds reflection in legal pronouncements and decisions. (Federal Republic of Germany, 19:3; International Criminal Tribunal, 2004-2006; People's Republic of China, II:36) HIPs are instrumentally involved in the conduct of eHealth in this very sense. It therefore follows that any violation of patient privacy rights that occur in eHealth—say, in intelligence gathering when EHRs are accessed for security or other non-medical purposes—will implicate HIPs. They are co-determinative of the causal flow of events that constitutes eHealth, and hence they share in responsibility.

All of this assumes cardinal importance when eHealth crosses international borders—for instance, when the eHealth providers who employ the HIPs store the EHRs that are used in their system in jurisdictions other than those where the service is actually delivered (cloud storage) (Chen et al., 2012), or when the providers are incorporated in jurisdictions like the USA where provisions like the USA PATRIOT Act (USA Patriot Act, 2001) apply to the parent corporations and by extension are assumed to apply to their subsidiaries. In the first sort of case, the privacy rights of patients in the jurisdiction-of-delivery may be different from those of the jurisdiction-of-storage, and what is legal with respect to use—for instance for research purposes—may differ in the respective jurisdictions. HIPs who are instrumentally involved in eHealth that fits this pattern and who do not ensure that the patients of the relevant eHealth system are informed of this possibility will be ethically complicit in any violation of the patient privacy rights in the jurisdiction-of-delivery even though they themselves are not involved relative to the content of these actions. The notion of complicity still applies.

In the second sort of case, the legal provisions in the provider's jurisdiction-of-incorporation may stipulate that EHRs may be accessed by security forces without patient consent or knowledge. Therefore while the actions of the HIPs as facilitators (and of the corporations as employers and service providers) may be considered ethical and legal in the parent corporation's jurisdiction-of-incorporation, they may not be considered ethical or legal in the jurisdiction-of-delivery. Some of the concerns that have been raised about US corporate eHealth providers relative to the ethical and legal considerations that apply in European countries point in that direction, the so-called Safe Harbour agreements notwithstanding, (Commission of the European Union, 2014) and they raise ethical (and legal) concerns for HIPs engaged in inter-jurisdictional eHealth.

Further Considerations

What has just been outlined does not, of course, present the full extent of the HIP's ethical role in eHealth. There is also the fabric of duties they have towards the employers who underwrite eHealth as a business. They include fit-for-the-purpose considerations and extend to ensuring that the systems in which eHealth is delivered function consistently, reliably and in the best possible way without imperilling the commercial success of the eHealth enterprise. While these and related duties existed before the advent of eHealth, they acquired increased importance because of the integrally causal role of HIPs in eHealth itself; and while they are addressed in current codes of ethics for HIPs, (International Medical Informatics Association, 2002) these latter were originally formulated for the traditional health care context and do not provide entirely satisfactory guidance in the eHealth setting.

Codes of Ethics and Other Considerations

All of this raises the question what reflection any of this should find in ethical and legal provisions—especially when eHealth transcends juridical boundaries. The issue itself has two sides. On one side is the question of how to structure relevant provisions in a formal ethical code that acknowledges the novel position of HIPs in eHealth; on the other side is the question of how to operationalize this in terms of pragmatically workable features that make a difference in actual practice.

As to the first, the foundational provisions of the IMIA Code of Ethics for Health Information Professionals of course continue to apply even in the eHealth context because the underlying ethical principles that govern the actions of HIPs have not changed. What has changed is the HIPs' role and function. Whereas previously HIPs occupied a subordinate role as provider of technical services, with eHealth they became the causal foundation of health care and became pivotal to its inception and delivery. Therefore what is required are not new principles but a new framework for implementing the principles—particularly since, as has been emphasized, eHealth in its expanded version is inter-jurisdictional in nature.

An integral step in achieving this—which in turn is based on the acknowledgment that HIPs operate in a corporate setting—would involve ensuring that the corporate eHealth framework in which HIPs work is itself ethically structured. This would ensure that HIPs can function in an ethically appropriate manner. However, since the focus of this discussion is not the corporate framework of eHealth but the ethical issues that face HIPs in the eHealth setting, it is not necessary to expand on this aspect of the issue. Moreover, the matter is specifically dealt with elsewhere. (Croll, Ruotsalainen, Kluge, Lacroix & Sahama, 2015)

As to HIPs, the aim could be achieved by establishing a globally accepted certification and accreditation structure for HIPs who wish to work in eHealth in an interjurisdictional setting. Such a structure would be headed by an international body under the auspices of the WHO. The membership of this body would be drawn from such organizations as the national health informatics associations who are members of IMIA, as well as from the Council of European Professional Informatics Societies, the Asia-Pacific Association of Medical Informatics, the International Conference of Data Protection and Privacy Commissioners and related international organizations.

The function of this body would be threefold: to set international standards of technical proficiency and ethical understanding for HIPs, to certify health information professionals as meeting these standards, and to monitor and adjudicate profession-related issues from an inter-jurisdictional perspective. The technical certification process could be based on the model that was developed by Belgium for certification of health informatics professionals, which in turn could be adapted with reference to the protocols that are used by the European Computer Driving Licence Foundation in its technical certification programme.(European Computer Driving Licence Foundation, 2015) It would have both a technical and an administrative competence focus, and would be regularly updated as the technology evolves and administrative parameters change in the international setting. Ethical understanding and competence would an integral part of the required skill-set necessary for certification. Sufficiency and competence in this regard would be measured with reference to ethical guidelines that would be based on the IMIA Code of Ethics for Health Informatics Professionals and addenda specific to HIPs engaged in eHealth. In order to ensure continued competence as the international context of eHealth evolves and develops, certification would be on a limited-time basis and would require evidence of maintenance of competence similar to the model that exists for physicians and other health care professionals in many jurisdictions relative to their medical specialty. Certification would be a fee item, which latter would fund the operation of the certification structure itself.

Finally, any matters of conflict that might arise with respect to these and related issues would be resolved by an adjudication process that was conducted by an independent body, also under WHO auspices and along the lines of the United Nations Commission on International Trade Law (United Nations, 1966), where membership was drawn on a rotating basis from members of IMIA. Identification of the relevant individuals from member organizations would fall to the member organizations themselves. This body would be funded by countries subscribing to the certification process itself.

Conclusion

eHealth situates HIPs in a novel ethical and legal context which in some respects importantly differs from that of traditional health care. This does not mean that the traditional ethical and legal provisions for HIPs have lost their relevance. Traditional methods of health care delivery continue to exist side-by-side with eHealth, and HIPs continue to operate in this established setting. However, the new roles that HIPs play in eHealth setting cannot be accommodated by adding technical fixes to current ethical and legal provisions. That would be to assume that technical fixes are answers to ethical (and legal) problems. What is required is an expanded set of guidelines and regulations. The preceding discussion has outlined why and how this is the case. It has also emphasized that because of the interjurisdictional aspects to eHealth, merely national adjustments will amount to no more than patchwork solutions to a problematic that has global dimensions. It remains to be seen whether this situation will be dealt with in a piecemeal or an all-embracing and consistent fashion.

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THE IMPROVE OF COMBUSTION PROPERTIES ON WOODEN MATERIAL BY USING LIQUED NITROGEN AND BORIC ACID

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Abstract: In this study, the effects of combustion properties on oriental beech (Fagus orientalis L.) wood species which treated with liquid nitrogen and impregnated with boric acid. The dipping method was used for the impregnation and liquid nitrogen process. The combustion test was performed according to the procedure defined in the ASTM-E 69 standards and during the test the mass reduction, temperature were determined for each 30 seconds. According to the test results, it was found that the samples treated with liquid nitrogen retention was increase. Moreover, sample treated with liquid nitrogen and impregnated with boric acid was more successfully to combustion retardant than samples only impregnated with boric acid.

Key words: Combustion, Beech, Liquid Nitrogen, Boric acid, Impregnated, Wood.

Introduction

The wood materials widely used from wood construction sector, urban furniture and interior design to furniture sector are renewable resource. To increase service life of wood materials which especially used to urban furniture, wood materials are treated coating and impregnated materials against to biological and mechanical factors. Wood materials used in wood construction sector should be treated by using fire retardant chemicals. Beside, the wood materials that are used in place where can be attack biological pets should be used to some impregnate materials. Many researchers have studied effects of combustion properties of wooden materials. Uysal et. al (2009) studied combustion properties of the oriental spruce (*Picea orientalis L.*) impregnated with boron compounds. A borax-boric acid 10% solution was found to be the most successful fire retardant chemical . Yapıcı et. Al (2011) studied effects of pretreatment with boric acid, borax and Tanalith-E on combustion properties of varnished Oriental beech. It was shown that the most mass reduction occurred in samples impregnated with boric acid and varnished with polyurethane varnish. Borates have several great advantages as wood preservatives as well as imparting flame retardancy, providing sufficient protection against all forms of wood destroying organisms, have low mammalian toxicity and low volatility, they are moreover colorless and odorless (Murphy,1990;Yalınkılıç et.al, 1999; Drysdale, 1994; Chen et al., 1997). In this study, it was investigated properties of the beech wood treated with liquid nitrogen and impregnated with borax.

Material and Method

Wood Species

Oriental beech (*Fagus orientalis L.*) was chosen randomly from timber suppliers of Ankara, Turkey. Blending process was made to represent control simples on other groups. A special emphasis was put on the selection of the wood material. Accordingly, non-deficient, whole, knotless, normally grown (without zone line, reaction wood, decay, insect or fungal infection) wood materials were selected.

Chemical Materials

Boric acid were used as impregnation chemical. Properties of impregnation chemical and test plan are given in Table 1.

Table 1. Properties of impregnation chemical and test plan

Impregnation Chemicals	Solution Conc.	Solvent	Purity	pH		Density (g/ml)	
	(%)	Pure water	(%)	BI	AI	BI	AI
Boric Acid	5		98	5.23	5.30	1.02	1.02

BI:Before impregnation AI: After impregnation

Nitrogen gas composes 78% of the Earth's atmosphere. It is a colorless, odorless and non-flammable gas. It is used in the electrical industry, producing chemicals safely, the food packaging industries and in the drying and preparation of refrigeration systems. Nitrogen gas is also used in at temperatures below -196 ºC, nitrogen is a liquid. When liquid nitrogen comes into contact with objects at room temperature it boils rapidly from the heat energy emitted by the objects.

Determination of density

Wood materials were kept in the room at 20 ± 2°C and 65 ± 3 % relative humidity until their weight became stable.Air dry densities of wood materials before and after impregnated used for the preparation of treatment samples were determined according to TS 2472. Afterwards, the dimensions of wood materials were measured by a compass of ±0,001 sensitivity and volumes were determined by a stereo-metric method. The air dry density (δ12) was calculated by the following equation:

$$\delta 12 = M12/V12 \ \ g/cm^3 \qquad (1)$$

where M12 is the perfect air dry weight (g) and V12 is the volume (cm^3) of the wood material.

Preparation of Test Samples

The oversized test samples were acclimatized until they were stable at 20 ± 2 ºC and 65 ± 3 % relative humidity in climate room. Later on they were cut with the dimensions of 9x19x1016 mm according to the procedure of ASTM E – 69 then, specimens were treated to liquid nitrogen in tank during 4 hours. Impregnation processes stated at ASTM D 1413-76 was applied to the prepared test samples. Using the dipping method, the samples were dipped into the impregnation solution for 48 h for long-term dipping. Before the impregnation process, all samples were weighed and then kiln-dried at a temperature of 103 ± 2 ºC until they reached constant weight. Then, the samples were weighed in an analytic balance with 0.01-g sensitivity. After the impregnation, all impregnated samples were held for 15 days in circulating air for evaporation of the solvent. Impregnated test samples were kept at a temperature of 20 ± 2 ºC and 65 ± 3% relative humidity until they reached constant weight. After this period, the impregnated samples were kiln-dried at 103 ± 2 ºC until they reached constant weight. After cooling, all dried samples in the dessicator were weighed on the scale. The dry weight of the samples was determined and recorded. The amount of retention (R, kg/m^3) was calculated as follow:

$$R(kg/m^3) = \frac{GC}{V} \times 10 \qquad (2)$$

where, G= T2-T1, T2 is the sample weight after impregnation (g), T1 is the sample weight before impregnation (g), V is the volume of sample (cm^3), and C is the concentration of solution (%).

Execution Test

The combustion test was carried out according to the principles of the ASTME –69. But some changes were made in the stand. For this purpose, a digital balance having 0.01 g sensitiveness has been used for determination of mass reduction of materials when they are burnt. Butane gas was used to make an ignition flame. The gas flow is standard as the high of flame is 25 cm, the temperature must be 1000 ºC. The distance between the bottoms of the test samples, which were hanged inside of the fire tube and the top of the gas pipe must be adjusted as 2.54 cm. During the test, mass reduction, temperature were determined in every 30 seconds. The test was made under a chimney where the flow of air blown was drawn with natural draft. At the beginning of combustion test flame source was used for 4 minutes then flame source was taken away and it was continued 6 minutes. Totally 10 minutes, the test was lasted. Testo 350 M and XL flue gas analyzers was used for measuring concentration of the released gasses (CO, NO, O_2) and temperature variation. The probe was inserted into the first hole from the top of the fire tube.

Data Analyses

By using untreated control samples and treated with liquid nitrogen, impregnation chemical and unimpregnated control sample a total of 120 (2x2x30)samples were prepared using 30 samples for each parameter.

Results and Discussion

The averages of density are given in Table 2. The air dry density (0. 695 gr/cm^3) was obtained in control oriental beech wood. The air dry density (0.737 gr/cm^3) was obtained in treated with impregnated oriental beech wood samples.

Table 2. Average values of density (gr/cm^3).

Control	Treated with liquid nitrogen	Treated with impregnated	Treated with liquid nitrogen and impregnated
0.695	0.627	0.737	0.704

Retention amount of boric acid was obtained from control samples 1.60% when treated with liquid nitrogen samples was determined retention amounts 1.83% and also these samples impregnated with boric acid.

The averages of mass reduction are given in Table 3. The highest mass reduction occurred in control samples with 45.90% (8th measurement) as a result of flame source while the lowest one occurred in treated with liquid nitrogen and impregnated samples with 22.83%. The highest mass reduction occurred in control samples with 98.32% as a result of the end of combustion while the lowest one occurred in treated with liquid nitrogen and impregnated samples with 31.37%.

Table 3. Average of mass reduction(%)

Measured of time	Control	Treated with liquid nitrogen	Treated with impregnated	Treated with liquid nitrogen and impregnated
1*	1,52	2,71	2.40	2,85
2*	2,78	5,37	6.43	4,17
3*	5,55	7,32	8.87	5,70
4*	10,20	12,59	11.45	8,99
5*	17,19	19,05	15.08	13,42
6*	26,92	29,92	17.34	16,80
7*	37,33	39,54	19.46	18,96
8*	45,90	46,70	23.66	22,83
9	52,94	50,96	24.02	23,97
10	61,68	58,73	25.38	24,08
11	72,07	67,53	26.26	25,09
12	76,56	76,44	26.89	25,70
13	86,83	85,66	27.09	26,14
14	91,71	92,17	28.45	26,40
15	95,03	94,31	29.61	26,86
16	95,47	95,65	30.10	27,42
17	96,67	96,38	31.73	28,97
18	97,21	96,80	32.59	30,39
19	97,78	97,31	34.99	30,99
20	98,02	98,66	36.07	31,37

* Flame source combustion

The averages of temperature are given in Table 4. The highest temperature (740 ^{0}C) variation was observed in the treated with liquid nitrogen samples, the lowest (219 ^{0}C) in treated with liquid nitrogen and impregnated samples.

Table 4. Average of temperature values (^{o}C)

Measured of time	Control	Treated with liquid nitrogen	Treated with impregnated	Treated with liquid nitrogen and impregnated
1*	75	80	72	81
2*	91	100	84	95
3*	108	118	95	107
4*	135	136	109	122
5*	164	158	130	142
6*	199	186	156	157
7*	239	213	178	165
8*	268	238	189	177
9	313	266	200	184
10	417	327	208	187
11	556	495	215	195

12	680	654	224	206
13	723	740	236	219
14	711	724	217	205
15	641	707	209	198
16	531	561	186	184
17	452	473	174	172
18	398	412	163	161
19	358	367	151	145
20	318	329	139	132

* Flame source combustion

The averages of O_2 amounts are given in Table 5. The highest reduction of O_2 concentration (% 19.14) was measured in treated with liquid nitrogen and impregnated samples, the lowest change of O_2-concentration (%16.42) in combustion of control samples**.**

Table 5. Average of O_2 amounts(%)

Measured of time	Control	Treated with liquid nitrogen	Treated with impregnated	Treated with liquid nitrogen and impregnated
1*	20,85	20,75	20,42	20,48
2*	20,46	20,45	20,26	20,21
3*	19,82	20,02	20,04	20,06
4*	19,26	19,41	19,37	19,73
5*	18,60	18,94	19,33	19,65
6*	17,93	18,28	19,19	19,39
7*	17,39	18,34	18,90	19,34
8*	17,09	18,33	18,80	19,25
9	16,94	18,38	18,74	19,14
10	16,42	18,17	19,15	19,47
11	16,82	17,92	19,40	19,88
12	17,23	17,41	19,60	20,11
13	17,75	17,05	19,83	20,27
14	18,82	16,28	19,95	20,43
15	19,41	17,64	20,28	20,83
16	20,48	20,07	20,67	20,84
17	20,55	20,40	20,85	20,92
18	20,60	20,51	20,96	20,98
19	20,67	20,60	20,97	20,99
20	20,79	20,77	20,97	20,99

* Flame source combustion

The averages of variations of CO are given in Table 6. The highest increase in CO concentration was (822 ppm) observed in the treated with liquid nitrogen samples and the lowest in (363 ppm) treated with liquid nitrogen and impregnated samples.

Table 6. Variation of CO (ppm)

Measured of time	Control	Treated with liquid nitrogen	Treated with impregnated	Treated with liquid nitrogen and impregnated
1*	11	32	3	40
2*	43	99	52	112
3*	120	178	137	167
4*	195	269	203	216
5*	283	322	283	255
6*	324	372	328	288
7*	372	418	360	304
8*	490	501	361	341
9	526	558	365	363
10	549	639	368	345
11	561	750	326	315
12	692	822	306	274
13	707	798	285	260

14	664	728	238	242
15	596	603	206	210
16	513	534	161	188
17	322	413	96	115
18	256	299	65	77
19	192	209	38	49
20	105	136	16	26

* Flame source combustion

The averages of variation of NO are given in Table 7. In this study, the highest increase in NO concentration was observed in the experiment of (17.2 ppm) control samples and the lowest in those of (11,8 ppm) treated with impregnated samples.

Table 7. Variation of NO (ppm).

Measured of time	**Control**	**Treated with liquid nitrogen**	**Treated with impregnated**	**Treated with liquid nitrogen and impregnated**
1*	0,3	1,0	0,8	0,8
2*	1,3	2,6	1,8	2,8
3*	4,4	4,2	3,6	3,6
4*	8,3	7,9	5,4	6,0
5*	9,6	9,9	7,2	8,4
6*	10,6	10,2	9,4	10,6
7*	11,4	12,4	11,8	11,4
8*	12,6	13,1	10,6	12,0
9	13,7	14,4	9,4	10,6
10	14,1	15,4	8,4	8,8
11	14,5	16,0	7,0	7,2
12	13,2	17,2	5,8	6,2
13	12,1	14,0	4,4	5,0
14	9,2	10,8	3,4	4,2
15	7,0	6,9	2,1	3,6
16	4,4	5,5	1,3	2,1
17	2,9	3,4	0,8	1,1
18	1,9	2,2	0,6	0,7
19	1,3	1,6	0,4	0,5
20	0,6	1,0	0,2	0,3

*Flame source combustion

Conclusion

The highest value was found in treated with liquid nitrogen samples at the end of flame source combustion (8^{th} measurement or 4^{th} minute). It was observed that mass reduction values in % occurred in the control samples 2% lower, treated with impregnated samples 49% lower and in the treated with liquid nitrogen-impregnated samples 51% lower compared with the treated with liquid nitrogen samples.

The highest value was found in treated with liquid nitrogen samples at the end of combustion. It was observed that mass reduction values in % occurred in the control samples 1% lower, treated with impregnated samples 63% lower and in the treated with liquid nitrogen-impregnated samples 68% lower compared with the treated with liquid nitrogen samples.

Take into account the temperature values occurred at the end of combustion tests. The highest values were found in the treated with liquid nitrogen samples while the lowest one was observed in the treated with liquid nitrogen-impregnated samples.

In such places, service life of industrial wood materials depends on retention ratio of impregnate chemicals. To use wood materials in exterior service, penetrating thickness on wood materials is very important. Impregnate chemicals which stay on surface of wood will be leached during time. This progress will cause wood material unprotected against to biological factors. Because of this reason, anatonical structure of wood material (wood cell) would change physically (by increasing volume of frozen liquid) by treating liquid nitrogen and penetration ratio would be easier and increased.

Consequently, treated with liquid nitrogen-impregnated was found to be the most successful according to the CO amounts and mass reduction. It can be proposed that protecting impregnating of historical wooden structure due to fire risk.

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THE MISSING PERSONS FINDING SENSITIVE TO MOVEMENTS WITH IMAGE RECOGNITION SYSTEM AND NUMERIC DATA PEOPLE OF LOSS IN TURKEY

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Abstract: Lost children and adults in our country and in other countries that they are known by everyone to be a major social problem. According to the study, records from 12 April 2010 to 1 January 2006 Turkey were examined. During this review process, it was observed that a total of 29.223 recourses for missing children. Of these, 27.741 children are said to be found later. Children and young people are the future of the country and the main architect of assurance. In this study, the robot is designed to find missing persons. Thanks to the wireless camera on the robot, transmits images to the authorities in the outside world. Face images with previously saved from a computer face pictures of missing persons matched. If there is a match between the faces, the system automatically provides alerts to the authorities.

Keywords: Image recognition, Numeric data

Introduction

Children lost their today have become a major social problem. Whatever the way, where it is known by parents or legal representatives, made on children reported missing, is defined as lost a child (LC).The number of children disappears every day; we see that increase according to official data released by the police. For this young potential, appropriate environment should be provided. If the healthy development of our children socially supported, the progress of the country, the development and the increase of social welfare will be faster and easier. Any type of youth will directly contribute to the shaping of the future investment. As the number of positive role models in society, positive actions in the next younger generation, success and peace will grow exponentially (Anonymous, 2010).

The evaluation of children who were reported as missing in Turkey, General Directorate of Security, Gendarmerie General Command, considered by Turkey Statistics Institution, the statistics are utilized. Full on missing children, are difficulties in collecting accurate data about the world in general. Some of these countries have not reached all of the public record of birth, it cannot be determined exactly in the pediatric population. In addition, to the authorities of the child may be listed as missing in reporting deficiencies (Anonymous, 2010).

Robotics, to enter into interaction with the environment in which people and to have become inevitable. Yılmaz, N. et al. (2006) did in their project, which can communicate wirelessly over the WAN (Wide Area Network) and LAN (Local Area Network), traceable, have created a Web robot that can be controlled and can be reprogrammed. Similar studies on facial recognition before (Başak et al. 1998; Hjelmas & Low, 2001; Viola & Jones, 2004; Eleyan, 2010; Varol & Cebe, 2011) were made.

According to Region in Turkey Number of Lost Children

In the following Table 1, 2008 the number of children missing are analyzed according to regions. According to the ranking of the number of first place with 434 missing children LC is the Marmara region. After the Marmara region is followed by Central Anatolia Region, Southeastern Anatolia Region, the Black Sea Region, Aegean Region, the Eastern Anatolia Region and Mediterranean Region. It is believed that there is a region between the distinctive features in this regard (Anonymous, 2008).

Table 1: Rate Ranking of the Region Population Number of Missing Children (Anonymous, 2008).

Regions	Density Loss (LC Count/Population Ratio)	Number of Losses	Population	The Ratio of Total Population
Marmara	15,00	434	20.724.950	29%
Southeastern Anatolia	8,30	83	7.170.849	10%
Eastern Anatolia	6,50	52	5.694.582	8%
Black Sea	6,20	68	7.462.451	11%
Central Anatolia	5.70	92	11.327.675	16%
Aegean	4,30	56	9.299.322	13%
Mediterranean	3,70	48	8.906.427	13%

After about Loss recourse is made, the number of children located, in 2013, increased by 97.4% compared to 2009. In 2013, loss (found) children 39.6% male and 60.4% are girls (Anonymous, 2014).

Lost Children According to Gender Number in Turkey

Missing child information, which was filed on officially lost and brought to security units include children found by security units/citizens. The child finds information is lost children who made the recourses officially. In addition, children who are brought to the security unit was found by security units/citizens. The following Table 2, the number of missing children according to gender in 2011-2013 indicated (Anonymous, 2014-1).

Table 2: TÜİK – The distribution by gender of the children disappeared (Anonymous, 2014-1).

Year	Male	Famale	Total
2011	4.254	5.813	10.067
2012	4.885	7.589	12.474
2013	6.421	9.797	16.218
Total	15.560	23.199	38.759

Total Number of Lost Children in Turkey

In Turkey, about missing children by the Police General Directorate (PGD), records are kept since 1997.Lost children with recourse, 67.1% in the 15-19 age group, 28.8% in the 10-14 age group and 4.1% are known to be in the 0-9 age group. The following Table 3, the distribution of children according to years lost between 2006 and 2010 is shown (Anonymous, 2010). When viewed in Table 3, the age range can also see that the rate increases progressively lost child.

Table 3: The distribution of children who disappeared between 2006 and 2010, according to the PGD record (Anonymous, 2010).

Age Group of Child	Total Lost		Still Dialed		Has Been Found	
	Count	%	Count	%	Count	%
0-9 Year	1.208	4,1	87	5,8	1.121	4
10-14 Year	8.406	28,8	423	28,5	7.983	28,8
15-19 Year	19.609	67,1	972	65,5	18.637	67,2
Total	29.223	100,0	1.482	100,0	27.741	100,0

This lost child figures, it should be noted that only consists of those reported to the relevant government agencies. Families, unless notice to the concerned public units is not covered by these children lost child registration. Therefore, the actual figures could be much more than the specified number. When these numbers are considered, the number of missing persons is quite high.

Robot Findings Missing Peopler

When we look at the history of science, major scientific and technological growth after a long static periods are observed. We live in modern science and technology in the process, all the people and society has an important place robot concepts and applications that will change the life of many cases. Facial recognition algorithms can be divided into two parts as the overall structure. The first of them is the facial recognition technology via images; face recognition technology is a moving image on the other. These two technologies are used today in place tens. In these examples, many countries face in the use of screening and passport control to start the nationwide

Surveillance cameras as used in cameras that have made demonstrable Interpol facial recognition application (Torun et al. 2007). At passport control logic, matched with the biometric details of the person in the person's face is based on whether the same person in the transition to the next passport. A biometric characteristic of a person's face in defining these methods (for example distance between the nose and the mouth, eyes as the ratio of the width of the mouth of the distance from each other) is recorded in the system. After in the transitions compared old and new data just by looking at the camera.

Facial recognition algorithms operation steps are as follows:

- Such as a Web cam or traffic cameras, optical image from an input source.
- Picture educating, preparing for the receipt of sections rather than just taking the whole face.
- Comparison with the face in the database section by taking the face section.
- Repeating the steps from the image input in case of incompatibility (Varol & Cebe, 2011).

This study was designed a robot find missing persons. The robot makes discoveries by visiting the outside world. Robot, face the people he encountered during discovery, the center thanks to wireless camera transmits on. The purpose of the designed system, to reduce the number of lost finding missing children and material and moral adverse effects due to losses occurring in society to eliminate.

Pairing between facial images saved on the computer with the loss of facial images from the outside world is made. If there is pairing between the face, SMS and automatic voice warning is given to the authorities. Robot wireless camera transmits real-time images on the center.

The flow diagram of designed system shown in Figure 1.

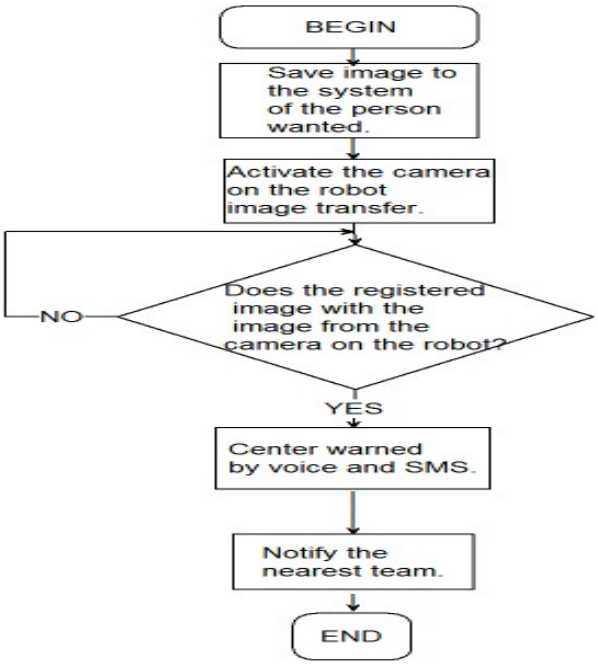

Figure 1. Flow Diagram System

In this way, the robot where to find the missing persons will have been seen. Where the missing person is found, it is reported to the nearest team. As a result, people would have been lost. System operation steps are as follows;

1) Missing person's face in the picture is saved to the computer center. Schematic of this process is shown in Figure 2.

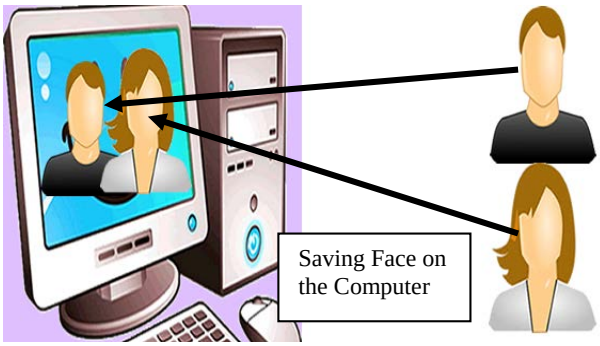

Figure 2. Registration Process

2) The robot starts to wander outside world. Schematic of this process is shown in Figure 3.

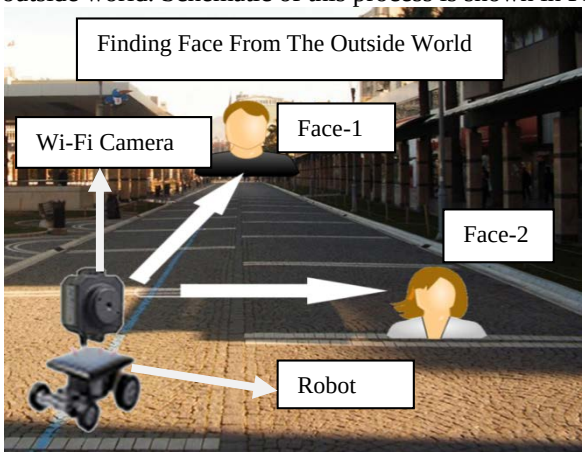

Figure 3. Discovery Process

3) Faces faced by the outside world, transmits center with the help of a wireless camera. Schematic of this process is shown in Figure 4.

Figure 4. Transferring Process

4) Faces incoming the center, matched with faces stored in the computer. Schematic of this process is shown in Figure 5.

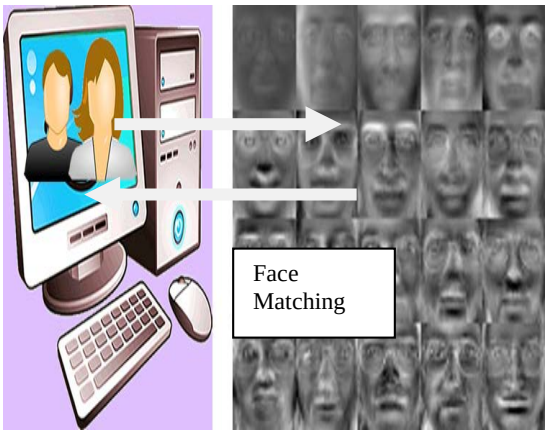

Figure 5. Matching Process

5) If matching system automatically to authorities sends alerts as SMS and voice. Schematic of this process is shown in Figure 6. The name of the person who has sent the SMS. Thus completes the process of finding missing persons.

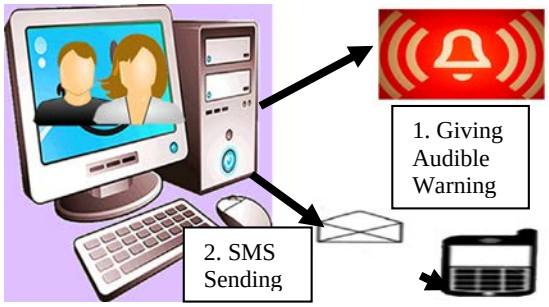

Figure 5. Warning Giving Process

Conclusions

Security General Directorate, "which disappears if you disappear from the environment, where it is known by parents or legal representatives and made about reported missing children" are traded on as a missing child. International data of missing children are reported to be mostly composed of women and girls trafficked for sexual exploitation outside the country's borders. In the national data, lost children of law enforcement officers is mainly to show the way in the search. The missing boy friends, family and social environment related features are not enough information about the factors that may be related to the loss of the child. Of data rather than electronically, collection and storage of printed media, integration of data, reporting and make it difficult to share.

The research covered in Turkey, within a selected representative sample of 1 January 2006-12 June 2010, it was reported that a total of 2455 children interviewed close. The children selected for the sample, in case the wanted group has reached 78.1%.In the groups have been found were reached 89%.

When adding the missing persons system, adding a few times from different angles, will provide the right people there more quickly. Otherwise, the system will alert with the presence of other persons. After the warning given, it is confirmed by looking at the computer screen of missing persons.

Discharge of the battery will not be known when the robot wandering outside world.

Through the robot designed this study cannot be reached and ever increasing missing persons, instant discovery process was carried out. In addition to reducing the number of losses is intended to eliminate the negative effects of the resulting material and moral society. After the discovery process can be known the whereabouts of missing persons.

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USING VIKOR METHOD FOR ANALYZING OF QUALIFICATION LEVELS AND TRANSITION TO EMPLOYMENT OF EUROPEAN UNION AND CANDIDATE COUNTRIES

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Abstract: The aim of this study is to evaluate and rank European Union and Candidate countries with respect to some of the qualification levels and transition to employment indicators especially which are relevant with women. The data obtained from the "Key Data on Education in Europe 2012" report. Indicators have selected as follows: 1- proportion of tertiary education qualifications awarded to women by field of educational/professional training, 2- proportion of people in employment by age group (25-39; 40-64), 3- tertiary education graduates in employment of females by occupational category (age 25-64), 4- unemployment rates of females for the 25-64 age group by educational attainment. VIKOR Method which is one of the multi-criteria decision making techniques used in this study. By using this method, alternatives (EU and candidate countries) ranked by comparing the measure of closeness to the ideal alternative and then the best (compromise) alternative from a set of alternatives in the presence of conflicting criteria (indicators mentioned above) has selected.

Keywords: Multi Criteria Decision Making, VIKOR Method, Education, Employment, European Union.

Introduction

The gap of gender in education and employment has important effects on the countries' development. There are many studies about gender inequality in education in the literature. Some of them investigated its economic effects. Barro and Lee (1994) and Barro and Sala-i-Martin (1995) considered the impact on gender inequality in education. They suggest differences in male and female schooling may indicate backwardness and can bring on economic growth (Klasen, 2002). Hill and King (1995) find that a low female-male enrollment ratio is associated with lower per capita, over and above the impact of female education levels on GDP per capita (Nganga, 2011). Knowles et al. (2002) find that gender inequality in education significantly reduces GDP per capita (Klasen, 2002). Klasen (1999, 2002) and Klasen and Lamanna (2009) investigated the implications of gender inequality in labor market participation on economic growth. Klasen (1999) found that female share of the total labor force participation had a large, positive and significant impact on growth.

It is important to analyze and monitor the differences on educational levels and situations of countries. The aim of this study is to evaluate and rank European Union (EU-27) and candidate countries (Turkey and Croatia in 2012) with respect to some of the qualification levels and transition to employment indicators especially which are relevant with women. The data obtained from the "Key Data on Education in Europe 2012" report. Eurydice Network is producing the Key Data on Education report for more than 15 years. Since 1980, Eurydice network has been one of the strategic mechanisms established by the European Commission and Member States to support European cooperation in the field of education. The educational information of 41 national units based in 37 countries participating in the Erasmus+ programme obtainable on Eurydice Network. Key Data on Education in Europe makes a valuable contribution to the debate on education policy at both European and national level and helps to monitor progress on the strategic framework. Based on data collected through the Eurydice network, Eurostat and the PISA international survey, the report provides standardised and readily comparable quantitative and qualitative indicators which offer a wide-ranging overview of the organisation and functioning of European education systems (Key Data on Education in Europe, 2012).

Instead of statistical methods, VIKOR (Vise Kriterijumska Optimizacija I Kompromisno Resenje) Method which is one of the multi-criteria decision making (MCDM) techniques, used for ranking countries with respect to their performances in this study. Multi criteria decision making is a branch of Operations Research. The VIKOR Method was introduced as an applicable technique to implement within MCDM (Opricovic, 1998). It has been used in

many areas such as energy planning, marketing, supplier selection, financial performance evaluation, university selection, personnel training selection, performance evaluation, strategy evaluation, site selection, etc.

Vikor Method

The VIKOR method focuses on ranking and selecting from a set of alternatives, and determines compromise solutions for a problem with conflicting criteria, which can help the decision makers to reach a final decision (Opricovic, 1998; Opricovic and Tzeng, 2007). It introduces the multi criteria ranking index based on the particular measure of "closeness" to the "ideal" solution (Opriovic and Tzeng, 2004)

The steps of the VIKOR Method are explained in detail below (Opricoviz and Tzeng, 2004; Opricoviz and Tzeng, 2007):

Step 1. Determination the best f_i^* and the worst f_i^- values of all criterion functions, i=1,2,…,n. If the ith function represents a benefit then

$$f_i^* = \max_j f_{ij} \qquad f_i^- = \min_j f_{ij} \quad \text{if the i-th function represents a benefit;} \tag{1}$$

$$f_i^* = \min_j f_{ij} \qquad f_i^- = \max_j f_{ij} \quad \text{if the i-th function represents a cost.}$$

Step 2. Computation the values S_j and R_j, j=1,2,…,J

$$S_j = \sum_{i=1}^{n} w_i (f_i^* - f_{ij}) / (f_i^* - f_i^-), \tag{2}$$

$$R_j = \max_i [w_i (f_i^* - f_{ij}) / (f_i^* - f_i^-)], \tag{3}$$

Here w_i are the weights of criteria.

Step 3. Computation the values Q_j, j=1, 2… J

$$Q_j = v(S_j - S^*) / (S^- - S^*) + (1 - v)(R_j - R^*) / (R^- - R^*) \tag{4}$$

Where $S^* = \min_j S_j$, $S^- = \max_j S_j$, $R^* = \min_j R_j$, $R^- = \max_j R_j$

v is introduced as weight of the strategy of "the majority of criteria" (or "the maximum group utility"), here $v = 0.5$.

Step 4. Ranking the alternatives, sorting by the values S, R and Q, The results are three ranking lists.

Step 5. Proposing as a compromise solution the alternative (a') which is ranked the best by the measure Q (minimum) if the following two conditions are satisfied:

C1: "Acceptable advantage": $Q(a'') - Q(a') \geq DQ$ Where a'' is the alternative $DQ = 1/(J-1)$; J is the number of alternatives.

C2. "Acceptable Stability in decision making": The alternative a' must also be the best ranked by *S* or/and *R*. This compromise solution is stable within a decision making process, which could be the strategy of maximum group utility (when $v > 0.5$ is needed), or "by consensus" $v \approx 0.5$, or "with veto"($v < 0.5$). Here, *v* is the weight of decision making strategy of maximum group utility.

The best alternative, ranked by *Q*, is the one with the minimum value of *Q*. The main ranking result is the compromise ranking list of alternatives, and the compromise solution with the "advantage rate".

ANALYSIS OF QUALIFICATION LEVELS AND TRANSITION TO EMPLOYMENT OF EUROPEAN UNION AND CANDIDATE COUNTRIES

The measurement of countries' education performances can be evaluated with respect to many quantitative and qualitative criterions. In this study qualification levels and transition to employment of countries has been taken into consideration. The total of 28 countries (because of missing data Luxemburg excluded) included in this study. Selected total 19 educational and employment ratios of these 28 countries have gathered from the publications of the EURYDICE (http://eacea.ec.europa.eu/education/eurydice).

Table 1. The Criterion which used in Countries' Evaluation

MC1. Proportion of tertiary education qualifications awarded to women by field of educational/professional training	**MC2.** Proportion of people in employment by age group (25-39; 40-64),
SC1. Education and training SC2. Humanities and arts SC3. Social sciences, business and law SC4. Science, mathematics and computing SC5. Engineering, manufacturing and construction SC6. Agriculture and veterinary science SC7. Health and welfare SC8. Services	SC9. Low (25-39) SC10. Low (40-64) SC11. Medium (25-39) SC12. Medium (40-64) SC13. High (25-39) S14. High (40-64)
MC3. Tertiary education graduates in employment of females by occupational category (age 25-64)	**MC4.** Unemployment rates of females for the 25-64 age groups by educational attainment.
SC15. Professionals and manages SC16. Technicians and associate professionals	SC17. Low SC18. Medium SC19. Higher

APPLICATION OF VIKOR METHOD

Firstly the best f_i^* and the worst f_i^- values of all criterion functions were determinate from equation (1). After that with using the equation (2), (3) and (4) S_j, R_j and Q_j are calculated for each country j=1,2,…,28. (Q_j values are computed by selecting v=0.75). Table 2 gives the scores of countries and their corresponding rankings.

Table 2. S, R and Q Scores and Ranks of the Countries

Rank	Sj		Rj		Qj (v=0.75)	
1.	Sweden	0,289	Bulgaria	0,0337	Sweden	0,096
2.	Finland	0,334	Czech Rep	0,0358	Portugal	0,142
3.	Portugal	0,344	Portugal	0,0375	Finland	0,193
4.	Slovenia	0,347	Hungary	0,0399	Slovenia	0,215
5.	Romania	0,356	Sweden	0,0410	Czech Rep	0,222
6.	Malta	0,358	Malta	0,0423	Bulgaria	0,224
7.	Estonia	0,370	Belgium	0,0424	Malta	0,230
8.	Denmark	0,373	Finland	0,0426	Romania	0,232
9.	Netherlands	0,397	Slovenia	0,0426	Belgium	0,336
10.	Austria	0,398	Croatia	0,0427	United Kg	0,348
11.	Czech Rep	0,406	Romania	0,0428	Estonia	0,348
12.	Germany	0,409	Latvia	0,0433	Latvia	0,365
13.	United Kg	0,421	United Kg	0,0434	Denmark	0,391
14.	Belgium	0,422	Estonia	0,0499	Hungary	0,395
15.	Bulgaria	0,424	Austria	0,0500	Austria	0,397
16.	Cyprus	0,428	Belgium	0,0500	Croatia	0,408
17.	Latvia	0,432	France	0,0506	Netherlands	0,430
18.	Italy	0,446	Greece	0,0508	Germany	0,433
19.	France	0,452	Germany	0,0513	Cyprus	0,482
20.	Croatia	0,462	Spain	0,0526	France	0,495
21.	Belgium	0,465	Lithuania	0,0526	Belgium	0,508
22.	Greece	0,474	Denmark	0,0526	Italy	0,512
23.	Hungary	0,477	Ireland	0,0526	Greece	0,533
24.	Lithuania	0,483	Italy	0,0526	Lithuania	0,572
25.	Slovakia	0,510	Cyprus	0,0526	Slovakia	0,618
26.	Ireland	0,557	Netherlands	0,0526	Ireland	0,696
27.	Spain	0,576	Slovakia	0,0526	Spain	0,728
28.	Turkey	0,740	Turkey	0,0526	Turkey	1,000

The best alternative, ranked by Q, is the one with the minimum value of Q. It can be seen that Sweden is the best alternative. Sweden satisfies condition C1 and C2. Because $Q(a'') - Q(a') = 0.142 - 0.096 = 0.046 \geq DQ = 0.037$ and this country is also the best ranked by S. Therefore Sweden has an acceptable advantage and acceptable stability in decision making with respect to the other countries. Note that the weight v has a central role in identifying the ranking. Some values (like v=0, v=0.25, v=0.50, v=0.75) between 0 and 1 tried in this study. When they are compared the value of 0.75 had give the best results for this study.

Conclusion

There are several methods especially statistical methods for evaluate and compare countries' various characteristics. In this study 28 countries were rated against to qualification levels and transition to employment. The indicators has selected from the Key Data on Education report which published by Eurydice Network. The ranking countries' list was acquired using, the multi-criteria analysis method, called VIKOR. After the application of VIKOR method Sweden is the best country among twenty eight countries with respect to qualification levels and transition to employment. It is not a surprise because according to the Current Situation of Gender Equality in Sweden – Country Profile (2013), the general employment rate of women in the Swedish labour market is the highest in the EU-27. Attainment of secondary education is higher for Swedish women (76.9%) than the EU-27 average (70.9%), and also higher than the rate of Swedish men (75.5%). The employment rate of women in Sweden (71.8%) was the highest in the EU-27 and consequently above the EU-27 average (58.6%). Women participated in the labour market nearly to the same degree as men (75.6%) in Sweden. These all information support the results which gathered by using VIKOR method. The second and third countries are Portugal and Finland respectively. Turkey is at the end of the list according to S, R and Q values.

In this study all indicators have equal priority. Further researches may try give different priorities to indicators. VIKOR method is very useful technique for ranking countries with respect to various indicators. Also further researches may try rank countries with choose different indicators.

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