International Congress on Fundamental and Applied Sciences

18-22 June 2018 Skopje, Macedonia

ICFAS2018

Proceeding Book

Editors

Muhammet Kurulay
Elif Segah Öztaş

icfas2018.intsa.org

ISBN 978-605-67052-2-9

ICFAS2018 Committees

Conference Chair

Muhammet Kurulay, Yildiz Technical University

Scientific Committee

Abdelouahab Kadem, University of Setif
Ali Erdogmus, Yildiz Technical University
Azzmer Azzar Abdul Hamid, International Islamic University Malaysia
Carlo Cattani, University of Tuscia, Mathematics, Italy
Elif Segah Oztas, Karamanoglu Mehmetbey University
Erhan Tabakoğlu, Trakya University
Fahrul Zaman Huyop, Universiti Teknologi Malaysia
Hari Mohan Srivastava, University of Victoria
Hasan Kilic, Marmara University
Ismail Kocayusufoglu, International Balkan University
Khalid Jbilou, LMPA
Kenan Yildirim, Mus Alparslan University
Masood Khalique, North-West University
M. Fatih Karaaslan, Yildiz Technical University
Muhammet Kurulay, Yildiz Technical University
Mumin Sahin, Trakya University
Murat Türkyılmaz, Trakya University
Murat Yurtcan, Trakya University
Mustapha Hached, LMPA
M. Talha Gonullu, Adiyaman University
Nadir Ayrilmis, Istanbul University
Orhan Uzun, Bartin University
Sevket Erol Okan, Trakya University
Yilmaz Can, Trakya University
Yilmaz Kaya, Ondokuz Mayis University
Xiao Jun Yang, Department of Mathematics and Mechanics, China University of Mining and Technology

Organizing Committee

Elif Segah Oztas, Karamanoglu Mehmetbey University
M. Fatih Karaaslan, Yildiz Technical University
Meltem Uzun, Yildiz Technical University
Mirsad Yesiltepe, Yildiz Technical University
Yaprak Guldoğan, Yildiz Technical University

Participants

Name Surname	E-mail
Ahmet Alper Öner	alperoner@erciyes.edu.tr
Ahmet Yucekaya	ahmety@khas.edu.tr
Algirdas Ambrazevicius	algirdas.ambrazevicius@mif.vu.lt
Ali Bashan	alibashan@gmail.com
Antohe Magda-ecaterina	magda.antohe@yahoo.com
Aouati Mohamed Khelil	aouati.mk@gmail.com
Ayman Badawi	abadawi@aus.edu
Barış Özkapi	barisozkapi@trakya.edu.tr
Bekir Aktaş	baktas@erciyes.edu.tr
Cagri Sel	cagrisel@karabuk.edu.tr
Cem Canan	cemcanan@trakya.edu.tr
Cigdem Gunduz Aras	carasgunduz@gmail.com
Cristina Gena Dascalu	cdascalu_info@yahoo.com
Çiler Kartal	cilermeric@trakya.edu.tr
Dilek Varol Bayram	dvarol@pau.edu.tr
Elçin Ceren Yaldir	elcinyaldir@gmail.com
Elif Segah Oztas	elifsegahoztas@gmail.com
Enver Özdemir	ozdemiren@itu.edu.tr
Fadime Gökçe	fgokce@pau.edu.tr
Fatah Benatia	fatahbenatia@hotmail.com
Fatma Güneş	drgunes@gmail.com
Fatma Yeşil Baran	ftm1618ysl@gmail.com
Fevzi Yılmaz	yfevzi@mu.edu.tr
Figen Boz	figenb@trakya.edu.tr
Filiz Yağcı	gfiliz@uludag.edu.tr
Fulya Öz Tuncay	fulyaoz@ktu.edu.tr
Furkan Semih Dündar	furkan.dundar@boun.edu.tr
Gokhan Altan	gokhan_altan@hotmail.com
Gözde Yaylalı Umul	gozdeyaylali@mu.edu.tr
Gühergül Uluçam	gulergul@trakya.edu.tr
Gül Gözde Biçer Şarlak	gulgozdebicer@hotmail.com
Gülfem Isiklar Alptekin	gisiklar@gsu.edu.tr
Gülhan Ayar	gulhanayar@gmail.com
Hami Gündoğdu	hamigundogdu@sakarya.edu.tr
Hasan Kiliç	hkilic@marmara.edu.tr
Hatam Guliyev	hatamguliyev@gmail.com
Hulya Kes	hulyakesuyguner@trakya.edu.tr

İhsan Başaran	ihsanbasaran.tr@gmail.com
İkbal Sarikaya	ikbal.sarikaya@ktu.edu.tr
İsmail Çelik	icelik@cumhuriyet.edu.tr
Kharfouchi Soumia	s_kharfouchi@yahoo.fr
Korhan Cengiz	korhancengiz@trakya.edu.tr
Kubra Nari	nari15@itu.edu.tr
Makbule Burkut Koçak	mkocak@itu.edu.tr
Mehmet Ali Balci	mehmetalibalci@mu.edu.tr
Mehmet Fatih Karaaslan	mfatihk34@gmail.com
Mehmet Ozen	ozen@sakarya.edu.tr
Mehmet Saçak	sacak@science.ankara.edu.tr
Mehmet Seven	mimseven@istanbul.edu.tr
Meltem Uzun	uzunn.meltem@gmail.com
Meral Yay	meral.yay@msgsu.edu.tr
Meral Yay	meral.yay@gmail.com
Mevlude Canlica	mcanlica@yahoo.com
Mihaela Sterpu	
Mirsat Yeşiltepe	mirsatyesiltepe@hotmail.com
Muhammet Kurulay	muhammetkurulay@gmail.com
Murat Bingül	murat.bingul@dicle.edu.tr
Murat Celtek	mceltek@trakya.edu.tr
Murat Yurtcan	myurtcan@trakya.edu.tr
Musa Turkan	musa.turkan@bilecik.edu.tr
Mustafa Can Güçlü	m.can.gcl@gmail.com
Mustafa Kaya	mustkaya22@hotmail.com
Mutlu Colakogullari	mutlucolakogullari@trakya.edu.tr
Muttalip Ozavsar	mozavsar@yildiz.edu.tr
Nadir Ayrilmis	nadiray@istanbul.edu.tr
Nazan Polat	ncakmak@mu.edu.tr
Octavian Agratini	agratini@math.ubbcluj.ro
Okba Belahssen	belahssenokba@gmail.com
Olga Danilkina	olga.danilkina@gmail.com
Özgül İlhan	oilhan@mu.edu.tr
Özgür Culfa	ozgurculfa@kmu.edu.tr
Rocsoreanu Carmen	crocsoreanu@gmail.com
Roksana Brodnicka	rbrodnicka@o2.pl
Ruhsar Ela İriş	iris.r.ela@gmail.com
Saban Aktas	sabana@trakya.edu.tr
Sadettin Emre Alptekin	ealptekin@gsu.edu.tr
Sadi Bayramov	baysadi@gmail.com
Salih Paşa	drsalihpasa@gmail.com

Savas Bayram	sbayram@erciyes.edu.tr
Sedat Sengul	sedatsengul@trakya.edu.tr
Semra Bilgiç	bilgic@science.ankara.edu.tr
Sena Güler Özkapi	senaguler@trakya.edu.tr
Sertaç Görgülü	sgorgulu@mehmetakif.edu.tr
Sevket Erol Okan	erolokan@trakya.edu.tr
Seyit Baran	seyitbaran40@gmail.com
Şevket Aslan	sevketaslan@erciyes.edu.tr
Şule Dinç Zor	sule_dinc@yahoo.com
Uğur Talaş	ugur.talas@bilecik.edu.tr
Unal Domekeli	unaldomekeli@trakya.edu.tr
Veysel Selimoğlu	v.selimoglu@hotmail.com
Vincenzo Tibullo	vtibullo@unisa.it
Vladas Skakauskas	vladas.skakauskas@mif.vu.lt
Yaprak Dericioğlu	yyguldogan@gmail.com
Yeşim Sağlam Özkan	ysaglam@uludag.edu.tr
Zahir Muradoglu	zahir@kocaeli.edu.tr
Zülküf Kaya	zkaya@erciyes.edu.tr

NODE DISPLACEMENT TO CLUSTER 3D POINT CLOUDS

Mehmet Ali Balcı, Ömer Akgüller

Muğla Sıtkı Koçman University, Faculty of Science, Department of Mathematics, Muğla 48000, Turkey
mehmetalibalci@mu.edu.tr
Muğla Sıtkı Koçman University, Faculty of Science, Department of Mathematics, Muğla 48000, Turkey
oakguller@mu.edu.tr

Abstract:

The 3D point clouds used for displaying the discrete smooth surfaces have become quite common with the developing technology. The geometric processing of 3D point clouds depends on the number of points. Clustering methods are presented for shortening these processes. In this work, we present a clustering method that is based on the vibration potential of the vertices of the Delaunay graph, which includes the points as vertices.

Keywords: Point Cloud Processing, Delaunay Triangulation, Node Displacement, Clustering
General area of research: Mathematics
ICFAS2018-ID: 1013

1. INTRODUCTION

Recently, increasing demand for realism in visualization has led to the popularity of structured light and laser-range scanners. Having many application areas such as reverse engineering, rapid prototyping, digital geometry processing and architecture, these scanners are also useful for modeling real world objects from time consuming and expensive digital design processes. Basically, they produce point clusters that are directly measured and produce a discrete representation of the object by sampling the geometry of the object in the determined locations. These generated point clusters can then be reverse reconstructed to obtain the object surface. In contrast to the discrete representation of the object, construction can be examined in five steps: data acquisition, data noise reduction, point cloud simplification, point cloud recording, and surface reconstruction. Achieving data clusters in each of these five steps significantly shortens the time to perform processes [6,10,11].

Clustering is, naturally, a problem of density estimation, which collects and groups samples with similar properties. Cluster detection is the process of grouping a set of objects into clusters so that the objects in a cluster have high similarities, but not similar to objects in other clusters [5]. Partitioned clustering and hierarchical clustering methods are the most commonly used clustering methods. Partial algorithms usually specify all the clusters in one place. K-means is a typical partitioned clustering algorithm. The main advantages of the K-means algorithm are the simplicity and speed that allows it to work in large data sets. However, since the resulting clusters are bound to the first random assignment, they do not give the same result during each run and

the number of clusters must be defined in advance. Hierarchical clustering is agglomerative or divisor. Agglomerative algorithms start as a separate set from each element, and two sets separated by the shortest distance are joined one after the other. Many hierarchical clustering algorithms are agglomerates. The divider starts with a large cluster, and the division is repeated as the hierarchy progresses downward. Hierarchical clustering creates a hierarchy of hierarchies called a dendrogram. The way the elements are clustered is clearly shown in the dendrogram.

The distances or similarities between 3D points become more uniform and make this partition or hierarchical clustering processes more difficult. In addition, similarities between 3D points can be problematic because a point in the 3D domain may be closer or more similar to another cluster member. Neighborhood associations can be effective at solving such a problem. It is well known that 3D Voronoi diagram and Delaunay triangulation provide topological neighborhood relations and reasonable explanations for spatial locations [9]. Clustering methods based on these approaches have been extensively studied to distinguish significant segmentation of 3D models, contrary to mesh fragmentation or surface segmentation [1-8].
In this paper, we discuss the clustering of elements of a point cloud cluster according to their vibrational potentials. We present a geometric approach to the construction of networks formed with point cloud elements as an alternative to traditional operations, which generally treat networks as combinational objects and based solely on classical graph theoretic concepts. To do this, we embed the point cloud to n-dimensional Euclidean space, where n is the number of nodes of the network, using the Moore-Penrose pseudo-inverse of the graph Laplacian created by Delaunay Triangulation.

2. METHOD

Given a network expressed by a simple $G = (V, E)$ graph, some physical concepts may be useful for analyzing it. One of these concepts is called vibrational potential. The vibrational potential is a measure of the amount of grafting that is held in the thermal bath and then under a small perturbation of the equilibrium state of a node. The vibrational potential of a graph can be computed as

$$V(\vec{x}) = \frac{k}{2}\vec{x}^T L\vec{x},$$

where k is the spring constant, L is the graph Laplacian, and $\vec{x}$ is the vector whose i-th entry is the displacement of x_i. A vibrational potential of a network is deeply studied in [3] and we strongly refer it to interested readers.
In this work we consider the vibrational potential energy from the static position of the Delaunay triangulation created on the point cloud. As mentioned earlier, the local neighborhood of each point is effective for the clustering of 3D point clouds.
For this purpose we present the vibrational potential of a node respect to its neighboring nodes with

$$V(\overrightarrow{x_v}) = \frac{k}{2}\overrightarrow{x_v}^T L_N \overrightarrow{x_v}$$

where k is the spring constant, L_N is the Laplacian of the neighboring graph G_N of the node v in G, , and $\vec{x}_v$ is the vector whose i-th entry is the displacement of v. The mean displacement of the node v can be computed with the reverse temperature β as

$$\Delta x_i = \sqrt{\int x_i^2 P(\overrightarrow{x_v}) d\overrightarrow{x_v}},$$

where the probability distribution $P(\overrightarrow{x_v})$ is

$$P(\overrightarrow{x_v}) = \frac{1}{Z} exp\left(-\frac{\beta k}{2} \overrightarrow{x_v}^T L_N \overrightarrow{x_v}\right), \qquad Z = \int d\overrightarrow{x_v} exp\left(-\frac{\beta k}{2} \overrightarrow{x_v}^T L_N \overrightarrow{x_v}\right).$$

By the diagonalization of the Laplacian matrix L_N these values can be computed as follows:

Let $0 = {\lambda^N}_1 < {\lambda^N}_2 \leq \cdots \leq {\lambda^N}_n$ be the spectrum of L_N respect to eigenvalues ${\lambda^N}_\mu$. Since the quantity respect to 0 eigenvalue is the center of mass, the 0 eigenvalue does not affect the vibrational potential. Then the integral measure can be transformed by

$$d\overrightarrow{x_v} = \prod_{i=n}^{n} dx_i = |detU_N| \prod_{i=1} dy_i = d\overrightarrow{y_v},$$

where U_N is the matrix formed by the orthagonal eigenvectors of L_N. By the introduction of this transform the new probability distribution can be obtained as

$$Z = \int d\overrightarrow{y_v} exp\left(-\frac{\beta k}{2} \overrightarrow{y_v}^T \Lambda_N \overrightarrow{y_v}\right) = \prod_{\mu=1}^{n} \int_{-\infty}^{\infty} dy_\mu \, exp\left(-\frac{\beta k}{2} {\lambda^N}_\mu y_\mu^2\right),$$

where Λ_N diagonal matrix involves the eigenvalues ${\lambda^N}_\mu$.

By the simplification methods presented in [3], it is possible to obtain the mean square of the node displacement as

$$(\Delta x_i)^2 = \frac{1}{\beta k} L_{ii}^{N+},$$

where L^{N+} is the generalized Moore-Penrose pseudo-inverse of L_N

3. EXPERIMENTAL RESULTS

To analyze the results of the method we present in this study, we consider two examples as stated in Figure 1.

Fig.1. 3D test models. The upper one is referred as the cow model and the lower one is referred as the plant model.

The discretization of the cow model has 2903 vertices and the discretization of the plant model has 6510 vertices. The Delaunay triangulation of each models are presented in Figure 2.

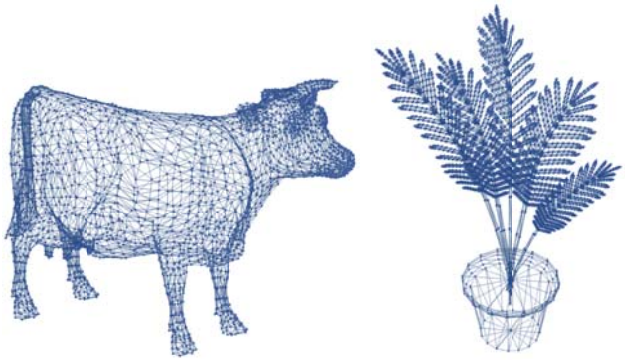


Fig.2. Delaunay triangulation of the cow model with 5804 triangles and of the plant model with 12364 triangles.

The mean displacements of each node are computed for the respected Delaunay triangulations. The calculations show that the maximum and mean of the vibrational potentials are 0.0061595 and 0.0020569 for the cow model, 0.0069094 and 0.00182428 for the plant model, respectively. As seen in Figure 3, the vibrational potentials of the nodes tend to form clusters among themselves. The vibrational potentials below the mean value are more dispersed, while those above the mean value are more uniform. For this reason, the K-Means clustering algorithm is used.

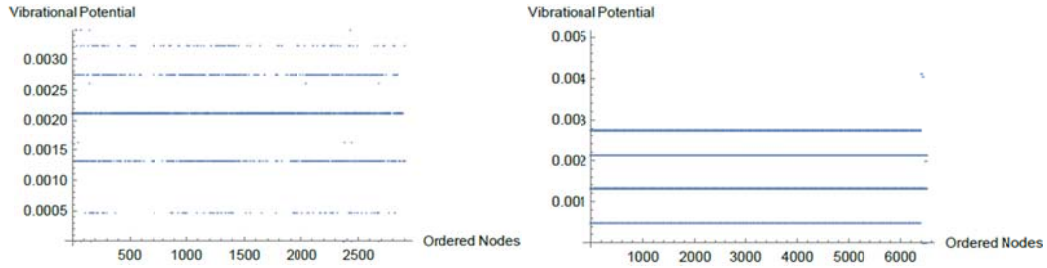


Fig3. The vibrational potentials for the ordered nodes of the cow model (left) and plant model (right).

In Figures 7, we present the points with vibrational potentials closer to the mean for K-Means clustering algorithm for $K = 3$ and $K = 5$, respectively.

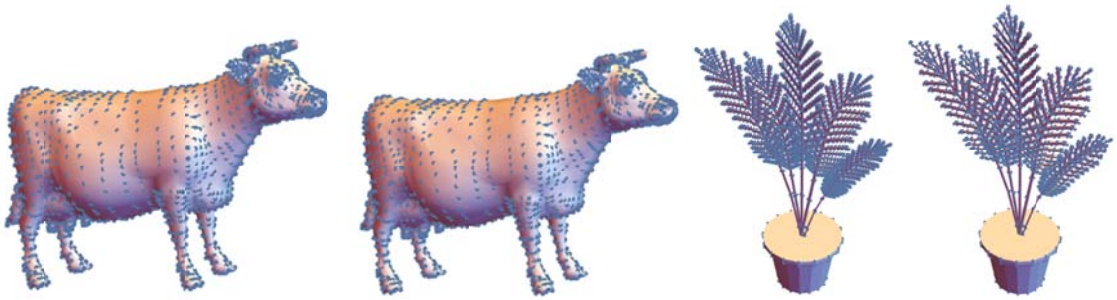


Fig.6. The cluster with mean 0.00187143 for $K = 3$ and The cluster with mean 0.00193029 for $K = 5$ for cow model and the cluster with mean 0.00197157 for $K = 3$ and the cluster with mean 0.00168184 for $K = 5$ for plant model

4. CONCLUSIONS

To determine point clusters in 3D point clouds is important for the several steps of point cloud processing. In this study, the clustering of the elements of the 3D point cloud is obtained by using the vibrational potential of each node. Topological neighborhoods in clusters are important for the point clouds embedded in Euclidean space. To this end, by using the Moore-Penrose pseudo-inverse of the Laplacian of the graph emerges from the Delaunay triangulation we are able to embed the point cloud to $|V|$-dimensional Euclidean space and compute the vibrational potentials.
Calculation of the vibration potential showed a certain clustering in the resultant values. When we examine these clusters in the point cloud, it is observed that the clusters with the average vibrational potency near the vibrational potential are points that are the elements of the small triangles in the Delaunay triangulations. Thus, in a point cloud, the points that deviate the most from the average vibration potential are the outliers or the points that contain the most noises.

REFERENCES

1. Chen, Y., He, F., Wu, Y. and Hou, N., “A local start search algorithm to compute exact Hausdorff Distance for arbitrary point sets”. Pattern Recognition, 67, 2017, pp.139-148.
2. Cohen-Steiner, D., Pierre A., and Desbrun, M. "Variational shape approximation." In ACM Transactions on Graphics (TOG), 23(3), 2004, pp. 905-914.
3. Estrada, E. and Hatano, N. “A vibrational approach to node centrality and vulnerability in complex networks”. Physica A: Statistical Mechanics and its Applications, 389(17), 2010, pp. 3648-3660.
4. Feng, L. and Bhanu, B., “Understanding dynamic social grouping behaviors of pedestrians”. IEEE Journal of Selected Topics in Signal Processing, 9(2), 2015, pp.317-329.
5. Han, J., Kamber, M. and Tung, A. “Spatial clustering methods in data mining: A survey”. Geogr. Data Min. Knowl. Discov. Taylor Fr. 2001, pp. 188–217.
6. Ma, X., and Robert J. C. "Shape preserving data reduction for 3D surface points." Computer-Aided Design 43(8), 2011, pp. 902-909.
7. Majeed, M. and Cirak, F., “Isogeometric analysis using manifold-based smooth basis functions” Computer Methods in Applied Mechanics and Engineering, 316, 2017, pp.547-567.
8. Pauls, S.D. and Remondini, D., “Measures of centrality based on the spectrum of the Laplacian”. Physical Review E, 85(6), 2012, pp. 066127.
9. Ramdan, J., Omar, K. and Faidzul, M. "A New Rule to Reconfirm Potential Segmentation Points with Vertexes Points of VDS." Middle-East Journal of Scientific Research 24(3), 2016, pp. 657-662.
10. Shi, B., Jin, L., and Qing L. "Adaptive simplification of point cloud using k-means clustering." Computer-Aided Design 43(8), 2011, pp. 910-922.
11. Song, H., and Hsi-Yung F. "A global clustering approach to point cloud simplification with a specified data reduction ratio." Computer-Aided Design 40(3), 2008, pp. 281-292.

LONG-TERM HYGROSCOPIC THICKNESS SWELLING RATE OF HYDROTHERMALLY TREATED BEECH WOOD FLOUR/POLYPROPYLENE COMPOSITES

Nadir Ayrilmis[1], Seyyed Khalil Hosseinihashemi[2], Farhad Arwinfar[3], Abdollah Najafi[4], Ferhat Özdemir[5]

[1] Department of Wood Mechanics and Technology, Forestry Faculty, Istanbul University - Cerrahpaşa, Bahcekoy, Sariyer, 34473 Istanbul, Turkey
nadiray@istanbul.edu.tr
[2] Department of Wood Science and Paper Technology, Karaj Branch, Islamic Azad University, Karaj, Iran
skhhosseinihashemi@gmail.com
[3] Department of Wood Science and Paper Technology, Karaj Branch, Islamic Azad University, Karaj, Iran
[4] Department of Wood Science and Paper Technology, Chalous Branch, Islamic Azad University, Chalous, Iran
[5] Department of Wood Chemistry and Technology, Forestry Faculty, Kahramanmaraş Sütçü İmam University, Kahramanmaraş, Turkey

Abstract:

Long-term hygroscopic thickness swelling rate of polypropylene (PP) composites filled with thermally treated wood flour was investigated. The beech wood chips were heat treated at 120 °C, 150 °C or 180 °C for 30 or 120 min using saturated steam in a digester. The composites based on PP, beech wood flour (BF), and coupling agents (PP-g-MA) were made by melt compounding and injection molding. The weight ratio of BF to PP was controlled at 50/47 for all blends. The amount of coupling agent was fixed at 3 wt% for all formulations. Further study was conducted to model thickness swelling of the composites, a swelling rate parameter (KSR). The thickness swelling of thermally-treated samples at 30 min for 120 ºC and 30 min for 150 ºC were lower than that of control samples, followed thermally-treated samples at 120 min for 180 ºC, 30 min for 180 ºC, 120 min for 120 ºC, and 120 min for 150 ºC, respectively. Furthermore, the thickness swelling of the BF/PP composites decreased with increasing time and temperature of the thermal-treatment. In addition, at 30 min for 120 ºC, the composites showed a lower parameter of swelling rate than control samples. The KSR of the composites was influenced both by the time of thermal treatment and temperature.

Keywords: Thickness swelling rate, Thermal-treatment, Lignocellolusic filler, Polypropylene
General area of research: Wood Mechanics
ICFAS2018-ID: 1017

1. INTRODUCTION

Thermal treatment has been used by many researchers to improve dimensional stability of wood and wood-based composite. It decreases the water absorption of wood by the crystallization of

cellulose and extraction of hemicelluloses from wood (Hosseinihashemi *et al*., 2016). The enhancement of the dimensional stability, reduction of the swelling, and alteration of the chemical composition of wood have been found in thermally modified wood (Tjeerdsma *et al*., 2000; Hadi *et al*., 2016).

The improvement in the hygroscopic and micromechanical properties of heat-treated wood occurred with an elevation in the steam temperature, which correlated well with this pattern of degradation in the constituents of the biocomposite matrix in the cell wall (Yin *et al*., 2010). Also, the improvement in the dimensional stability of thermally treated wood could be related a reduction in number of free hydroxyl groups with chemical reactions (Dale Ellis, 1994). This could be also related to the chemical modification in the fiber cell walls during the hydrothermal treatment (Hadi *et al*., 2016). Hemicelluloses degraded by thermal treatment positively affect the dimensional stability of wood. Although the effect heat treatment of wood on thickness swelling of wood plastic composites were investigated by previous studies (Ayrilmis *et al*., 2011; Hosseinihashemi *et al*., 2016), the long term thickness swelling has not been extensively investigated. In the present study, the effect of thermal treatment of modified beech wood flour on the long-term thickness swelling of the thermoplastic composites was investigated.

2. MATERIAL AND METHODS

a. Materials

The polymer matrix was comprised of V30S polypropylene (PP), with a melt flow index of 16 g/10 min and a density of 0.87 g/cm^3, supplied by Marun Petrochemical Co. (Mahshahr, Iran). The lignocellulosic material used as the reinforcing filler in the composites was beech (*Fagus orientalis* L.) wood flour, which was ground by a grinder A a maleic anhydride grafted polypropylene (MAPP), which was PPG101 provided by Kimia Javid Sepahan Co. (Tehran, Iran), with a melt flow index of 64 g/10 min, a density of 0.91 g/cm^3, and a grafted maleic anhydride content of 3 wt.%, was used as the coupling agent.

b. Thermal-treatment of wood chips

Before the preparation of the composites, beech logs were chipped by a drum-type chipper. Prior to the heat treatment, the wood chips were dried at room temperature for 24 h. After cooling in a desiccator, the wood chips were heat treated for 30 or 120 min at different temperatures (120 °C, 150 °C, or 180 °C) using saturated steam in a digester. Then Beech wood flour (BWF) was prepared from the treated chips using laboratory type grinder. The wood flour was dried until 0 to 1% moisture in an oven at 103 ± 2 °C for 24 h. Polypropylene, beech wood flour, and the coupling agent were then weighed and bagged according to the formulations given in Table 1.

Table 1 Composites of the evaluated WPC formulations

WPC code	Treatment type	Beech wood flour (wt.%)	Polypropylene (PP) (wt.%)	MAPP[a] (wt.%)
A	WPC-30 min-120 ºC	50	47	3
B	WPC-30 min-150 ºC	50	47	3
C	WPC-30 min-180 ºC	50	47	3
D	WPC-120 min-120 ºC	50	47	3
E	WPC-120 min-150 ºC	50	47	3
F	WPC-120 min-180 ºC	50	47	3
G	WPC-control	50	47	3
[a] MAPP = maleic anhydride grafted polypropylene				

c. Preparation and testing of WPCs

The mixing of raw materials was carried out with a counter-rotating intermeshing twin-screw extruder (Model T20, 1990, Dr. Collin GmbH, Germany) which its barrel temperature ranging from 180 °C at six zone, from feeding zone to the die zone, at a screw speed of 60 rpm for 14 min. The pasty compound produced was cooled to room temperature and then grinded to produce suitable granules for further processing. Grinding was carried out in a laboratory mill (Wieser, WGLS 200/200 Model, Germany) and the granulated materials were dried at 105 °C for 4 h. Test specimens were prepared by injection molding machine (Model EM80, Aslanian Co., Iran) set at 160-180 °C temperature was used to prepare test specimens. At each molding operation a complete set of specimens for different tests are produced. Finally, the specimens were conditioned at a temperature of 23 °C and relative humidity of 50% for at least 40 h, according to ASTM D 618-99 prior to testing. The water absorption was determined according to ASTM D 570 standard.

d. Physical test

Water absorption (WA) studies were performed following the ASTM D 570 standard. The water absorption of the WPC specimens with nominal dimensions of 5 mm x 11 mm x 80 mm was determined after 2, 4, 6, 8, 10, 12, 24, 48, 72, 168, 336, 504, 720, and 1440 h immersion in distilled water at room temperature. Three specimens of each type of WPC were dried in an oven for 24 h at 105 ± 2ºC. The dried specimens were weighed with a precision of 0.001 g and then they were placed in distilled water. At the end of immersion periods, the specimens were removed from the distilled water and the surface water was wiped off using blotting paper. Weight of the specimens was measured at different time intervals during the long-time immersion.

3. RESULTS AND DISCUSSION

a. Long term water absorption and thickness swelling behavior

Long-term water absorption and thickness swelling of the composites after 1440 h immersed in water are presented in Figures 1 and 2. Generally, water absorption and thickness swelling increased with immersion time, reaching a certain value beyond which no more weight and

thickness increased. At the early stage of the water uptake test as compared with the long term test, the composites clearly absorbed more water as well as faster. The composites containing thermally treated beech wood flour had longer equilibrium time (time to reach to equilibrium water absorption and thickness swelling) (Figures 1 and 2). Furthermore, the composites containing thermally treated beech wood flour swelled and gained weight very slowly.

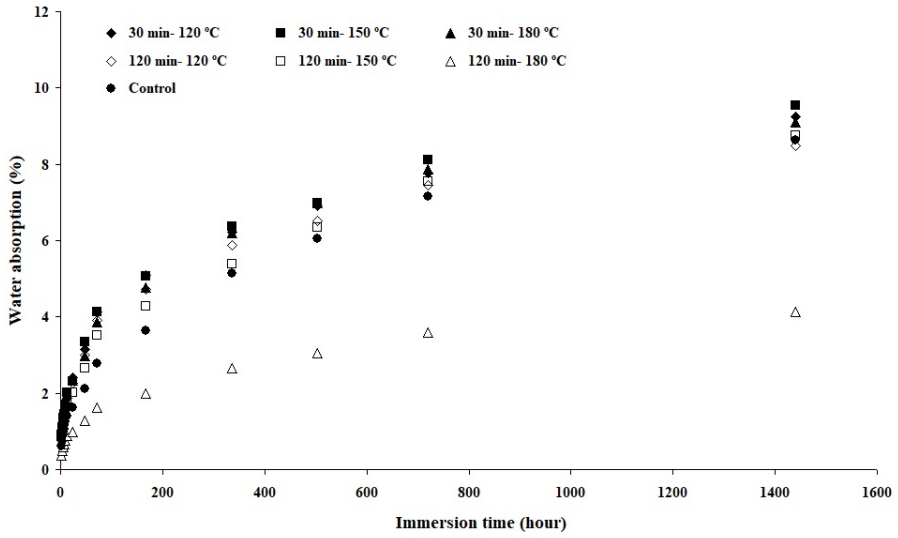


Figure 1 Effect of thermal-treatment severity on the long-term water absorption of WPCs

Exposure duration and temperature are two important factors affecting hemicelluloses degradation. Cumulative thermal exposure in the hot-press alters the hemicelluloses structure because arabinan and galactan, each a side-chain component of the hemicelluloses, tend to be more degraded as the chip size decrease (Winandy and Krzysik, 2007). These changes in the chemistry of hemicelluloses seem to reduce the hygroscopicity of the flakes. A lower internal void volume which might obstruct the migration of moisture and diminish the convective effect.
The decrease of hemicellulose content results in a decrease of hydroxyl groups, including free hydroxyl groups, thus decreasing the water absorption capacity of wood. water absorption of untreated wood was the greatest. The greater water uptake of samples with greater weight loss could be due to the possible presence of larger and more pores in these samples, which will increase capillary motion of water.

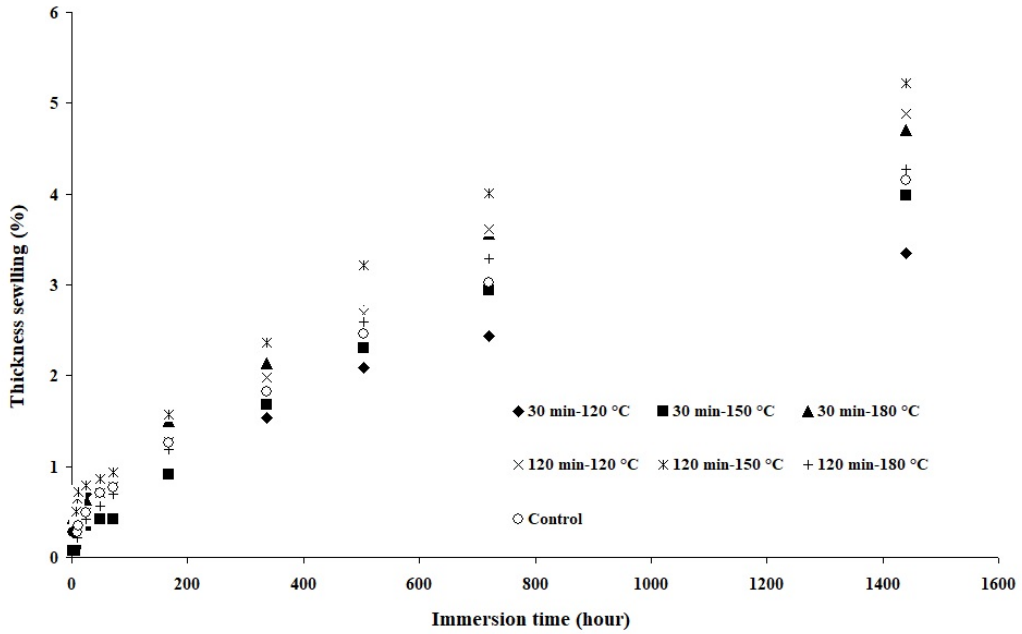


Figure 2 Effect of thermal-treatment severity on the long-term thickness swelling of WPCs

4. CONCLUSIONS

The composites produced with thermally treated beech wood flour swelled and gained weight very slowly. The thickness swelling of the composites decreased with increasing time and temperature of the thermal-treatment. In addition, at 120 ºC for 30 min, the composites showed a lower parameter of swelling rate than control samples. A strong relationship was found between the long-term water absorption and thickness swelling in the composites. Based on the findings obtained from the present study, it can be said that thermal treatment of the wood chips at 150 °C for 30 min is the optimum parameters for the wood flour reinforced polypropylene composites having higher water resistance among the treatment groups.

REFERENCES

1. Hadi, S.; Hosseinihashemi, S. K.; Jahan Latibari, A.; Salem, M. Z. M., 2016: Effects of acid copper chromate preservative and hydrothermal treatment on the dimensional stability, hardness, and decay resistance of poplar wood. BioResources, 11: 4850-4864.
2. Hosseinihashemi, S. K.; Arwinfar, F.; Najafi, A.; Nemli, G.; Ayrilmis, N., 2016: Long-term water absorption behavior of thermoplastic composites produced with thermally treated wood. Measurement, 86: 202-208.
3. Tjeerdsma, B. F.; Stevens, M.; Militz, H., 2000: Durability aspects of hydrothermal treated wood. International Research Group on Wood Preservation, Section 4-Processes, Nº IRG/WP 00-40160.

TECHNOLOGICAL PROPERTIES OF ORIENTED STRANDBOARD BONDED WITH PHENOL-FORMALDEHYDE RESIN SYNTHESIZED WITH BIO-OIL FROM THERMAL AND CATALYTIC PYROLYSIS METHODS

Nadir Ayrilmis[1*], Günay Özbay[2]

[1] Department of Wood Mechanics and Technology, Forestry Faculty, Istanbul University, Bahcekoy, Sariyer, 34473, Istanbul, Turkey
nadiray@istanbul.edu.tr
[2] Faculty of Engineering, Industry Engineering, Aksaray University, 78050, Aksaray, Turkey

Abstract:

Bio-oil was produced from wood wastes using thermal and catalytic pyrolysis methods. Phenol-formaldehyde (PF) resin was then synthesized with the different amounts of the bio-oil obtained from thermal method (10 to 50 weight %) and alkali catalyst (potassium carbonate, K_2CO_3) (10 to 50 weight %). The wood sawdust was selected as a biomass feedstock, which was pyrolyzed in a vacuum reactor at 500 °C, with and without catalysts. The chemical composition of bio-oils was determined by GC-MS analysis. Bio-based PF (BPF) resins synthesis from bio-oil, phenol, and formaldehyde, were characterized by some chromatographic and specstrocopic methods. Oriented strandboard (OSB) panels were produced with BPF resins and then their technological properties were determined. The chemical properties of the PF resins with bio oil and technological properties OSB panels were compared with the results of lab-scale and commercial PF resin and OSB panels. Some physical and mechanical properties of the thickness swelling of the OSB panels produced by the synthesized resins were determined. As the amount of the K_2CO_3 catalysts increased from 20 wt% in the PF resin, the 24-hour thickness swelling of the OSB panels decreased from 15.4 to 14.3%, but further increment in the K_2CO_3 catalysts content increased the thickness swelling. Although the amount of the thermal bio oil increased from 10 to 40 wt% in the PF resin 14.1 to 17.1%, it was lower than that of the control particleboard (19.3%). As for the mechanical properties, as the amount of the thermal bio-oil and K_2CO_3 catalysts was 10 wt% in the PF resin, the internal bond strength of the OSB panels was higher than that of the control OSB. The results of this study showed that bio-based chemical products could be partially replaced with the petrochemicals in the PF resin production.

Keywords: Bio-oil, Bio-based resin, catalysts Pyrolysis, Wood, OSB, technological properties
General area of research: Wood Mechanics
ICFAS2018-ID: 1018

1. INTRODUCTION

Fossil fuels have been major source of energy and chemical feedstock production all over the world. Environmental problems associated with the fast-growing consumption of fossil fuels have increased the keen interest in the development of renewable energy and chemicals. Biomass is one of the renewable energy sources derived from lignocellulosic materials

including woody and non-woody waste. Pyrolysis thermal conversion of biomass in the absence of oxygen is one of the most promising thermal conversion technologies. Pyrolytic liquid (bio-oil) has many advantages in storage and/or transport to the user is now appreciated and it is gaining more widespread acceptance (Zakzeski et al., 2010; Saxena et al., 2009). Many researchers have focused on the use of bio-oil as substitute of phenol in the synthesis of bio-oil-phenol–formaldehyde resins (Fan et al. 2010; Cheng et al. 2012; Aslan et al., 2015).

Today, crude oil is the main resource for the production of phenol. Phenol has been produced from cumene in multi-step procedures. Cumene is obtained from the alkylation of benzene with propylene over an acid catalyst. PF resins are formed by the reaction of phenol and formaldehyde. PF resins are grouped as resols or novolacs depending on the type of catalyst that are used in the synthesis of the resin. In this study, scots pine (*Pinus sylvestris* L.) sawdust was used as biomass. Catalysed and uncatalysed pyrolysis processes were carried out in a vacuum pyrolysis reactor at the temperature of 500 °C. Alkali salt ($K_2CO_{3)}$ were used as catalysts in the pyrolysis process. In addition, thermal method was used in the production of bio-oil.

The aim of this study, was to examine the effect of the substitution degree of the catalytic pyrolysis oil on the chemical, physical and thermal characteristics of the PF resins. Also, some mechanical and technological properties of wood panels produced with the PF resins modified with different amounts of catalytic pyrolysis oil were determined.

2. Materials and methods

Biomass

Scots pine (Pinus sylvestris L.) sawdust was used to produce bio-oil as biomass feedstock. Biomass was ground and sieved to particle size of between <1mm and >2 mm, and it was then air dried for 48 h at 20–22 °C prior to use as a pyrolysis runs.

Chemicals

The catalyst used in these pyrolysis experiments are K_2CO_3 purchased from Sigma Aldrich. The bio-oil-phenol–formaldehyde (BPF) and laboratory resins were synthesized by using phenol (liquid) and 37 wt% formaldehyde solution supplied by GENTAŞ chemical industries, Izmit, Turkey. The commercial PF resol resin for OSB manufacture with solids content of 47.1%, viscosity of 232 cPs and pH of 9.14 was supplied by Polisan chemical company in Izmit, Turkey. All chemicals were of analytical grade.

Non-catalytic and catalytic vacuum pyrolysis of biomass to produce bio-oil

The pyrolysis experiments were performed in a vacuum pyrolysis reactor. The reactor had a stainless-steel cylinder with an inside diameter of 24 cm and a total length of 36 cm., which was externally heated by an electric furnace. During the experiments, pyrolysis temperature and heating rate were controlled with a Proportional–Integral–Derivative (PID). In a non-catalytic pyrolysis, biomass sample of 2000 g was placed into the reactor. In a catalytic pyrolysis, the reactor was charged with 200 g (10 wt%) of catalyst and 2000 g of biomass sample. The reactor was heated up to final temperature of 500 °C and kept at this temperature for 30 min. under a total vacuum pressure of 10 kPa. During pyrolysis, the bio-oil was evacuated in two condensers by vacuum pomp.

Resin synthesis procedure

Bio-oil obtained from non-catalytic and catalytic vacuum pyrolysis of biomass was used without further pre-treatment for the synthesis. The PF resol resins were prepared in an adhesive reactor. In synthesizing, PF resol resin without bio-oil (lab. PF resol resin) was to produce control group of the resins. For lab. PF resol resin synthesis, F/P molar ratio of 2.0 and 700 g of phenol, 1100 g of formaldehyde (37 wt.%) and 62.5 g of NaOH solution (50 wt.%) (1/3 of total NaOH weight) were charged into the adhesive reactor. The reaction temperature increased from room temperature to 60 °C within 60 min. The reaction mixture was heated to 90 °C and maintained at 90 °C for 60 min., and then the second part NaOH (50 wt.%) solution was added into the reactor at temperature of 60 °C. At end of the reaction, the mixture was allowed to cool to room temperature. BPF resins obtained by the same procedure. The replacement levels of phenol by the bio-oil were increased from 10 wt.% to 50 wt.%. The physical properties of the BPF resins were determined.

OSB preparation and testing

The OSB panels were produced in the Wood Based Composite Laboratory (Istanbul University, Faculty of Forestry). Standard poplar wood strands were supplied from Kronospan OSB manufacturer, Kastamonu. The OSB panels with dimensions of 10 mm x 400 mm x 400 mm were produced under laboratory conditions. The modulus of rupture and modulus of elasticity (EN 310), internal bond strength (EN 319) and screw withdrawal resistance (EN 320), and density were determined according to European Standard (EN).

3. RESULT AND DISCUSSION

Characterizations of the PF and BPF resins

The physical properties of the various BPF resins and the reference PF resins, including pH value, viscosity, solid content, and gel time values are summarized in Table 3. As shown in Table 3, all of the BPF resin synthesized with non-catalytic bio-oil exhibited lower pH value than the reference PF resins and BPF resins synthesized with catalytic bio-oils. And also the pH value of the BPF resins was determined that significantly decreased with the bio-oil substitution level rising. Bio-oil contains organic acids. These compounds might have decrease pH value of the BPF resins.

Table 3. Physical properties of the resins

Resin type	Bio-oil substitution level (%)	pH (20 °C)	Viscosity (25 °C, cPs)	Solid content (%)	Gel time (100 °C) (s)
Com. PF	0	11.92	320	58.88	172
Lab. PF	0	11.98	265	46.65	165
None	10	11.88	326	47.37	158
	20	11.84	342	48.24	150
	30	11.84	355	49.51	143
	40	11.76	359	51.58	135
	50	11.71	371	53.19	119
Thermal	10	11,88	326	47,37	158
	20	11,84	342	48,24	150
	30	11,84	355	49,51	143
	40	11,76	359	51,58	135
	50	11,71	371	53,19	119

K_2CO_3	10	11,92	321	47,19	158
	20	11,90	320	48,04	150
	30	11,90	327	48,89	147
	40	11,87	345	51,15	136
	50	11,83	351	51,91	124

Test results of OSB panels

Physical and mechanical properties of OSBs produced with the PF resins modified with different amounts of catalytic pyrolysis oil are presented in Table 4. The results showed that type of catalyst and bio-oil substitution level that affect mechanical properties of OSBs were statistically significant (95% confidence intervals). It was found that the use of BPF resins modified with catalytic bio-oils improved the mechanical properties of OSBs, though the effect sizes were different from each other.

Table 4. Test results of OSB panels produced using catalytic pyrolysis oil

Resin Type	Bio-oil substitution level (%)	Density	Tensile strength perpendicular to the plane of the board	Screw withdrawal resistance		Modulus of rupture		Modulus of elasticity	
				Surface	Side	Parallel	Perpendicular	Parallel	Perpendicular
		(g/cm^3)	(N/mm^2)	N	N	(N/mm^2)	(N/mm^2)	(N/mm^2)	(N/mm^2)
Comm. PF	0	0.816 (0.01)	2.05 (0.23)	89.5 (3.2)	74.3 (2.6)	34.2 (2.3)	29.9 (3.1)	5011.1 (162.4)	4764.5 (126.3)
Lab. PF	0	0.812 (0.013)	1.97 (0.21)	82.6 (2.8)	71.9 (3.1)	32.6 (3.1)	29.2 (2.6)	4860.4 (135.4)	4885.3 (152.7)
None	10	0.810 (0.05)	2.18 (0.18)	114.6 (4.3)	107.3 (4.5)	42.2 (4.6)	33.6 (3.5)	5585.7 (182.3)	4864.5 (113.9)
	20	0.824 (0.09)	1.95 (0.22)	95.9 (4.8)	86.5 (3.6)	34.8 (3.7)	31.2 (2.8)	6012.4 (168.6)	5322.9 (195.4)
	30	0.816 (0.013)	1.42 (0.19)	91.7 (3.7)	88.3 (2.5)	31.5 (2.8)	24.5 (2.4)	5306.7 (103.9)	5117.1 (203.6)
	40	0.813 (0.015)	1.19 (0.14)	84.1 (4.2)	70.7 (3.3)	30.0 (4.2)	24.5 (3.6)	4615.1 (121.6)	4459.3 (134.7)
	50	0.828 (0.016)	1.02 (0.11)	80.3 (3.6)	65.0 (4.1)	25.8 (2.6) c	23.8 (3.1)	4245.5 (138.4)	4278.6 (162.8)
Thermal	10	0,810 (0,05)	2,18 (0,18)	114,6 (4,3)	107,3 (4,5)	42,2 (4,6)	33,6 (3,5)	5585,7 (182,3)	4864,5 (113,9)
	20	0,824 (0,09)	1,95 (0,22)	95,9 (4,8)	86,5 (3,6)	34,8 (3,7)	31,2 (2,8)	6012,4 (168,6)	5322,9 (195,4)
	30	0,816 (0,013)	1,42 (0,19)	91,7 (3,7)	88,3 (2,5)	31,5 (2,8)	24,5 (2,4)	5306,7 (103,9)	5117,1 (203,6)
	40	0,813 (0,015)	1,19 (0,14)	84,1 (4,2)	70,7 (3,3)	30,0 (4,2)	24,5 (3,6)	4615,1 (121,6) 1	4459,3 (134,7)
	50	0,828 (0,016)	1,02 (0,11)	80,3 (3,6)	65,0 (4,1)	25,8 (2,6)	23,8 (3,1)	4245,5 (138,4)	4278,6 (162,8)
K_2CO_3	10	0,826 (0,015)	2,18 (0,15)	117,5 (5,3)	100,6 (5,6)	36,2 (4,3)	37,9 (4,1)	6326,2 (172,7)	5650,4 (185,4)
	20	0,813 (0,016)	1,91 (0,18)	106,4 (4,8)	97,5 (4,4)	42,5 (3,7)	35,5 (3,7)	5883,8 (128,7)	5268,3 (216,8)
	30	0,819 (0,015)	1,81 (0,10)	98,9 (4,2)	75,3 (3,9)	30,8 (2,6)	34,3 (2,6)	5625,7 (154,9)	5035,2 (169,3)
	40	0,811 (0,01)	1,73 (0,12)	93,7 (3,7)	88,4 (4,0)	25,6 (2,3)	28,4 (3,7)	5189,2 (129,4)	4618,9 (148,4)
	50	0,825 (0,013)	1,68 (0,15)	84,5 (2,8)	76,7 (3,2)	22,3 (3,4)	25,9 (3,0)	4769, (155,6)	4436,4 (175,6)

Tensile strength perpendicular to the plane of the board tests are important to evaluate the bonding strength between wood strands. The tensile strength of OSBs made with BPF resins modified by use of K_2CO_3 were higher than those of thermal process and non-catalytic. Tensile strength values of all sample groups meet TS EN 300 OSB-4 minimum property requirement which is 0.50 N/mm^2 (TS EN 300, 1997). Also, modulus of rupture (parallel: 30 N/mm^2, perpendicular: 16 N/mm^2) and modulus of elasticity (parallel: 4800 N/mm^2, perpendicular: 1900 N/mm^2) values of all sample groups excluding samples made with non-catalytic BPF resins with 40%-50% phenol replacements met the requirements for OSB-4. Observations of the modulus of rupture, modulus of elasticity, screw withdrawal resistance and tensile strength showed similar trends to the results found in tensile strength perpendicular to the plane of the board tests. Tensile strength perpendicular to the plane of the board after cyclic test values of all panel groups meet EN 321 OSB-4 minimum property requirement which is 0.21 N/mm^2.

4. CONCLUSIONS

The GC/MS analysis results showed that bio-oils obtained from non-catalytic and catalytic pyrolysis of biomass contained large amounts of oxygen functional groups including aldehydes, ketones, phenols, benzenes, alcohols and polycyclic aromatic hydrocarbons (PAHs). Also, phenols accounted for the largest amount of compounds in the bio-oil. The amount of phenolic in the bio-oil markedly increased with the use of thermal process and K_2CO_3 compared with non-catalytic bio-oil. The viscosity values of the BPF resins were higher than lab. PF resin and gradually increased with the bio-oil replacement rising due to the high molecular weight compounds in bio-oil. The solid content of all the BPF resins increased with the bio-oil substitution level raised. As the bio-oil substitution level raised, the solid content increased for all the BPF resins synthesized with non-catalytic bio-oil. Lab. PF resin had also the lowest solid content.

Acknowledgements
This work was supported by Research Fund of Istanbul University, Istanbul, Turkey. Project no: BYP-2018-28288.

REFERENCES

1. Aslan, M., Özbay, G., Ayrilmis, N. 2015. “Adhesive characteristics and bonding performance of phenol formaldehyde modified with phenol-rich fraction of crude bio-oil”, Journal of Adhesion Science and Technology 29 (24): 2679-2691.
2. Cheng, S., Yuan Z., Anderson M., Leitch M, and Xu C. 2012. “Synthesis of biobased phenolic resins/adhesives with methylolated wood-derived bio-oil”, Journal of Applied Polymer Science 126, 430-440.
3. Fan, D., Chang, J., Gou, J., Xia, B., Ren, X. 2010. “On the cure acceleration of oil-phenol-formaldehyde resins with different catalysts”, The Journal of Adhesion, 86:836-845.
4. Saxena, R. C., Adhikari, D. K. and Goyal, H. B. 2009. “Biomass-based energy fuel through biochemical routes: A review”, Renewable and Sustainable Energy Reviews, 13 (1): 167-178.
5. Zakzeski, J, Bruijnincx, P.C., Jongerius, A.L., Weckhuysen, B.M. 2010. The catalytic valorization of lignin for the production of renewable chemicals Chem. Rev., 110, 3552-3599.

DISCOVERY OF THE LAST ACIDITY CONSTANTS: FINAL SITUATION OF THE ACID-BASE EQUILIBRIA FOR A NOVEL PYRIMIDINE AND THIOPYRIMIDINE

Hasan Kılıç

Department of Chemistry, Faculty of Arts and Sciences, Marmara University, Ziverbey 34722 Istanbul, Turkey
hkilic@marmara.edu.tr

Abstract:

The acid-base properties of recently synthesized 5-benzoyl-1-(methylphenylmethyleneamino)-4-phenyl-1H-pyrimidine-2-one, (I), and 5-benzoyl-1-(methylphenylmethyleneamino)-4-phenyl-1H-pyrimidine-2-thione, (II) were investigated in aqueous methanol (5% v/v methanol). New pKa values of 2.883 (R2 = 0.999) and 3.684 (R2 = 0.998) were obtained at λ = 245.2 nm for I and λ = 247.4 nm for II, respectively. The pKa values were determined from the pH-dependence of the absorbance values using the Henderson-Haselbalch equation. The studies were carried out in the pH range 1.0–13.0 using UV-Vis spectroscopy at a temperature of 25 ± 0.1 °C and an ionic strength of 0.1M.

Keywords: Pyrimidines; Semicarbazone; Thiosemicarbazone; Acidity constants; UV/vis spectroscopy.
General area of research: Chemistry
ICFAS2018-ID: 1053

1. INTRODUCTION

Pyrimidine bases are minor constituents of nucleic acids. The chemistry of these compounds has been the subject of extensive research because of their applications in molecular biology and medicine [1-4]. These compounds display antibacterial, antifungal, antiviral, insecticidal and miticidal activities [5-7].

Considering the importance of the pyrimidine derivatives, **I** and **II** may display novel biological and medicinal features, as well. Thus, the determination of dissociation constants of these compounds is necessary in selecting appropriate acidic or basic reagents in drug discovery and development. The structures of the compounds under investigation are given in Fig. 1.

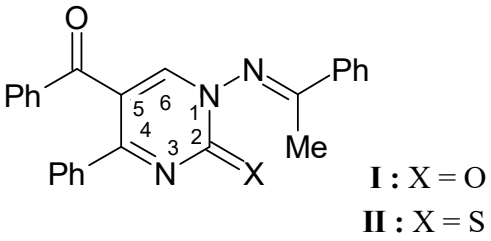


Fig.1. Molecular structures of the compounds

As shown in Fig.1, the compounds are analog of each other and containing amino and carbonyl functional groups though they are a good model system for such investigation. Knowledge of the dissociation behavior of any functional group is critical to understand the pharmacokinetic and pharmacodynamic properties of new drug substances. Therefore, acidity constants (pK_a values) for a reactant are useful physicochemical parameters, describing the extent of dissociation of functional groups of the related compound with respect to pH. A pK_a value for a drug is a key parameter influencing many biopharmaceutical characteristics [8].

The purpose of this study was to investigate whether if there is an acid-base equilibrium for the each compound in their aged solutions.

2. MATERIAL AND METHODS

Apparatus: UV/vis spectroscopy studies are carried out using a Shimadzu 1601 PC UV/vis spectrophotometer with quartz cells (1.0-cm path length). The pH of the aqueous solutions are measured using a digital pH meter (Hanna Instruments 8314, Italy; ± 0.01 pH unit) and a combined pH electrode that is calibrated using standard aqueous buffers (pH 4.00, 7.00, and 9.00) as described in a previous report [9]. An Eppendorf micro-pipette was used for the addition of solutions. A Sartorius A120 S analytical balance (sensitivity of ± 0.0001 g) was used for measuring the masses of the compounds (**I** - **II**) and chemicals.

Reagents: Stok solutions of **I** and **II** were prepared in analytical grade methanol. Aqueous Britton-Robinson buffer solutions [10] are prepared with the desired pH values for the experiments.

Sample preparation: Experimental solutions were prepared by diluting the appropriate amount of stock solution of the compounds with the Britton-Robinson buffer in the range from 2.060×10^{-5} to 5.630×10^{-5} M for **I** and from 3.611×10^{-5} to 7.962×10^{-5} M for **II**. The final alcohol content was adjusted to 5% v/v.

Measurements: The ionic strength of the solution is kept constant with 0.1 M LiCl. The experiments are conducted in Britton-Robinson buffer media over a pH range of 3.0 to 5.0 in increments of 1.0 pH unit. For the pH values 1.0 and 2.0, 0.1 M HCl and 0.01 M HCl media are used. The UV/Vis spectra were taken from 600 to 200 nm for each compound. The reference beam contained a blank of buffer containing the same amount of pure methanol as the solvent.

Determination of acidity constants: The acidity constants of the compounds were calculated at selected wavelengths, by using the Henderson-Haselbalch equation as described by Albert et al. [11].

$$pH = pK_a + \log \{[A^-] / [HA]\}$$

In this equation A^- denotes the ionized form of the investigated compound. However, HA denotes molecular form, i.e. non-ionized form of the investigated compound.

3. RESULTS AND DISCUSSION

Compounds **I** and **II** are basic in character. Thus, they exist in their protonated forms in acidic solutions (Fig. 2). Therefore, the obtained pK_a values have been explained on the basis of the relative contribution of acidic character of respective groups.

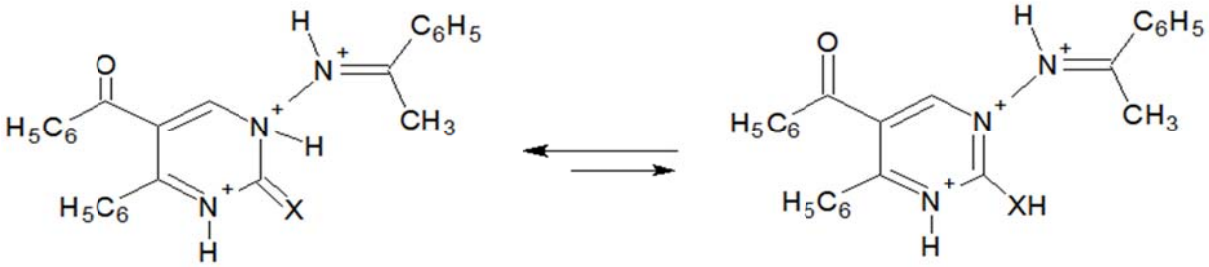


Fig. 2: Protonated form of the compounds under investigation. **I**: X = O, **II**: X = S

As an example, two obtained time-dependent UV/vis spectra are given for the each compound of **I** and **II** in Figs. 3 and 4. All the spectra shown both in Figs. 3 and 4 are obtained 30 min after the experiments starts, using aged solutions of the compounds.

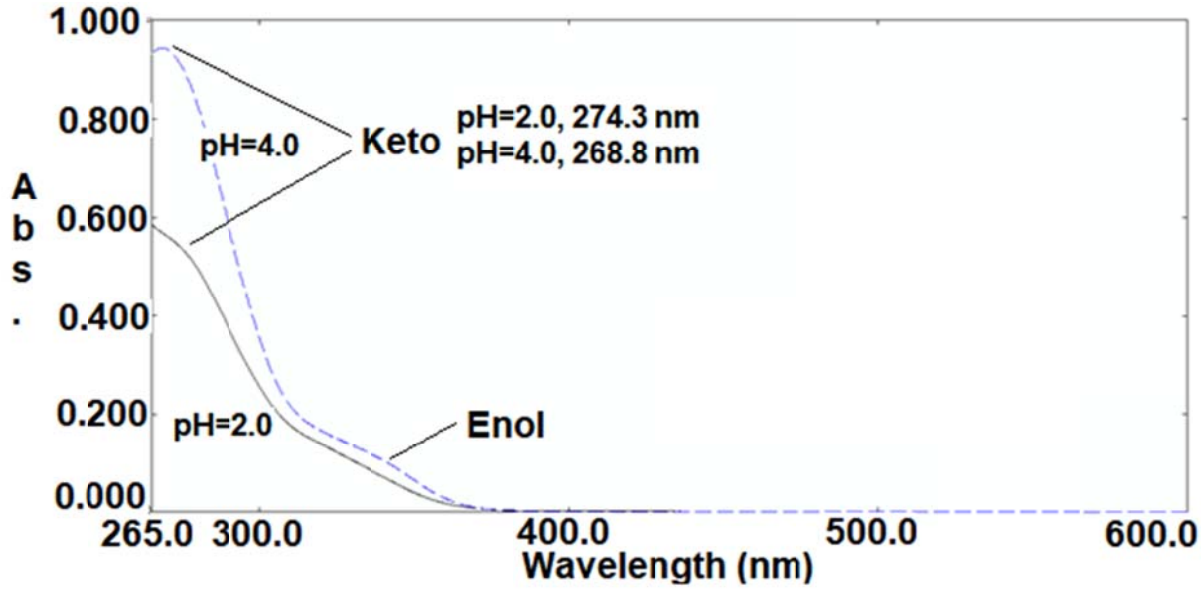


Fig. 3: UV/vis spectra for compound **I**, showing the shift in the wavelength of keto maximum, on increasing the pH from 2.0 to 4.0. The both spectra shown in Fig. 3 are obtained 30 min after the experiments starts, using aged solutions of the compounds.

As shown in Fig. 3, a hypsochromic shift by 5.5 nm in the wavelength of the keto maximum is observed as the pH increased from 2.0 to 4.0. Fig. 4 is given below.

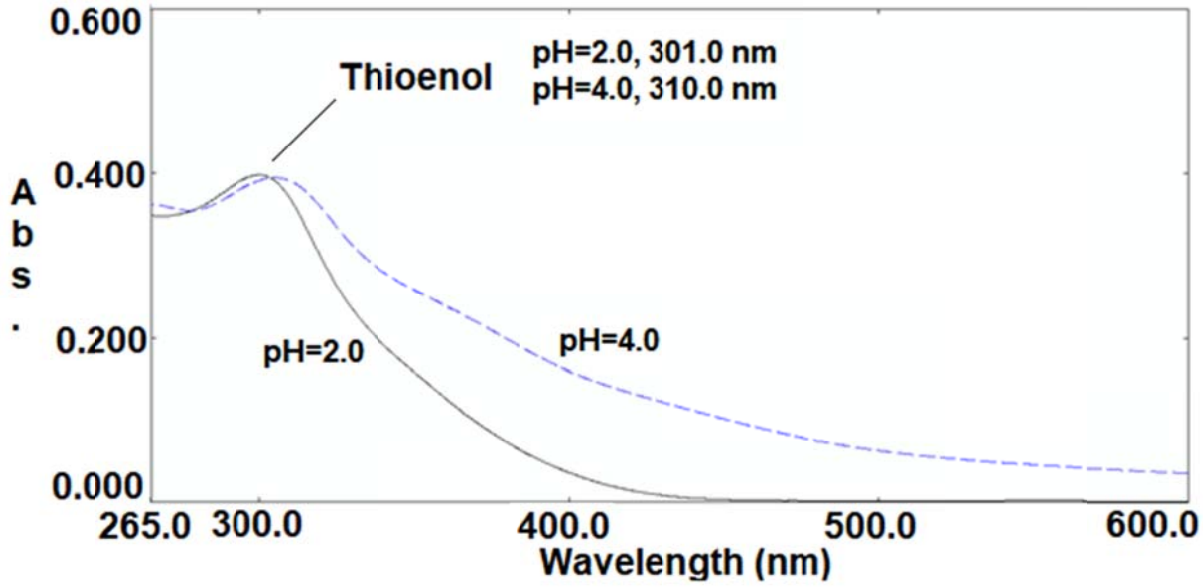


Fig. 4: UV/vis spectra for compound **II**, showing the shift in the wavelength of the thioenol maximum**,** on increasing the pH from 2.0 to 4.0. The both spectra shown in Fig. 4 are obtained 30 min after the experiments starts, using aged solutions of the compounds.

As shown in Fig. 4, a bathochromic shift by 9.0 nm in the wavelength of the thioenol maximum is observed as the pH increased from 2.0 to 4.0.

The observed shifts in Figs. 3 and 4 are essential in the presence of an acid base equilibrium thus, important in the calculation of related acidity constants. On the basis of the spectrophotometric data obtained one dissociation constant is calculated from the Henderson-Haselbalch equation for the each of **I** and **II**, in the pH range from 1.0 to 5.0 aged solutions. The calculated pK_a values were observed to be between 2.50 and 3.00 for **I**. However, it was found to be between 3.40 and 4.00 for **II**. Unfortunately, the calculated each acidity constant cannot be determined exactly belong to which atom in the corresponding molecules of **I** and **II** in this study. As a prediction, the both pK_a values are thought to be corresponded to the previously protonated nitrogen atom substituted to the ring nitrogen at position 1 of **I** and 1 of **II**, respectively (Fig. 2). A new work and assessments are needed to clarify this situation.

4. CONCLUSION

The present study provides a picture of the spectroscopic characteristics of compounds **I** and **II** in aged aqueous methanol (v/v, 5% methanol) solutions. In this study, UV/vis spectral studies were used in detail, for the first time, to check the presence of any acid-base equilibrium for **I** and **II** in their aged solutions. An acid base equilibrium was found to be existed for the each compound investigated in their aged solutions. The calculated each acidity constant cannot be determined exactly belong to which atom in the corresponding molecules of **I** and **II** in this study. It have to be clarified in a further study.

Acknowledgement

This work was supported by the Scientific Research Project Program of Marmara University (Project No: FEN-D-090518-0259). The author is grateful to Marmara University for their financial support and the provision of laboratory facilities.

REFERENCES

1. A. Kamal, J.R. Tamboli, V.L. Nayak, S.F. Adil, M.V.P.S. Vishnuvardhan, S. Ramakrishna, Synthesis of pyrazolo[1,5-a]pyrimidine linked aminobenzothiazole conjugates as potential anticancer agents, Bioorg. Med. Chem. Lett. 23 (2013) 3208-3215.
2. T. Eicher, S. Hauptmann, A. Speicher, The Chemistry of Heterocycles: Structure, Reactions, Syntheses, and Applications, third ed., Wiley-VCH Verlag & Co., Weinheim, 2012.
3. J.G. Grote, D.E. Diggs, R.L. Nelson, J.S. Zetts, F.K. Hopkins, N. Ogata, J.A. Hagen, E. Heckman, P.P. Yaney, M.O. Stone, L.R. Dalton, DNA Photonics, Mol. Cryst. Liq. Cryst. 426 (2005) 3–17.
4. M. Asif, A Mini Review: Biological Significances of Nitrogen Hetero Atom Containing Heterocyclic Compounds, International Journal of Bioorganic Chemistry, 2(3) (2017) 146-152.

5. S. Massari, G. Nannetti, J. Desantis, G. Muratore, S. Sabatini, G. Manfroni, B. Mercorelli, V. Cecchetti, G. Palù, G. Cruciani, A. Loregian, L. Goracci, O. Tabarrini, A broad anti-influenza hybrid small molecule that potently disrupts the interaction of polymerase acidic protein-basic protein 1 (PA-PB1) subunits, J. Med. Chem. 58 (2015) 3830-3842.
6. H. Wang, M. Lee, Z. Peng, B. Blázquez, E. Lastochkin, M. Kumarasiri, R. Bouley, M. Chang, S. Mobashery, Synthesis and evaluation of 1,2,4-triazolo[1,5-a]pyrimidines as antibacterial agents against Enterococcus faecium, J. Med. Chem. 58 (2015) 4194-4203.
7. 1984.
8. A.M. Gamal-Eldeen, N.A. Hamdy, H.A. Abdel-Aziz, E.A. El-Hussieny, I.M.I. Fakhr, Induction of intrinsic apoptosis pathway in colon cancer HCT-116 cells by novel 2-substituted-5, 6, 7, 8-tetrahydronaphthalene derivatives, Eur. J. Med. Chem. 77 (2014) 323-333.
9. D.T. Manallack, The pKa distribution of Drugs: Application to drug discovery, perspectives in medicinal chemistry, 1 (2007) 25-38.
10. P.R. Mussini, T. Mussini, S. Rondinini, Pure Appl. Chem. 69 (1997) 1007-1014.
11. D.D. Perrin, B. Dempsey, Buffers for pH and Metal Ion Control, 1st ed., Chapman and Hall, London, 1974.
12. A. Albert, E.P. Serjeant, The Determination of Ionization Constants, A Laboratory Manual, third ed., Chapman and Hall, London, 1984.

GENERALIZATION OF THE SPACE l(p) DERIVED BY ABSOLUTE EULER SUMMABILITY

Fadime Gökçe, Mehmet Ali Sarıgöl

University of Pamukkale, Department of Mathematics, Denizli, Turkey
fgokce@pau.edu.tr
msarigol@pau.edu.tr

Abstract:

The sequence space l(p) having an important role in summability theory was defined and studied by Maddox. In this study, using the absolute summability of Euler mean, we introduce the space |E_ϕ^r |(p) which is generalized from the space l(p). Then, we show that there is an isomorphism between |E_ϕ^r |(p) and l(p). Also, we determine duals of this space.

Keywords: Absolute summability, Euler mean, matrix transformation, sequence spaces, Maddox's spaces.
General area of research: Mathematics
ICFAS2018-ID: 1091

1 INTRODUCTION

By ω, we denote the set of all sequences of complex numbers. Let X and Y be any subsets of ω and $A = (a_{nv})$ be an infinite matrix of complex numbers. If for every sequence $x \in X$, the sequence $(A_n(x))$, A-transform of a sequence $x = (x_v)$, is in Y and the series

$$A_n(x) = \sum_{v=0}^{\infty} a_{nv} x_v$$

are convergent for all $n \in \mathbb{N}$, then, we say that A defines a matrix transformation from X into Y and denote by $A \in (X, Y)$. The matrix domain of an infinite matrix A in a sequence space X is defined by

$$X_A = \{x = (x_n) \in \omega : A(x) \in X\}$$

which is a sequence space.

Let $\sum a_v$ be a given infinite series with its n-th partial sum s_n, ϕ be any positive sequence and $p = (p_n)$ be any bounded sequence of positive real numbers. If

$$\sum_{n=1}^{\infty} (\phi_n)^{p_n - 1} |A_n(s) - A_{n-1}(s)|^{p_n} < \infty$$

then, the series $\sum a_v$ is said to be summable $|A,\phi|(p)$ (Gökçe and Sarıgöl (in press)).

We write c_s, b_s and l_k, for the space of all convergent, bounded, k −absolutely convergent series, respectively. Also, the $\alpha-,\beta-,\gamma-$ duals of the space X are given by

$$X^{\alpha} = \{z = (z_k)\epsilon\ \omega:\ xz = (x_k z_k)\epsilon l \ \text{ for all } x = (x_k) \in X\ \}$$
$$X^{\beta} = \{z = (z_k)\epsilon\ \omega:\ xz = (x_k z_k)\epsilon cs \ \text{ for all } x = (x_k) \in X\ \}$$
$$X^{\gamma} = \{z = (z_k)\epsilon\ \omega: xz = (x_k z_k)\epsilon bs \ \text{ for all } x = (x_k) \in X\ \}$$

respectively. A subspace X is called an FK-space if it is a complete metrizable locally convex space with continuous coordinates $P_n: X \to \mathbb{C}\ (n = 0,1,2,\dots)$, where $P_n(x) = x_n$ for all $x \in X$; an FK-space whose metric is given by a norm is said to be a BK-space. An FK-space X including the set of all finite sequences ϕ has the property AK if every sequence $x \in X$ has a unique representation $x = \sum_{v=0}^{\infty} x_v e^{(v)}$, that is

$$\left\| x - \sum_{v=0}^{n} x_v e^{(v)} \right\| \to 0, n \to \infty$$

where $e^{(v)}$ is the sequence whose only non-zero term is one in v-th place for $v \geq 0$. The Maddox's space

$$l(p) = \left\{ x = (x_k)\epsilon\ \omega: \sum_{k=0}^{\infty} |x_k|^{p_k} < \infty \right\}$$

having an important role in summability theory is an FK-space with AK with respect to its natural paranorm

$$g(x) = \left(\sum_{k=0}^{\infty} |x_k|^{p_k} \right)^{1/M}$$

where $M = \max\{1, \sup_k p_k\}$, (Maddox 1969, Maddox 1968, Maddox 1967, Nakano 1951).

Recently, the literature concerned with producing sequence spaces by means of matrix domain of a special limitation method has grown up. For example, the sequence spaces $\bar{l}(p), r_p^t, l(u,v,p)$ and $N^t(p)$ were defined as the domains of the band, Riesz, the weighted mean and Nörlund matrices in the space $l(p)$ and studied by Choudhary and Mishra (1995), Altay and Başar (2002), Altay and Başar (2007), Yeşilkayagil and Başar (2014), respectively. On the other hand, Başar, Altay and Mursaleen have studied the spaces e_p^r and e_∞^r using by $E^r = (e_{nk})$ Euler matrix where

$$e_{nk}^r = \begin{cases} \binom{n}{k}(1-r)^{n-k} r^k, & 0 \leq k \leq n \\ 0, & k > n \end{cases}$$

for all $0 < r < 1$, ((Başar, Altay and Mursaleen 2005), (Mursaleen, Altay and Başar 2006)).

Throughout this study, we take $0 < inf p_n < \infty$ for all $n \in \mathbb{N}$ and p_n^* is the conjugate of p_n, that is $\frac{1}{p_n} + \frac{1}{p_n^*} = 1$ for $p_n > 1$ and $\frac{1}{p_n^*} = 0$ for $p_n = 1$. Before going to the main results, we remind some well known lemma which is essential in our study.

Lemma 1 Let $p = (p_v)$ be any bounded sequence positive numbers.

(a) If $p_v > 1$ for all v, then $A \in (l(p), l_\infty)$ if and only if there exists an integer $M > 1$ such that

$$\sup_n \sum_{v=0}^{\infty} |a_{nv} M^{-1}|^{p_v^*} < \infty,$$

(b) If $p_v \leq 1$ for all v, then $A \in (l(p), l_\infty)$ if and only if

$$\sup_{n,v} |a_{nv}|^{p_v} < \infty$$

hold.

(Grosse-Erdmann 1993).

2 MAİN THEOREMS

In this section, it is aimed to introduce the absolute Euler space $|E_\phi^r|(p)$, to give γ- dual of this space. The absolute Euler space can be expressed as

$$|E_\phi^r|(p) = \left\{ a \in \omega: \sum_{n=1}^{\infty} \left| \phi_n^{1/p_n^*} \sum_{k=1}^{n} \binom{n-1}{k-1} (1-r)^{n-k} r^k a_k \right|^{p_n} < \infty \right\}$$

or,

$$|E_\phi^r|(p) = (l(p))_{T^r(\phi,p)}$$

where

$$t_{nk}^r(\phi, p) = \begin{cases} \phi_0^{1/p_0^*}, & k = n = 0 \\ \phi_n^{1/p_n^*} \binom{n-1}{k-1} (1-r)^{n-k} r^k, & 1 \leq k \leq n \\ 0, & k > n. \end{cases}$$

Because every triangle matrix has a unique invers which is a triangle, $T^r(\phi, p)$ has a unique invers $S^r(\phi, p)$ where

$$s_{nk}^r(\phi_n, p) = \begin{cases} \phi_0^{-1/p_0^*}, & k = n = 0 \\ \phi_k^{-1/p_k^*} \binom{n-1}{k-1} (r-1)^{n-k} r^{-n}, & 1 \leq k \leq n \\ 0, & k > n. \end{cases}$$

Theorem 1 Let $0 < r < 1$ and $p = (p_v)$ be a bounded sequence of positive numbers. There exists a linear isomorphism between the spaces $\left|E_\phi^r\right|(p)$ and $l(p)$.

Theorem 2 Let $0 < r < 1$ and $p = (p_v)$ be a bounded sequence of positive numbers. If $p_v > 1$ for all $v \in \mathbb{N}$, then

$$\left\{\left|E_\phi^r\right|(p)\right\}^\gamma = \left\{a \in \omega: \exists\, M > 1, \sup_n \sum_{v=1}^{n} \left| \sum_{k=v}^{n} M^{-1} \phi_v^{-1/p_v^*} \binom{k-1}{v-1} (r-1)^{k-v} r^{-k}\ a_k \right|^{p_v^*} < \infty \right\},$$

and if $p_v \leq 1$ for all $v \in \mathbb{N}$, then

$$\left\{\left|E_\phi^r\right|(p)\right\}^\gamma = \left\{a \in \omega: \sup_{n,v} \left| \sum_{k=v}^{n} \phi_v^{-1/p_v^*} \binom{k-1}{v-1} (r-1)^{k-v} r^{-k}\ a_k \right|^{p_v} < \infty \right\}.$$

Proof Let's recall that $a \in \left\{\left|E_\phi^r\right|(p)\right\}^\gamma$ if and only if $ax \in l_\infty$ whenever $x \in \left|E_\phi^r\right|(p)$.

$$\begin{aligned}
\sum_{k=0}^{n} a_k x_k &= T_0^r(\phi,p)\phi_0^{-1/p_0^*} a_0 + \sum_{k=1}^{n} a_k \sum_{v=1}^{k} \phi_v^{-1/p_v^*} \binom{k-1}{v-1} (r-1)^{k-v} r^{-k} T_v^r(\phi,p) \\
&= T_0^r(\phi,p)\phi_0^{-1/p_0^*} a_0 + \sum_{v=1}^{n} \phi_v^{-1/p_v^*} \sum_{k=v}^{n} a_k \binom{k-1}{v-1} (r-1)^{k-v} r^{-k}\ T_v^r(\phi,p) \\
&= \sum_{v=0}^{n} f_{nv} T_v^r(\phi,p)
\end{aligned}$$

where

$$f_{nv} = \begin{cases} \phi_0^{-1/p_0^*} a_0, & v = n = 0 \\ \sum_{k=v}^{n} \phi_v^{-1/p_v^*} \binom{k-1}{v-1} (r-1)^{k-v} r^{-k}\ a_k\,, & 1 \leq v \leq n \\ 0, & v > n. \end{cases}$$

Since $T^r(\phi,p)(x) \in l(p)$ whenever $x \in \left|E_\phi^r\right|(p)$, $a \in \left\{\left|E_\phi^r\right|(p)\right\}^\gamma$ if and only if $F \in (l(p), l_\infty)$. Using Lemma 1 to F, we get what we wished to prove, so the proof is completed.

REFERENCES

1. B. Altay and F. Başar, Generalization of the sequence space $l(p)$ derived by weighted mean, Journal of Mathematical Analysis and Applications, 330.1, 174-185, (2007).
2. B. Altay, F. Başar and M. Mursaleen, On the Euler sequence spaces which include the spaces l_p and l_∞ I, Information Sciences, 176, no. 10 1450-1462, (2005).
3. B. Altay and F. Başar, On the paranormed Riesz sequence spaces of non-absolute type, Southeast Asian Bulletin of Mathematics, 26(5), 701-715, (2002).

4. B. Choudhary and S. K. Mishra, A note on Köthe-Toeplitz duals of certain sequence spaces and their matrix transformations, International Journal of Mathematics and Mathematical Sciences, 18(4), 681-688, (1995).
5. K.G. Grosse-Erdmann, Matrix transformations between the sequence spaces of Maddox, Journal of Mathematical Analysis and Applications, 180: 223-238, (1993).
6. F. Gökçe and M.A. Sarıgöl, Matrix operators on the series space $\left|\bar{N}_p^{\theta}\right|(\mu)$ and applications, Kuwait Journal of Science, (in press)
7. I.J. Maddox, Some properties of paranormed sequence spaces, Journal of the London Mathematical Society, 1, 316-322, (1969).
8. I.J. Maddox, Paranormed sequence spaces generated by infinite matrices, Mathematical Proceedings of the Cambridge Philosophical Society, 64, 335-340, (1968).
9. I.J. Maddox, Spaces of strongly summable sequences, The Quarterly Journal of Mathematics 18, 345-355, (1967).
10. M. Mursaleen, F. Başar and B. Altay, On the Euler sequence spaces which include the spaces l_p and l_∞ II, Nonlinear Analaysis, 65, no. 3, 707- 717, (2006).
11. H. Nakano, Modulared sequence space, Proceedings of the Japan Academy, Ser. A, Mathematical Sciences, 27, 508-512, (1951).
12. M. Yeşilkayagil and F. Başar, On the paranormed Nörlund sequence space of nonabsolute type, Abstract and Applied Analysis., Vol. 2014. Hindawi, (2014).
13. Wilansky, A., Summability Through Functional Analysis, Mathematics Studies, 85. North Holland, Amsterdam, 1984.

THE ABSOLUTE CESARO SPACE ON THE l(p) WITH PARANORM AND SOME MATRIX TRANSFORMATIONS

Fadime Gökçe, Mehmet Ali Sarıgöl

University of Pamukkale, Department of Mathematics, Denizli, Turkey
fgokce@pau.edu.tr
msarigol@pau.edu.tr

Abstract:

The sequences spaces defined as domain of Nörlund, Riesz and Cesa´ro means in the spaces l(p) have recently been studied by several authors. Further, some absolute series spaces have been introduced. In this study, we have derived the absolute Cesa´ro space |C_(λ,μ) | (p) from the space l(p), given some topological and algebraic properties and also characterized certain matrix transformations on this space.

Keywords: Absolute summability, Cesaro mean, matrix transformation, sequence spaces, Maddox's spaces.
General area of research: Mathematics
ICFAS2018-ID: 1092

1 INTRODUCTION

By ω, we denote the set of all sequences of complex numbers. Let X and Y be any subsets of ω and $A = (a_{nv})$ be an infinite matrix of complex numbers. By $A(x) = (A_n(x))$, we denote the A-transform of a sequence $x = (x_v)$ if the series

$$A_n(x) = \sum_{v=0}^{\infty} a_{nv}x_v$$

are convergent for all $n \in \mathbb{N}$. If $Ax \in Y$ for every $x \in X$, then A defines a matrix transformation from X into Y, and by $A \in (X, Y)$, we mean the class of all infinite matrices A such that $A: X \to Y$. The matrix domain of an infinite matrix A in a sequence space X is defined by

$$X_A = \{x = (x_n) \in \omega : A(x) \in X\}$$

which is a sequence space.

We write c_s, b_s and l_k for the space of all convergent, bounded, k −absolutely convergent series, respectively. Also, the $\alpha-, \beta-, \gamma-$ duals of the space X are given by

$$X^{\alpha} = \{z = (z_k)\epsilon\, \omega:\ xz = (x_k z_k)\epsilon l \ \text{ for all } x = (x_k) \in X\}$$
$$X^{\beta} = \{z = (z_k)\epsilon\, \omega:\ xz = (x_k z_k)\epsilon cs \ \text{ for all } x = (x_k) \in X\}$$
$$X^{\gamma} = \{z = (z_k)\epsilon\, \omega: xz = (x_k z_k)\epsilon bs \ \text{ for all } x = (x_k) \in X\}$$

respectively. A subspace X is called an FK-space if it is a complete locally convex linear metric space, with continuous coordinates $P_n: X \to \mathbb{C}$ $(n = 0,1,2, \ldots)$, where $P_n(x) = x_n$ for all $x \in X$; an FK-space whose metric is given by a norm is said to be a BK-space. An FK-space X including the set of all finite sequences ϕ has the property AK if every sequence $x \in X$ has a unique representation $x = \sum_{k=0}^{\infty} x_k e^{(k)}$, that is

$$\left\| x - \sum_{v=0}^{n} x_v e^{(v)} \right\| \to 0, n \to \infty$$

where $e^{(v)}$ is the sequence whose only non-zero term is one in v-th place for $v \geq 0$. For example, the Maddox's space

$$l(p) = \left\{ x = (x_k) \epsilon\, \omega: \sum_{k=0}^{\infty} |x_k|^{p_k} < \infty \right\}$$

is an FK-space with AK with respect to its natural paranorm

$$g(x) = \left(\sum_{k=0}^{\infty} |x_k|^{p_k} \right)^{1/M}$$

where $M = \max\{1, \sup_k p_k\}$; also it is a BK-space if $p_k \geq 1$ for all k according to the norm

$$\|x\| = inf \left\{ \delta > 0: \sum_{k=0}^{n} |x_k/\delta|^{p_k} \leq 1 \right\}$$

(Maddox 1969, Maddox 1968, Maddox 1967, Nakano 1951).

Now, we remind some well known lemmas which is essential in our study.

Lemma 1.1 Let $p = (p_v)$ be any bounded sequence with $p_v > 1$ for all v. Then,
(a) $A \in (l(p), l)$ if and only if there exists an integer $M > 1$ such that

$$\sup \left\{ \sum_{v=0}^{\infty} \left| \sum_{n \in \mathcal{F}}^{\infty} a_{nv} M^{-1} \right|^{p_v^*} : \mathcal{F} \subset \mathbb{N} \text{ finite} \right\} < \infty,$$

(b) $A \in (l(p), c)$ if and only if there exists an integer $M > 1$ such that

(i) $\lim_n a_{nv}$ exists for all v

and

(ii) $\sup_n \sum_{v=0}^{\infty} |a_{nv} M^{-1}|^{p_v^*} < \infty,$

(c) $A \in (l(p), l_\infty)$ if and only if (ii) holds, (Grosse-Erdmann 1993).

Lemma 1.2 Let $A = (a_{nv})$ be an infinite matrix with complex numbers and (p_v) be a bounded sequence of positive numbers. If $U_p[A] < \infty$, or $L_p[A] < \infty$, then

$$(2C)^{-2}U_p[A] \leq L_p[A] \leq U_p[A]$$

where $C = max\{1, 2^{H-1}\}$, $H = \sup_v p_v$

$$U_p[A] = \sum_{v=0}^{\infty}\left(\sum_{n=0}^{\infty}|a_{nv}|\right)^{p_v}$$

and

$$L_p[A] = \sup\left\{\sum_{v=0}^{\infty}\left|\sum_{n\in K}a_{nv}\right|^{p_v} : K \subset \mathbb{N}\right\},$$

(Sarıgöl 2013).

Lemma 1.3 Let X be an FK-space with AK, T be triangle, S be its inverse and Y be an arbitrary subset of ω. Then, we have $A \in (X_T, Y)$ if and only if $\tilde{A} \in (X, Y)$ and $V^{(n)} \in (X, c)$ for all n, where

$$\tilde{a}_{nv} = \sum_{j=v}^{\infty} a_{nj}s_{jv} \quad n, v = 0,1, \ldots$$

and

$$v_{mv}^{(n)} = \begin{cases} \sum_{j=v}^{m} a_{nj}s_{jv}\ , & 0 \leq v \leq m \\ 0 & v > m, \end{cases}$$

(Malkowsky and Rakocevic 2007).

2. MAIN THEOREMS

In this section, we introduce the absolute Cesáro space as follows:

$$\left|C_{\lambda,\mu}\right|(p) = \left\{a = (a_v): \sum_{n=1}^{\infty} n^{p_n-1}\left|\sum_{v=0}^{n}\left(\frac{A_{n-v}^{\lambda-1}}{A_n^{\lambda+\mu}} - \frac{A_{n-v-1}^{\lambda-1}}{A_{n-1}^{\lambda+\mu}}\right)A_v^{\mu}s_v\right|^{p_n} < \infty\ \right\}.$$

Then, we investigate some topological and algebraic properties and characterize certain matrix transformations on that space.

Note that the absolute Cesáro space may be redefined as $\left|C_{\lambda,\mu}\right|(p) = (l(p))_{T^{\lambda,\mu}(p)}$ where the matrix $T^{\lambda,\mu}(p)$ is given by

$$t_{nv}^{\lambda,\mu}(p) = \begin{cases} 1, & n, v = 0 \\ \dfrac{vA_{n-v}^{\lambda-1}A_v^{\mu}}{n^{1/p_n}A_n^{\lambda+\mu}}, & 1 \leq v \leq n \\ 0, & v > n. \end{cases}$$

Also, since every triangle matrix has a unique inverse which is a triangle, $T^{\lambda,\mu}(p)$ has the inverse matrix $S^{\lambda,\mu}(p)$ such that

$$s_{nv}^{\lambda,\mu}(p)=\begin{cases}1, & n,v=0\\ v^{1/p_v}\dfrac{A_{n-v}^{-\lambda-1}A_v^{\lambda+\mu}}{nA_n^{\mu}}, & 1\le v\le n\\ 0, & v>n\end{cases}$$

where $\lambda+\mu,\ \mu\neq -1,-2,\ldots$.

Theorem 2.1 Let $\lambda+\mu,\ \mu\neq -1,-2,\ldots$ and (p_v) be a bounded sequence of non-negative numbers with $p_v>1$. The space $\left|C_{\lambda,\mu}\right|(p)$ is linearly isomorphic to the space $l(p)$.

Proof. To prove theorem, we should show the existence of a linear bijection between the spaces $\left|C_{\lambda,\mu}\right|(p)$ and $l(p)$. Consider the transformation $T^{\lambda,\mu}(p):\left|C_{\lambda,\mu}\right|(p)\to l(p)$. Since the matrix corresponding to this transformation is a triangle, it is clear that $T^{\lambda,\mu}(p)$ is a linear bijection. Since $T^{\lambda,\mu}(p)(x)\in l(p)$ whenever $x\in\left|C_{\lambda,\mu}\right|(p)$, we get

$$\|x\|_{\left|C_{\lambda,\mu}\right|(p)}=\left\|T^{\lambda,\mu}(p)(x)\right\|_{l(p)}$$

which completes the proof.

Theorem 2.2 Let $\lambda+\mu,\ \mu\neq -1,-2,\ldots$. If $p_v>1$, then there exists an integer $M>1$ such that

$$\left\{\left|C_{\lambda,\mu}\right|(p)\right\}^{\beta}=\left\{a\in\omega:\sum_{n=v}^{\infty}\frac{A_{n-v}^{-\lambda-1}A_v^{\lambda+\mu}}{v^{-1/p_v}nA_n^{\mu}}a_n \text{ converges for each } v\right\}$$
$$\cap\left\{a\in\omega:\exists\, M>1,\sup_n\sum_{v=1}^{n}\left|\sum_{k=v}^{n}\frac{A_{k-v}^{-\lambda-1}A_v^{\lambda+\mu}}{v^{-1/p_v}kA_k^{\mu}}a_k\,M^{-1}\right|^{p_v^*}<\infty\right\}.$$

Theorem 2.3 Assume that $\lambda+\mu,\ \mu,\ \lambda^*+\mu^*,\ \mu^*\neq -1,-2,\ldots$ and $A=(a_{nv})$ be an infinite matrix of complex numbers. If (p_v) is any bounded sequence of positive numbers with $p_n>1$ for all n, then $A\in\left(\left|C_{\lambda,\mu}\right|(p),\left|C_{\lambda^*,\mu^*}\right|\right)$ if and only if there exists an integer $M>1$ such that, for $n=0,1,\ldots$

$$\sum_{j=v}^{\infty}\frac{A_{j-v}^{-\lambda-1}A_v^{\lambda+\mu}}{v^{-1/p_v}jA_j^{\mu}}a_{nj} \text{ converges for each } v,$$
$$\sup_m\sum_{v=1}^{m}\left|\sum_{k=v}^{m}\frac{A_{k-v}^{-\lambda-1}A_v^{\lambda+\mu}}{v^{-1/p_v}kA_k^{\mu}}a_{nk}M^{-1}\right|^{p_v^*}<\infty,$$
$$\sum_{n=0}^{\infty}\left|\sum_{j=1}^{n}t_{nj}^{\lambda^*,\mu^*}(1)a_{j0}\right|<\infty,$$

$$\sum_{v=1}^{\infty}\left(\sum_{n=1}^{\infty}\left|\sum_{j=1}^{\infty} t_{nj}^{\lambda^*,\mu^*}(1)\sum_{i=v}^{\infty}\frac{A_{i-v}^{-\lambda-1}A_v^{\lambda+\mu}}{v^{-1/p_v}iA_i^{\mu}}a_{ji}M^{-1}\right|\right)^{p_v^*}<\infty.$$

REFERENCES

1. K.G. Grosse-Erdmann, Matrix transformations between the sequence spaces of Maddox, Journal of Mathematical Analysis and Applications, 180: (1993) 223-238.
2. E. Malkowsky and V. Rakocevic, On matrix domains of triangles, Applied Mathematics and Computation, 189 (2) (2007), 1146-1163.
3. I.J. Maddox, Some properties of paranormed sequence spaces, Journal of the London Mathematical Society, 1 (1969), 316-322.
4. I.J. Maddox, Paranormed sequence spaces generated by infinite matrices, Mathematical Proceedings of the Cambridge Philosophical Society, 64 (1968), 335-340.
5. I.J. Maddox, Spaces of strongly summable sequences, The Quarterly Journal of Mathematics 18 (1967), 345-355.
6. H. Nakano, Modulared sequence space, Proceedings of the Japan Academy, Ser. A, Mathematical Sciences, 27 (1951), 508-512.
7. M.A. Sarıgöl, An inequality for matrix operators and its applications, Journal of Classical Analysis, 2 (2013), 145-150.
8. Wilansky, Summability Through Functional Analysis, Mathematics Studies, 85. North Holland, Amsterdam, 1984.

RETAINING CARBONDIOXIDE IN AQUEOUS SUSPENSIONS OF CALCINED ULEXIT

Veysel SELİMOĞLU

Ministry of Environment and Urbanization, Ankara / Turkey
v.selimoglu@hotmail.com

Abstract

Uleksite is one of the most important commercial boron ores. As a general process, boric acid is obtained by reacting this ore with sulfuric acid in some countries. However, the ore extracted in Turkey is exported after concentrating.
As a general process, boric acid is obtained by reacting boron ores with sulfuric acid. However, carbon dioxide is an acid gas. In this study, the use of carbon dioxide instead of sulfuric acid is used to dissolve ulexite and then the products obtained are characterized. It is intended to stabilize both carbon dioxide, which is the product of combustion of fossil fuels and which is known to be harmful to the environment, and to recover B_2O_3 content of ulexite as a boron product.
In experiments carried out in a 1 L glass reactor under atmospheric pressure and in aqueous conditions with samples of ulexite calcined at 160 °C, temperature, solid / liquid ratio, particle size and time were used as parameters. The design of the experiment was made according to the Taguchi method.
Experimental results were analyzed by analysis of variance and optimum dissolution conditions were determined as 90 °C for the temperature, 1/5 for the solid / liquid ratio, <75 µm for the particle size and 60 min for the time. It was also determined by XRD and chemical analyzes that the carbon dioxide was stabilized in the form of $CaCO_3$ in the residue obtained in the dissolution process

Keywords: Ulexite, carbon dioxide, dissolution, optimization
General area of research: Chemistry
ICFAS2018-ID: 1106

KALSİNE ÜLEKSİTİN SULU SÜSPASİYONLARINDA KARBON DİOKSİTİN TUTULUMU

Veysel SELİMOĞLU

Çevre ve Şehircilik Bakanlığı, Ankara / Türkiye
v.selimoglu@hotmail.com

Özet

Uleksit en önemli ticari bor cevherlerinden biridir. Genel bir proses olarak bazı ülkelerde bu cevherin sülfürik asit ile reaksiyonundan borik asit elde edilmektedir. Ancak Türkiye'de çıkarılan cevher konsantre edildikten sonra ihraç edilmektedir.

Bu çalışmada sülfürik asit yerine karbondioksit kullanılarak üleksitin çözünmesi ve elde edilen ürünler incelenmektedir. Bu suretle fosil yakıtların yanma ürünü olan ve çevre için zararlı olduğu bilinen karbondioksitin hem stabilize edilmesi ve hem de üleksitin B_2O_3 içeriği bir bor ürünü olarak elde edilmesi amaçlanmıştır.

Atmosferik basınç altında ve sulu ortamda 1 L lik ceketli cam reaktörde 160 °C de kalsine edilmiş üleksit örnekleriyle yapılan denemelerde sıcaklık, katı/sıvı oranı, tane iriliği ve zaman parametre olarak kullanılmıştır. Deney tasarımı Taguchi metoduna göre yapılmıştır.

Deneysel sonuçlar varyans analizi ile analiz edilmiş, optimum çözünme şartları sıcaklık için 90 °C, katı/sıvı oranı için 1/5, tane iriliği için < 75 µm ve süre için 60 dak olarak belirlenmiştir. Ayrıca, çözünme işlemlerinde elde edilen katı bakiyede karbondioksitin $CaCO_3$ şeklinde stabilize edildiği XRD ve kimyasal analizlerle belirlenmiştir.

Anahtar Kelimeler: Üleksit, karbondioksit, çözünme, optimizasyon

1.Giriş

Bor cevherleri Türkiye'nin en önemli yeraltı zenginliklerindendir. Dünya'da 230 tür bor minerali bulunmakla birlikte ticari öneme sahip olanlar 7-8 i geçmez. Bunlardan kolemanit, tinkal ve üleksit Türkiye'de mevcuttur ve Türkiye dünya rezervlerinin %73 üne sahiptir. Bu cevherlerden kolemanit borik asit, tinkal boraks ve boraks hidratların üretiminde kullanılır. Üleksitten bazı ülkelerde borik asit üretilirse de Türkiye'de kullanılmaz ve ihraç edilir.

Üleksitin sulu ortamlarda çözünmesi ile ilgili bir çok çalışma mevcuttur. Üleksitin H_2SO_4, H_3PO_4 gibi mineral asitlerle, asetik asit gibi organik asitlerle, SO_2, CO_2 gibi asidik gazlarla çözünmesinin kinetiği incelenmiştir (Abalı et al.,2011, Demirkıran et al., 2009, Ekmekyapar et al, 2008, Tunç et al.,2001, Küçük et al.,2004)).

Son yıllarda özellikle fosil yakıtların emisyonu olarak atmosferde karbondioksit kirliliği ve giderilmesi önem kazanmıştır. Her yıl giderek artan atmosferdeki karbondioksit kirliliği en başta global ısınma ve ıklim değişikliğine neden olmaktadır. Bu nedenle ülkeler buemisyonu azaltacak ulusal ve uluslararası politikalar üretmektedirler(Anonim, 2008, Graham et al.,2008, Grande et al.,2008, Lee et al., 2008).

Bu çalışmada saf karbondioksiti ve baca gazını asidik bir reaktif olarak kullanarak üleksitin sulu ortamda çözünmesinde karbondioksit tutulumunun optimum şartları belirlenmeğe çalışılmıştır.

2. Materyal ve Yöntem

2.1 Materyallerin Temini ve Hazırlanması

Çalışmalarda Bigadiç'ten temin edilen üleksit örnekleri kullanılmıştır. %50,61 B_2O_3, %20,75 CaO, %6,99 Na_2O, %17,25 H_2O, %1,66 MgO, %0,04 Al_2O_3, %0,03 Fe_2O_3, %2,64 SiO_2, %0,03 SO_4 içeren bu örnekler bir laboratuvar tipi öğütücü ile öğütülmüş ve standart eleklerle elenerek -250,-180,-150 ve -125 µm tane boyutuna getirilmiştir.

2.2 Deneylerde Uygulanan Parametreler ve Seviyeleri

Tablo 1. 160 °C de kalsine olmuş üleksit örnekleriyle saf CO_2 gazı kullanılarak yapılan denemelerde kullanılan parametreler ve değerleri

Parametreler		Parametre Değerleri			
		1	**2**	**3**	**4**
A	Sıcaklık, °C	60	70	80	90
B	Tane Boyutu, µm	-150	-125	-75	-45
C	Süre, dak	60	90	120	150
D	Katı/Sıvı Oranı,g/500 g	100	130	200	235

Denemelerde uygulanan parametreler ve bu parametrelerin seviyeleri önceden yapılan ön denemelerden elde edilen verilere göre belirlenmiş olup, bu parametreler katı-sıvı oranı, tane boyutu, sıcaklık ve zaman olarak saptanmıştır. Parametreler ve seviyeleri Tablo 1. de verilmektedir.

2.3 Çözünme Deneylerinin Yapılışı

Atmosferik basınçta yapılan denemeler 1 litrelik ceketli cam reaktörde gerçekleştirilmiş, reaksiyon sıcaklığını kontrol için bir sabit sıcaklık sirkülatörü, çözeltinin pH sını kontrol için bir pH metre, reaksiyon karışımını homojen bir şekilde karıştırmak için bir mekanik karıştırıcı kullanılmıştır. Reaksiyon ortamına sabit bir debi ile bir gaz tüpünden karbondioksit gönderilmiş, deneylerde 500 g su istenen sıcaklığa getirildikten sonra karıştırılırken gereken miktarda cevher ilave edilmiş ve daha sonra da karbondioksit reaksiyon karışımından geçirilmiştir. Reaksiyon karışımı deneme sonunda süzülerek çözelti ve katı birbirinden ayrılmıştır.

Çözeltilerde B_2O_3, CaO, MgO, analizleri, katılarda ise suda çözünen B_2O_3, asitte çözünen B_2O_3 analizleri ile XRD analizleri yapılmıştır. Katıda yapılan suda ve asitte çözünen B_2O_3 analizleri çözeltiye geçen B_2O_3 oranlarının hesaplanmasında kullanılmıştır. Elde edilen B_2O_3 çözünme yüzdelerinin karbon dioksit tutulum yüzdelerine eşit olduğu düşünülerek karbon dioksit tutulum yüzdeleri hesaplanmış ve karbondioksit tutulumunun optimizasyonu değerlendirilmiştir.

2.4 Deney Tasarımı

Bu çalışmada, karbondioksit gazı ile üleksit cevherinin, atmosferik koşullarda çözünmesinin optimum şartlarının belirlenmesi amaçlanmıştır. Bu amaçla yapılan çalışmalarda belirlenen parametre sayısı 4 ve her bir parametre için de 4 farklı seviyenin incelenmesi düşünülerek L_{16} (4^4)Taguchi faktöriyel fraksiyonel deney tasarımı planı yapılmıştır.

3. Bulgular ve Tartışma

3.1. Kalsine Üleksitin Sulu Ortamda Saf CO_2 Gazı İle Çözündürülmesi

Tablo 2. 160 °C de kalsine edilmiş üleksitin sulu ortamda saf CO_2 ile çözünmesinde çözeltiye geçen B_2O_3 oranları

Deneme No	Parametreler				1. Seri Deney	2. Seri Deney	Ortalama
	A	**B**	**C**	**D**			
1	1	1	1	1	76,37	75,35	75,86
2	1	2	2	2	64,87	58,93	61,9
3	1	3	3	3	69,12	65,12	67,12
4	1	4	4	4	51,15	53,8	52,48

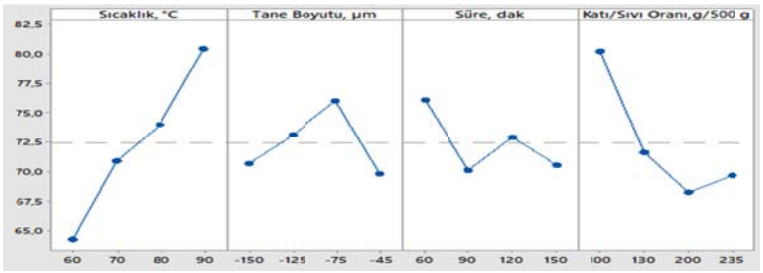
Deneme No	Parametreler				1. Seri Deney	2. Seri Deney	Ortalama
	A	B	C	D			
5	2	1	2	3	60,34	55,88	58,11
6	2	2	1	4	75,23	75,65	75,44
7	2	3	4	1	79,41	81,39	80,4
8	2	4	3	2	67,13	72,46	69,8
9	3	1	3	4	76,51	64,09	70,03
10	3	2	4	3	78,87	62,03	70,45
11	3	3	1	2	71,55	80,19	75,87
12	3	4	2	1	78,23	81,12	79,68
13	4	1	4	2	73,73	84,03	78,88
14	**4**	**2**	**3**	**1**	**84,15**	**85,54**	**84,85**
15	4	3	2	4	80,77	80,6	80,69
16	4	4	1	3	80,4	74,17	77,29

Bu çalışmalarda dört faklı tane boyutundaki örnekler kullanılmıştır. Bu amaçla Tablo 1. de verilen parametreler ve parametre değerleri kullanılarak L_{16} (4^4)deney planına göre deneyler yapılmış ve her bir deney iki kez tekrarlanmıştır. Tutulan B_2O_3 oranları Tablo 2'de verilmektedir.

4. Sonuçlar

4.1 Kalsine Üleksitin Saf CO_2 Gazı İle Çözündürülmesinde CO_2 Tutulumuna Ait Deney Tasarım Sonuçları

4.1.1 Parametrelerin etkinliği



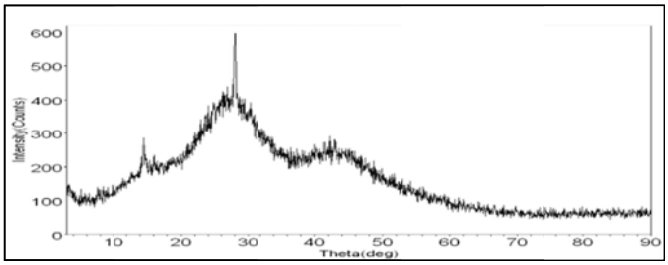
Şekil 1. 160 °C sıcaklıkta kalsine edilmiş üleksitin sulu ortamda saf CO_2 ile çözünmesinde kullanılan parametrelerin, CO_2'nin marjinal ortalama tutulum değerleri üzerine etkisi

Tablo 1'e göre seçilen optimum şartlar; 90°C sıcaklık, -75 µm tane boyutu, 60 dk süre ve 100 g üleksit/ 500 g su olarak belirlenmiştir. Varyans analizine göre Tablo 3. deki F değerleri ve Şekil 1 de ki tutulan CO_2 için her bir parametrenin etkinliğini göstermektedir.

Tablo 3. Sulu ortamda saf CO_2 ile 160 °C de kalsine edilmiş üleksitin B_2O_3 çözünürlüğünün optimizasyonu için varyans analizi

Parametre	Kareler Toplamı (SS_i)	Serbestlik Derecesi (SD_i)	Kareler Ortalaması (MS_i)	F
(A)Sıcaklık	1074,41	3	358,14	10,48
(B)Tane B	183,88	3	61,29	1,79
(C) Süre	183,24	3	61,08	1,79
(D)K/S Or	686,62	3	228,87	6,7
Hata	649,3	19	34,17	-
Toplam	2777,45	31		

Tablo 3. deki A (sıcaklık) ve D (katı/sıvı oranı) parametreleri için F değerleri standart tablolardaki F değerlerinden büyük olduğundan bu parametreler etkin, B(tane boyutu) ve C(süre) parametreleri için F değerleri ise standart tablolardaki F değerlerinden küçük olduğu için bu parametreler etkin değildir.



Şekil 2. Kalsine üleksitin sulu ortamda saf CO_2 ile çözünmesinde elde edilen katı atığın XRD' si

Deneme sonunda elde edilen katı atığın XRD'si alınmış olup grafiği Şekil 2'de verilmiştir. Bu XRD ye göre kalsine üleksitin kalsiyum içeriği çalışılan ortamda kalsiyum karbonata dönüşmektedir.

4.1.2. Gözlemlenen ve tahmin edilen çözünen B_2O_3 miktarları

Performans istatistik değerlerini maksimum yapan parametre seviyeleri A4, B3, C1 ve D1 olduğu görülmektedir. Optimum şartlar için tahmin değeri hesaplanmış, çalışmanın güven aralığını ve elde edilen modelin yeterli olup olmadığını belirlemek için doğrulama deneyi yapılmıştır. Optimum şartlarda ve farklı parametre seviyelerinde yapılan çalışmalar ve deney sonuçları Tablo 4. de verilmektedir. Buna göre güven aralığı için S_e (tahmin hatası için güven aralığı) değeri 13,86 olarak hesaplanmıştır. Optimum şartlar altında tutulan CO_2 için tahmin değeri %95,42 tutulan CO_2 için deneysel olarak bulunan iki değerin ortalaması da %93,45 dir.

Tablo 4. 160 °C kalsine üleksitin sulu ortamda saf CO_2 ile çözünmesine ait gözlemlenen ve tahmin edilen %B_2O_3 miktarı

Parametreler		**Değer**	**Seviye**
	Sıcaklık (°C)	90	4
B	Tane Boyutu (mm)	-75	3
C	Süre (dk)	60	1
D	Katı/sıvı oranı (g/500 g)	100	1
Gözlemlenen değer (%)B_2O_3		93,45	
Tahmin edilen değer (%)B_2O_3		95,42	
Güven aralığı		95,42±13,86	

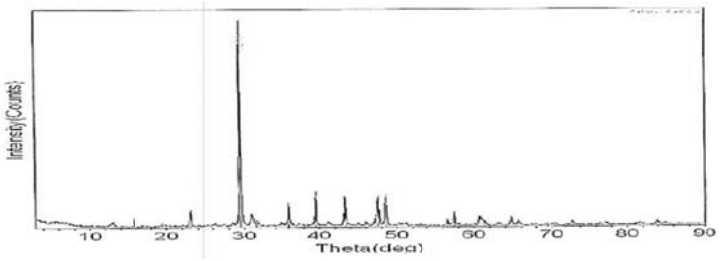
Elde edilen sonuçlara göre tahmin edilen değer ile deneysel değerler arasında bir uyum içerisinde olduğu görülmektedir. Doğrulama deneyi sonuçları ile modelden hesaplanan değerlerin birbiri ile uyum içinde olması ve doğrulama deney sonuçlarının güven aralığında bulunması, parametre seçiminin doğru olduğunu ve parametrelerin iç etkileşimlerinin ihmal edilebilir seviyede olduğunu göstermektedir.
Sonuç olarak bu model (additive model) bu prosesin çalışılan parametrelere bağlılığını tanımlamak için yeterli olduğunu göstermektedir.

4.1.3. Sprey Kurutucu ile Kurutma İşlemleri

Optimum şartlarda elde edilen çözelti Yamato marka ADL311 Model bir sprey kurutucuda kurutulmuş ve elde edilen katı ürünün XRD ve kimyasal analizleri yapılmıştır.

Ürünün XRD si Şekil 3. de görülmekte olup ürünün kristal bir yapı göstermediği anlaşılmaktadır. Ancak kimyasal analiz sonuçları bu ürünün $NaB_5O_8.xH_2O$ yapısında ve sodyum pentaborat olduğunu göstermektedir.

4.1.4. Katı Bakiyenin Karakterizasyonu



Şekil 3. 160 °C kalsine üleksitin sulu ortamda saf CO_2 ile çözünmesinde elde edilen katı bakiyenin XRD'si

Kalsine üleksitin karbondioksitle sulu ortamda çözünmesi sonunda elde edilen katı bakiyenin XRD ve kimyasal analizi yapılmıştır. Katı bakiyenin XRD si Şekil 3. de görülmektedir. Bu sonuçlar katı bakiyede CO_2'nin, $CaCO_3$ şeklinde bağlandığını göstermektedir.

Sonuç olarak, bu çalışmada kalsine üleksitin CO_2 ile çözündürülmesinin optimum şartlarının belirlenmesi amaçlanmış ve bu maksatla değişik tane boyutundaki orijinal üleksit cevheri kullanılarak atmosferik şartlarda sulu ortamda saf CO_2 ile çözünmenin optimizasyonu incelenmiştir.

Kalsine üleksit ile CO_2 arasında sulu ortamda meydana gelen reaksiyonun aşağıdaki gibi olduğu tespit edilmiştir.

$$Na_2O.2CaO.5B_2O_3.(16\text{-}x)H_2O+2CO_2 \rightarrow 2NaB_5O_8.5H_2O + 2CaCO_3+(6\text{-}x)H_2O$$

REFERANSLAR

1. Abalı, Y., Bayca, S. U., Mıstıncık, E., 2011. Leaching kinetics of ulexite in oxalic acid. Physicochem. Probl. Miner. Process, 47, 139-148.
2. Alsaran, A., 2001. Dubleks Yüzey İşlemi Uygulanmış Isı 5140 Çeliğinin Yapısal Mekanik ve Tribolojik Özelliklerinin Belirlenmesi. Atatürk Üniversitesi, Fen Bilimleri Enstitüsü, Makine Mühendisliği Anabilim Dalı, Doktora Tezi, Erzurum.
3. Anonim, Chemanager Europe.October 2008,Page 29.
4. Demirkıran, N., 2009. Dissolution Kinetics of Ulexite in Ammonium Nitrate Solutions. Hydrometallurgy. 95(1), 198-202.
5. Diao, Y., Zheng, X., He, B., Chen, C., Xu, X., 2004, Experimental Study on Capturing CO_2 Greenhouse Gas by Ammonia Scrubbing. Energy Conversion and Management 45 2283–2296.
6. Ekmekyapar, A., Demirkıran, N., Künkül, A., 2008. Dissolution Kinetics of Ulexite in Acetic Acid Solutions, Chemical Engineering Research and Design, 86, 1011-1016.
7. Graham, L. A., Rideout, G., Rosenblatt, D., Hendren, J., 2008, Greenhouse Gas Emissions From Heavy-Duty Vehicles, Atmospheric Environment, 42, 4665-4681.

8. Grande, C. A, Rodrigues, A. E., 2008, Electric Swing Adsorption for CO_2 Removal From Flue Gases, International Journal of Greenhouse Gas Control, 2, 194-202.
9. Küçük, Ö., Kocakerim, M.M., Çopur, M., Yartaşı, A., 2004, Optimization of Dissolution of Ulexite in $(NH_4)_2SO_4$ Solutions, Canadian Metallurgical Quarterly, 44 (1), 53-58.
10. Lee, S., Maken, S., Park, J., Song, H., Park, J.,Shim, J., Kim, J., Eum, H., 2008, A Study on the Carbon Dioxide Recovery from 2 ton-CO_2/day Pilot Plant at LNG Based Power Plant, Fuel 87 1734-1739.
11. Tunç, M., Yapıcı, S., Kocakerim, M., and Yartaşi, A., 2001. The Dissolution Kinetics of Ulexite in Sulphuric Acid Solutions, Chem. Biochem. Eng. Q, 15(4), 175-180.
12. Tekin, G., 2004. Kalsine Üleksitin Amonyum Klorür Çözeltileri İçinde Çözünürleştirilmesi Kinetiği, BAÜ Fen Bilimleri Enstitüsü Dergisi, 6.1, 100-114.

LESSEPSIAN MIGRANT PUFFERS (TETRAODONTIDAE) PROBLEM ALONG THE MEDITERRANEAN COAST OF TURKEY

Fevzi Yılmaz, Tuncer Okan Genç

Muğla Sıtkı Koçman University, Science Faculty, Biology Department, Kötekli, Muğla, 48100 Turkey
yfevzi@mu.edu.tr; tuncerokangenc@gmail.com

Abstract:

One of the most threat for ecosystems is the overpassing of the natural barriers by the so called "invasive species" that can cause serious changes in new environments. After the opening of the Suez Canal in 1869, with the opening of world sea trade routes, very different ecosystems of the Red Sea and Mediterranean have been united. So far the total number of invasive species detected in the Mediterranean has been approaching 800. One of the most dangerous invasive species that has reached the Mediterranean Sea Coast of Turkey is known as puffer fish. The first record for Turkey was recorded in 2003, from Gökova Bay and at today8 of the 11 known pufferfish species registered from the Mediterranean Sea are known to occur in Turkey. It is a common view among fishermen that a significant reduction in mollusk and fish species populations occurred after the puffer fish appears.
Tetrodotoxin (TTX), a neurotoxin found in the internal organs and tissues, as well as economic and ecological damage to puffer fishes, causes serious damage to the living health. It is known that this toxin is 1000 times more toxic than cyanide. TTX is used to treat some cancers and other aches.
In this study, our studies conducted in the Gökova Gulf in 2000-2004 and related published scientific studies were reviewed. The current status of the puffer fish species has been assessed and ideas for possible future work have been put forward. The killing of the puffer fish is not the best suitable solution. Recognizing the fact that these species are quite widespread, other suggestion to solve the problem of their invasion can be to: earn the fish with the help of expert people able to clean these specimens in competent centers; avoid the reduction of the large fish which is one of the reasons for these fish to enter in our waters and investigating ways to increase their abundances. The way to replicate the large fish is to quit fishing. Migration to the north due to global warming may be possible with international solutions.

Keywords: Invasive species, Puffer fish, Mediterranean, Turkey
General area of research: Biology, Hydrobiology
ICFAS2018-ID: 1111

1. INTRODUCTION

Much attention is being given to the problem today since these introductions are one of the most significant threats to ecosystem biodiversity, structure, and function. Evidence shows that invasions lead to a decline in the number of native species, disturbance of certain valuable processes, economic losses, and to the introduction of diseases and pathogens. In

certain extreme cases, native species can become extinct due to competition with or predation by the invasive organisms (Oral 2010).

The Suez Canal between the Mediterranean and Red Seas (Figure 1) is recognized by far to be the foremost path for invasive species, it was built in 1869 in order to facilitate the trade between Europe and the Far East by the engineer Ferdinand de Lesseps, after whom the species that migrated to the Mediterranean were named. The canal, connecting these two hydrographically and biologically dissimilar water bodies, extends 162.5 km and is relatively narrow and shallow for most of its length.

Figure 1. Mediterranean Sea (Edited from; Ozturk 2010)

Many exotic species in the Mediterranean Sea came from both the Red Sea and the Atlantic Ocean. They came through a variety of pathways including migration through the Suez Canal and Straits of Gibraltar, ballast water and other shipping operations, and other activities (Fricke et al. 2012; Farrag 2014). In the early 2000s, there were about 59 confirmed Lessepsian immigrant species reported out of a total of 650 fishes in the Mediterranean basin, constituting almost 10% of the population (Golani et al. 2002). Puffer fish, blow fish, balloon fish, toad fish, and globe fish, are all generic names given to several members of the fish family Tetrodontidae, which includes 187 different species worldwide (West 2009; Homaira 2008). In Turkey 8 puffer fish species have been identified (Figure 2). Puffer fish are among the important immigrant species within the different Mediterranean basins. They cause some negative effects to the fisheries' activities in the area partly because they are poisonous, and they can become quite abundant.

2. TETRODOTOXIN IN PUFFERFISH

The production of Tetrodotoxin (TTX) by marine bacteria has been investigated since the 1980"s, with studies focusing mainly on species belonging to the genus Vibrio and on a lower scale on bacteria of the genus *Pseudomonas*. Vibrio bacteria are a genus of aquatic, comma-shaped, very motile bacteria which belong to the family Vibrionaceae and which can cause many serious diseases to animals. The most common source of bacteria associated with TTX production is *Vibrio alginolyticus*. For instance, puffer fishes, Chaetognaths, and Nemerteans have been shown to contain *V. alginolyticus*. To confirm the bacterias role in the production of TTX, many screening experiments have been done which revealed that 10 strains of the Vibrio family produce this toxin. TTX is taken up from the food chain, but the transfer, accumulation, and elimination mechanisms of TTX obtained via preys remain unclear.
Several years of research on TTX revealed that toxicity of puffer fishes shows significant individual and regional variations (Sabrah et al. 2006; Noguchi 2008; Arakawa 2010). Most

studies reported that the liver of many puffer fish species has a specific TTX uptake mechanism, and TTX introduced into their bodies is first absorbed in the liver and then transferred to the skin through the circulatory system. This inter-tissue transfer and accumulation of TTX are greatly affected by the maturity state of the fish. An alternative explanation is that the toxin is produced by symbiotic or parasitic bacteria which the puffer fish accumulate inside their bodies rather than through feeding. Interestingly, the amount of TTX produced by the bacteria does not account for the accumulation in the fish, which means that bioconcentration occurs in the predator (Katikou et al. 2009; Kalogirou 2010).

a. Pufferfish Species in Turkey

1-*Lagocephalus sceleratus* (Gmelin, 1789); Silver-cheeked toad fish. The body is elongated, somewhat compressed laterally and inflatable; two lateral lines, grey to greenish colour with regular black spots above; dorsal and ventral small spinules extending dorsally to origin of the dorsal fin, and ventrally to before the cloacae. A wide silver band is located on the lower parts of the flanks from the mouth to the caudal fin with silver blotch in front and below of eye. The base of pectoral fin is black, and it has a wide base. The dorsal and anal fins are opposite each
other and the caudal fin is lunate.
2- *Lagocephalus suezensis* Clark & Gohar,1953; Tetraodon-lièvre de Suez. It is similar to L. sceleratus in its characteristics having two lateral lines; dorsal and ventral small spinules extending dorsally to origin of the dorsal fin, and ventrally to before the cloacae. A wide silver band is located on the lower parts of the flanks from the mouth to the caudal fin with silver blotch in front and below of eye but this species can be distinguished by smaller length than L.
sceleratus; the presence of a raised skin fold along lower side of caudal peduncle; spots are found irregularly shaped of brown to grey in various sizes dorsally, as opposed to the equal sized black spots on the back of *L. sceleratus*
3- *Lagocephalus guentheri* Miranda-Ribeiro, 1915; Diamond back puffer fish. The body is relatively elongate with a somewhat box-shaped, broad, head; two lateral lines with no spots.
Color is yellow- brownish or sometimes dark green yellowish with dark bands over the back, the first band between the eyes, the second above the gill opening, the third above the posterior part of the pectoral fin, the fourth encircling the dorsal-fin base, and a couple of small dark markings on the dorsal side of the caudal peduncle. Lunate caudal fin with the extended middle rays slightly to posterior with dusky to dark brownish color or many times black with the dorsal and ventral white tips as opposed to *L. spadiceus* where the dorsal two thirds of the caudal fin is dark yellow and the ventral one third is white (Matsuura et al. 2011).
4- *Lagocephalus spadiceus* (Richardson 1845); *L. guentheri* is similar to *L spadiceus* and *L. gloveri* in general appearance. However, the caudal fin in *L. guentheri* has a slight posterior extension medially that makes the fin appear to be doubly emarginate whereas the caudal fin is slightly lunate in *L. spadiceus* The first record of Lagocephalus.
5- *Lagocephalus lagocephalus* (Linnaeus, 1758); the Oceanic puffer fish was represented by single specimen of 45 cm total length. Body is elongated, somewhat compressed laterally and inflatable, two lateral lines. Colour is a dark blue above with no spots; large lateral silver band on the flanks extended from mouth to caudal fin; a silver blotch in front of eyes; belly with small spinules. Pectoral, dorsal and anal fins are dark located far posteriorly.
6-*Torquigener flavimaculosus* Hardy & Randall, 1983; yellow spotted puffer fish; body is elongated with two lateral lines and no spots and silver bands, compressed laterally and inflatable, terminal mouth; dorsal and anal fins are elongated and pointed, rounded pectoral fin with wide base. The skin had numerous longitudinal pleats, presence of small spinules on

the belly and head, on the gill opening, these spinules did not reach the dorsal fin; eye is encircled by dorsal lateral line; caudal fin is truncate. Colour is slightly brownish with irregular grey whitish spots dorsally and white below; a mid-lateral line of well-distinguished yellow-orange spots, followed by a pale yellow zone, separating the dorsal, colored, surface from the white ventral surface; scattered brown spots on caudal fin, dorsal lightly spotted with white, anal and pectorals fins are transparent; vertical yellow-brown bands on cheek, separated by irregular white bands

7-*Sphoeroides pachygaster* (Müller and Troschel, 1848); blunthead puffer; body is inflatable with one lateral line on each side convoluted; no dorsal and ventral spinules; large head with rounded snout; body is greyish on dorsal surface in color with faint brownish spots on flanks, belly whitish pale grey; dorsal fin placed behind

8-*Tylerius spinosissimus* (Regan, 1908); In the body of *T. spinosissimus* there are short thorns on the belly, the rear margin of the caudal fin is black, the back is dark brown, the belly whitish and fins are transparent.

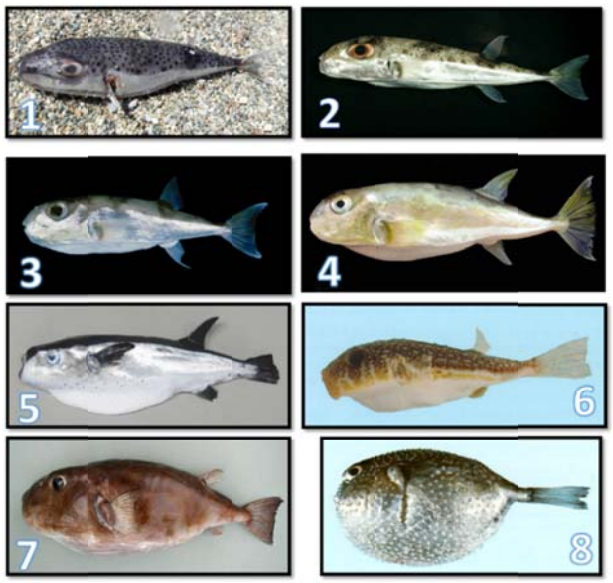


Figure 2. Eight puffer fish species: (1) *L. sceleratus*; (2) *L. suezensis*; (3) *L. guentheri*; (4) *L. spadiceus* (5) *L. lagocephalus*; (6) *Torquigener flavimaculosus*; (7) *Sphoeroides pachygaster* And (8) *Tylerius spinosissimus* collected from Turkey waters of the Mediterranean Sea

3. CONCLUSION

L. sceleratus is one of the Lessepsian species which has invaded the Eastern basin of the Mediterranean Sea. It was first recorded in Gokova Bay- Turkey in 2003, while the previous 1977 record by Mneimné was a misidentification of the similar puffer fish *L. suezensis*. *L. sceleratus* has already established a population which is colonizing new territories of the Eastern Mediterranean at a relatively rapid rate. This rapid expansion can be easily observed as the fish had reached the Aegean Sea in 2006, three years after it was reported for the first time in Turkey in 2003 (Bilecenoglu et al., 2006; Kassapidis et al., 2007; Carpentieri et al., 2009) Today, it is regarded to be among the worst invasive species in the Mediterranean Sea with a significant Suez Canal impact on the surrounding ecosystem and on the fisheries sector (Zenetos et al., 2005; Peristeraki 2006; Ozturk 2010.

REFERENCES

1. Arakawa, O., Hwang, D.-F., Taniyama, S., & Takatani, T. (2010). Toxins of Pufferfish That Cause Human Intoxications. Coastal Environmental and Ecosystem Issues of the East China Sea , 227-244.
2. Bilecenoglu, M., Kaya, M., Akalin, S. (2006). Range Expansion of Silverstripe blaasop, Lagocephalus sceleratus (Gemlin 1789), to the Northern Agean Sea. Aquatic Invasions. 1(4): 289-291.
3. Carpentieri, P., Lelli, S., Colloca, F. C., Mohanna, C., Bartolino, V., Moubayed, S., Ardizzone G.D. (2009). Incidence of lessepsian migrants on landings of the artisanal fishery of South Lebanon. Journal of Marine Biodiversity Records. 2:1-5.
4. Farrag MMS, Osman AGO, Akel EH Kh, Moustafa MA (2014) Catch and effort of night purse seine with emphasize to Age and Growth of lessepsian Etrumeus teres (Dekay, 1842), Mediterranean Sea, Egypt. Egyptian Journal of Aquatic Research 40: 181–190.
5. Fricke R, Golani D, Appelbaum-Golani B (2012) First record of the Indian Ocean anchovy Stolephorus insularis Hardenberg, 1933 (Clupeiformes: Engraulidae) in the Mediterranean. BioInvasions Records 1: 303–306.
6. Golani D, Orsi-Relini L, Massutí E, Quignard JP (2002) CIESM Atlas of Exotic Species in the Mediterranean. Vol. 1. Fishes [F. Briand, ed.], CIESM Publishers, Monaco, 256 pp
7. Homaira,N., Rahman, M., Luby, S., Rahman, M., Haider, M.S., Faruque, L.I, Khan, D., Parveen, S., Gurley, E. (2010). Multiple Outbreaks of Puffer Fish Intoxication in Bangladesh 2008. Centers for Disease Control and Prevention (CDC). 1-9.
8. Kalogirou, S., Corsini-Foka, M., Sioulas, A., Wennhage, H., Pihl, L. (2010). Diversity, structure and function of fish assemblages associated with Posidonia oceanica beds in an area of the Eastern Mediterranean Sea and the role of nonindigenous species. Journal of Fish Biology, 77:2338-2351.
9. Kasapidis, P., Peristeraki, P., Tserpes, G., & Magoulas, A. (2007). First record of the Lessepsian migrant Lagocephalus sceleratus (Gmelin 1789) (Osteichthyes: Tetraodontidae) in the Cretan Sea (Aegean, Greece). Aquatic Invasions, 2 (1), 71-73.
10. Katikou, P., Georgantelis, D., Sinouris, N., Ptesi, A., Fotaras, T. (2009). First Report on Toxicity Assessment of the Lessepsian Migrant Puffer Fish Lagocephalus sceleratus (Gmelin, 1789) From European Waters (Agean Sea, Greece). Toxicon, 54: 50-55.
11. Noguchi, T., & Arakawa, O. (2008). Tetrodoxin - Distribution and Accumulation in Aquatic Organisms and Cases of Human Intoxication. Marine Drugs, 6, 220-242.
12. Oral M (2010) Alien Fish Species in the Mediterranean - Black Sea Basin. Journal of the Black Sea/Mediterranean Environment 16: 87–132.
13. Ozturk, B. (2010). Draft Document on the Alien Species in the Mediterranean and the Black Sea. General Fisheries Comission for the Mediterranean, Scientific Advisory Committee. GFCM-SAC 12.
14. Peristeraki, P., Lazarakis, G., Skarvelis, C., Georgiadis, M., Tserpes, G. (2006). Additional Records on the Occurance of Alien Fish Species in the Eastern Mediterranean Sea. Mediterranean Marine Science. 7/2:61-66.
15. Sabrah, M., El-Ganainy, A., & Zaky, M. (2006). Biology and toxicity of the Puffer fish Lagocephalus Sceleratus From the Gulf of Suez. Egyptian Journal of Aquatic Research, 32 (1), 283-297.
16. West, M. (2009). Haley and the Blowfish. Washington University Global Studies Law Review. 8:427-442.

17. Zenetos, A., Cinar, M., Papadopoulou, M. P., Harmelin, J., Furnari, G., Andaloro, F., et al., (2005). Annotated list of marine alien species in the Mediterranean with records of. Mediterranean Marine Science, 6 (2), 63-118.

HEAVY METAL POLLUTION IN WATER AND SEDIMENTS AROUND THE YATAĞAN THERMAL POWER PLANT (SOUTH-WESTERN TURKEY)

Tuncer Okan Genç, **Fevzi Yilmaz**

Muğla Sıtkı Koçman University, Science Faculty, Biology Department, Kötekli, Muğla, 48100 Turkey
tuncerokangenc@gmail.com, yfevzi@mu.edu.tr

Abstract:

Today, many researchers have suggested that, heavy metal pollution must be analyzed at regular intervals in freshwater basins and sediments under the threat of pollution of industrial establishments. The industrial sector, which developed in parallel with the increasing world population, brought with it heavy metal pollution which could be toxic to the environment. In the process of industrialization, which has entered a trend of rapid increase due to the use of fossil fuel and energy use for energy production, the self-renewal capacity of nature has begun to fall and the scarce source of air, water and soil on the livable world has entered a rapid pollution process.
The Yatağan Thermal Power plant consists of three units with 210 MW capacity, and the lignite coal extracted from the plant is used as fuel. In this study, approximately 18 stations, including Dipsiz-Çine Stream, Geyik Dam and Milas District, located in the Yatağan Thermal Power Plant area, as well as the Saricay region, which is fed from the Geyik Dam, were selected as the study area. Analyzes of heavy metals (Al, Cd, Co, Cr, Cu, Fe, Mn, Ni, Pb, Zn) were carried out in water and sediment samples with ICP-IOS.
The average values of analyzed heavy metals, were not toxic and within the normal limits when compared to the Turkish Environmental Legislation. Nevertheless, when the values are evaluated separately for each station, it was found that each location carries a different heavy metal level. It has been observed that some metals have reached higher values within the scope of the thermal power plant.

Key words: Heavy Metal, Thermal Power Plant, Yatağan
General area of research: Biology, Ecology
ICFAS2018-ID: 1112

1. INTRODUCTION

Heavy metals are classified among the most dangerous groups of anthropogenic environmental pollutants due to their toxicity and persistence in the environment. Coal fired power productions are among the one of the main sources of heavy metal contaminations in the environment. The distribution of metals in sediments adjacent to settlement areas can provide researchers with evidence of the anthropogenic impact on ecosystems and, therefore, aid in assessing the risks associated with discharged human waste. The build-up of metals in sediments has significant environmental implications for local communities, as well as for river water quality. For example, many freshwater invertebrates process sediment as a food source and can be susceptible to bioaccumulation of toxic metals. This bioaccumulation can

potentially threaten the health of many species at the top of the food chain, especially birds, fish and humans (Wright and Mason, 1999; Genç and Yilmaz 2016). Additionally, the reclamation of metal-contaminated river and stream sediments poses a significant risk to local consumers through the remobilization of metals from agricultural lands into crops (Ross and Kaye, 1994; Genç et al; 2016).The objective of our study was to investigate the impact of a local coal combustion power plant with respect to metal pollution by: determining heavy metal concentrations in sediment and water.

2. MATERİAL AND METHOD

It has a 360MW energy capacity with three units, each producing 120 MW of energy, and an annual capacity of 3780000 KW h. Daily, 1500 tons of coal is burnt and 5000 tons of ash is produced. The solid waste is transported to the disposal site by conveyor belts, nearly 2 km in length (Baba, 2003). The Yatagan basin is located in the western part of the Aegean region, near Mugla city, and has a Mediterranean climate (Figure 1).

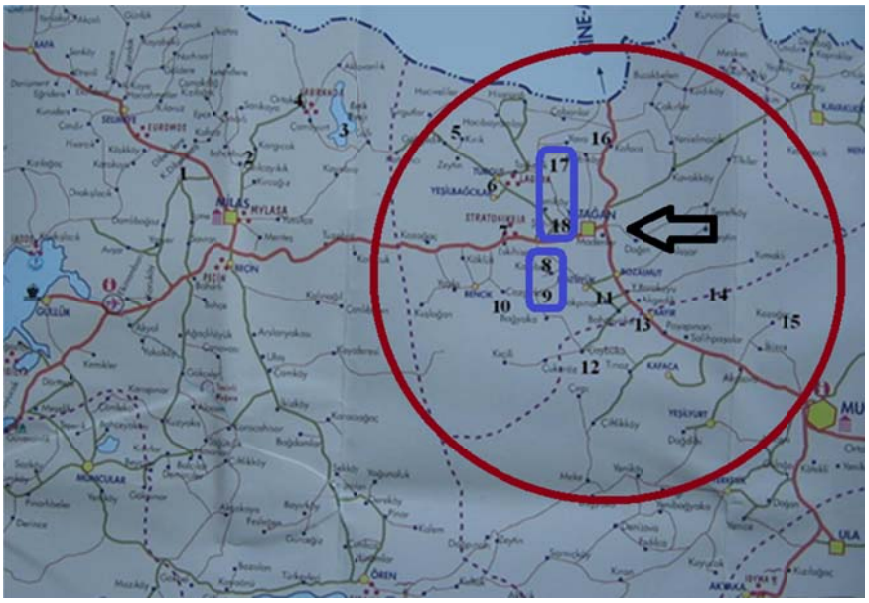


Figure 1; Location of the 18 sites

Surface water and sediment samples for metal analysis were collected from 18 stations on the Dipsiz stream. Surface water samples were collected in polyethylene bottles (washed with detergent, then with deionized water, 2 M nitric acid (Merck), then deionized water again, and finally surface water). Samples were acidified with 10% HNO3, placed in an ice bath and brought to the laboratory. The samples were filtered through a 0.45 lm micropore membrane filter and kept at 20 ^{o}C until analysis. Sediment samples from a depth of 15 cm from the surface were collected using a sediment collector with an acid-washed plastic scoop and returned to the laboratory in polyethylene bags. They were dried and passed through a 2 mm sieve.

Tissue samples were digested with concentrated nitric acid. Dissected samples were transferred to a 100-ml Teflon beaker. Then, 10 ml of ultrapure concentrated HNO3 (Merck) was added and the sample was heated to 100, 150, 210 and 280 ^{o}C on a hot plate for 0.5, 0.5, 0.5 and 2 h with DK-20 heating digester. Finally, 2 ml of 1 N HNO_3 was added to the residue and the solution evaporated again on the hot plate, continuing until every sample was completely digested. After cooling, a further 10 ml of 1 N HNO_3 was added. The solution was

then diluted and filtered through a 0.45-lm nitrocellulose membrane filter (Alam et al., 2002). Determination of the elements in all samples was carried out by ICP–AES (Opt. 2000, Perkin–Elmer.

3. RESULT AND DISCUSSION

The most polluted areas were found to be those in the vicinity of the coal fired power plant (densely in the western part) and southeastern slopes of Yatagan depression, particularly along the direction of predominant wind and due to topographic conditions (Figure 2 and 3).

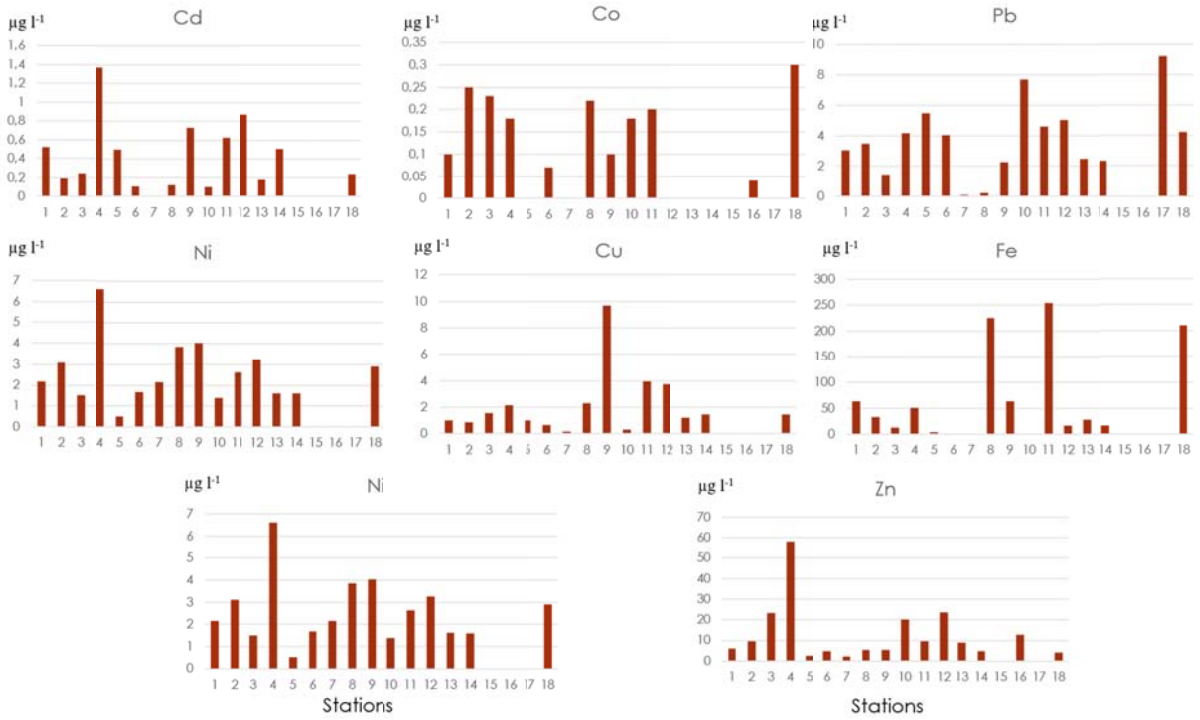


Figure 2: Metal concentrations in water

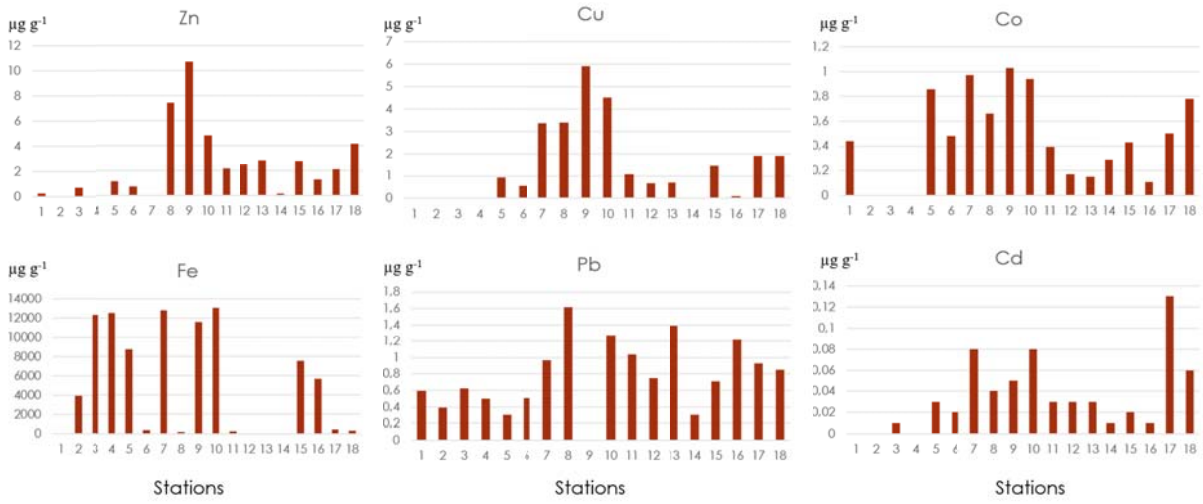


Figure 3: Metal concentrations in sediment

The heavy metals were distributed in different in the water and sediment in different amounts. Considering the mean values of Cd, Co, Cu and Pb from the 10 heavy metals analyzed, it is understood that they are not toxic values and are within normal limits. On the other hand, for Mn, Ni and Zn it is not possible to mention a pollution which reaches extreme dimensions. When a separate assessment was made according to the stations, it was determined that a different heavy metals had the highest value at each station. The acidic groundwater can move down gradients from the aquifer to the surface water.
Trace metal oxides present in stored fly ash might be the reason for the acid rain from gas emissions at the Yatagan Thermal Power Plant. It has been reported that the pH value of acid rain measured in the Yatagan region can be as low as 4.15 The presence of heavy metal pollution in freshwater resources poses a threat to sediment pollution at the same time. Because sediment quality is known to be an important indicator of water pollution.
As can be understood from the examination of the figüre 3, an important factor which multiplies the grain is the extreme values in Fe metal. The Fe metal is already present in large quantities in the earth's crust (about 5%) and the typical Mediterranean soils (Terra Rosa) in large territorial groups. Since Fe_2O_3 (Hematite) mineral which gives red color to Terra Rosa soils dominates in these soils, the height of Fe metal in local sediments may depend on it.
In addition, considering the existence of three thermal power plants in the region, the fly ash that comes out of the power plants and circulating in the air is likely to enrich the soil, water and sediments. It has also been reported that fly ash from thermal power plants can be transported over long distances and in particular contain large amounts of Cd, Cu, Co, Mn, Ni and Zn. In the region, the power plant causes acid rains, which decrease pH values in the sediment, and these low pH values lead Cd and Pb to dissolve; therefore, the Yatagan Thermal Power Plant may affect the concentration of these metal concentrations in the Yatağan region, as well as acidification and atmospheric deposition of metals.
Finally, the study was not detailed enough to estimate whether airborne pollutants via emissions from the thermal power plant may affect the sources. Hence, more comprehensive studies, covering this region and other resources in the region are needed.

References

1. Alam, M.G.M., Tanaka, A., Allinson, G., Laurenson, L.J.B., Stagnitti, F., Snow, E., 2002. A comparison of trace element concentrations in cultured and wild carp (*Cyprinus carpio*) of lake Kasumigaura, Japan. Ecotoxicol. Environ. Saf. 53, 348–354.
2. Baba, A., 2003. Geochemical assesment of environmental effects of ash from Yatagan (Mugla—Turkey) Thermal Power Plant. Water Air Soil Pollut. 144, 3–18
3. Environ 1999; 226:139]156.
4. Genç T. O, Yilmaz F (2016) Risk assessement and accumulation of metals in sediment of Köyceğiz Lagoon System Turkey. J Adv Agric 6(1):804–812
5. Genç TO, Yilmaz F, Sen B (2016) Metal accumulation in tissues of *Capoeta bergamae* Karaman, 1969 (Cyprinidae, Teleostei) from Köyceğiz Lagoon System, South-West Turkey. J Appl Biol Sci 10(2):29–34
6. Ross, S.M., Kaye, K.J., 1994. The meaning of metal toxicity in soil–plant systems. In: Ross, S.M. (Ed.), Toxic Metals in Soil–Plant Systems. Wiley and Sons, Ontario, pp. 27–61
7. Wright P, Mason CF. 1999, Spatial and seasonal variation in heavy metals in the sediments and biota of two adjacent estuaries, the Orwell and the Stour, in eastern England. Sci Total, 226, 139-156.

DETERMINATION INTERLAYER TRANSMISSION CONDITIONS FOR MULTILAYERED MATERIALS BY USING BIQUADRATIC FINITE ELEMENTS

Zahir Muradoglu[1], Tatsiana Urbanovich[2], Vildan Yazici[3]

[1,3]Department of Mathematics, Kocaeli University, Izmit, Turkey,
[1]*zahir@kocael.edu.tr,* [3]*maths.vildan@gmail.com*
[2]Department of Higher Mathematics, Polotsk State University, Belarus
[2]*urbanovichtm@gmail.com*

Abstract:

In this study, we deal with the boundary value problem for the Lame system, modeling the contact problem for a multilayered material. We use biquadratic basic functions to obtain the transmission conditions on the boundaries of interlayer by the Finite Element Method. We analyze the interlayer stresses.

This work is supported by the TUBITAK program 2221 - "Fellowship Program for Visiting Scientists and Scientists on Sabbatical Leave".

Keywords Biquadratic finite-element; Laminated medium, Interlaminar stress, Transmission conditions
General area of research: Mathematics
ICFAS2018-ID: 1113

The contact problem related to the deformation of a rigid punch attracts the interest of mathematicians, mechanics and engineers for many years. The problem was considered by many authors: a historical review one can find in [1], [2]. Nowadays the problem has not lost its relevance (see [3]–[8]). In the present study, we give an analysis and numerical solution of the boundary value problem for the Lame system, modeling the contact problem for a multilayered material. By using the biquadratic basic functions, the transmission conditions are obtained on the boundaries of interlayer by the Finite Element Method and the interlayer stresses are analyzed.

The mathematical model of the contact problem related to the deformation of a rigid punch with a frictional pressure of a finite dimensional elastic material, which is a quadrilateral region, is expressed by the boundary value problem for the Lame equation as follows (see, for example [2]):

$$\begin{cases} \dfrac{\partial \sigma_{11}(u)}{\partial x} + \dfrac{\partial \sigma_{12}(u)}{\partial y} = F_1(x,y), \\ \dfrac{\partial \sigma_{12}(u)}{\partial x} + \dfrac{\partial \sigma_{22}(u)}{\partial y} = F_2(x,y), (x,y) \in \Omega \subset R^2, \end{cases} \tag{1}$$

$$\begin{cases} u_2(x,0) \le -\alpha + \varphi(x),\ \sigma_{22}(x,0) \le 0, [u_2 + \alpha - \varphi]\sigma_{22}(x,0) = 0, \\ \sigma_{12}(u) = 0, \qquad (x,0) \in \Gamma_0; \end{cases} \tag{2}$$

$$\sigma_{11}(u) = 0, \sigma_{12}(u) = 0, \qquad (l_x, y) \in \Gamma_\sigma; \tag{3}$$

$$u_1(0,y) = 0, \sigma_{12}(u) = 0, \qquad (0,y) \in \Gamma_1; \tag{4}$$

$$\sigma_{12}(u) = 0, u_2(x,-l_y) = 0, \quad (x,-l_y) \in \Gamma_u. \tag{5}$$

where $\Omega = \{(x, y) : 0 < x < l_x, -l_y < y < 0\}$, $\partial\Omega = \Gamma_0 \cup \Gamma_\sigma \cup \Gamma_1 \cup \Gamma_u$, $\Gamma_0 = \{(x, 0) : 0 \le x \le l_x\}$, Γ_σ $\{(l_x, y) : -l_y < y < 0\}$, $\Gamma_1 = \{(0, y) : -l_y < y < 0\}$, $\Gamma_u = \{(x,-l_y) : 0 \le x \le l_x\}$ (Fig. 1).is the region occupied by the cross-section of the material under the influence of the punch and $\partial\Omega = \Gamma_0 \cup \Gamma_\sigma$ $\cup \Gamma_1 \cup \Gamma_u$, $\Gamma_0 = \{(x, 0) : 0 \le x \le l_x\}$, Γ_σ $\{(l_x, y) : -l_y < y < 0\}$, $\Gamma_1 = \{(0, y) : -l_y < y < 0\}$, $\Gamma_u = \{(x,-l_y) : 0 \le x \le l_x\}$ is the relevant part of the boundaries of the region. Since the condition at the $\Gamma_0 \subset \partial\Omega$ boundary is given by inequality, the contact region of the punch $\Gamma_c := \{(x,y) \in \Gamma_0 : u_2 = -\alpha + \varphi(x)\}$ is not certain, and therefore, even in the case of linear elasticity this problem is non-linear.

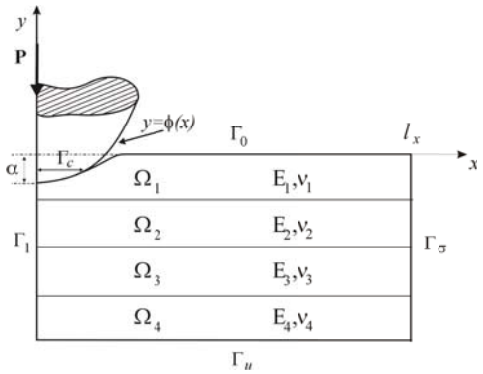


Figure 1: Geometry of the spherical indentation

In this study, the plate deformation problem of the layered material formed by different materials with λ_k, μ_k are the Lame constants belonging to the Ω_k layer forming the Ω region, respectively, $u(x,y)=(u_1(x,y),u_2(x,y))$ is displacement function and $\sigma_{ii}(u) = \lambda_k div(u) + 2\mu_k \partial u_i / \partial x_i, \sigma_{ij}(u) = \mu_k(\partial u_i / \partial x_j + \partial u_j / \partial x_i)$, $i, j \in \{1, 2\}$ are stress tensor, are investigated. By using the biquadratic base functions, the transmission conditions were obtained at the $L_k := \{(x,y) \in \Omega : -l_x < x < l_x,\ 0 < l_k < l_y, l_0 = 0, l_{k_0} = l_y, k = \overline{1,k_0}\}$. $L_k = \Omega_k \cap \Omega_{k+1}$ boundaries by the Finite Element Method and the interlayer stresses were analyzed.

For the Lame equations system, the solution of the boundary value problem (1)-(5) gives minimum value of functional $J(u) = 0.5a(u,u) - b(u))$ such that

$$a(u,v) = \iint_\Omega \left\{ (\lambda + 2\mu)\frac{\partial u_1}{\partial x}\frac{\partial v_1}{\partial x} + \lambda\frac{\partial u_2}{\partial y}\frac{\partial v_1}{\partial x} + \mu\left(\frac{\partial u_1}{\partial y} + \frac{\partial u_2}{\partial x}\right)\left(\frac{\partial v_1}{\partial y} + \frac{\partial v_2}{\partial x}\right) + \right.$$
$$\left. \lambda\frac{\partial u_1}{\partial x}\frac{\partial v_2}{\partial y} + (\lambda + 2\mu)\frac{\partial u_2}{\partial y}\frac{\partial v_2}{\partial y} \right\} dxdy \tag{6}$$

$$b(v)=\iint_{\Omega}\left[F_1v_1+F_2v_2\right]dxdy \tag{7}$$

are the bilinear and linear part of functional, respectively.

Let us use here the biquadratic basic functions to analyze the problem. In order to illustrate the method let us use the domain $\Omega=\{(x,y),0\le x\le 1.5,-1\le y\le 0\}$ and consider the size mesh $N_x\times N_y=50\times 21$ in the rectangular region Ω. In order to carry out numerical experiments let us consider two examples for two layers materials: iron-copper and iron-steel. Let us refresh, that copper and steel more soft than iron. The upper layer in both examples is iron. The elasticity modules and Poisson's constants of these materials are $E_{Fe}=30000\left[\text{kN}/\text{cm}^2\right]$, $\nu_{Fe}=0.27$, $E_{Cu}=18100\left[\text{kN}/\text{cm}^2\right]$, $\nu_{Cu}=0.36$, $E_{St}=21000\left[\text{kN}/\text{cm}^2\right]$, $\nu_{St}=0.3$. In order to clarify the contact domain *ac* we use the multigrid method ([7]). For the thickness of the iron layer 0.1, 0.2, 0.4, 0.5 respectively, we have the following figures Fig. 2 and Fig. 3.

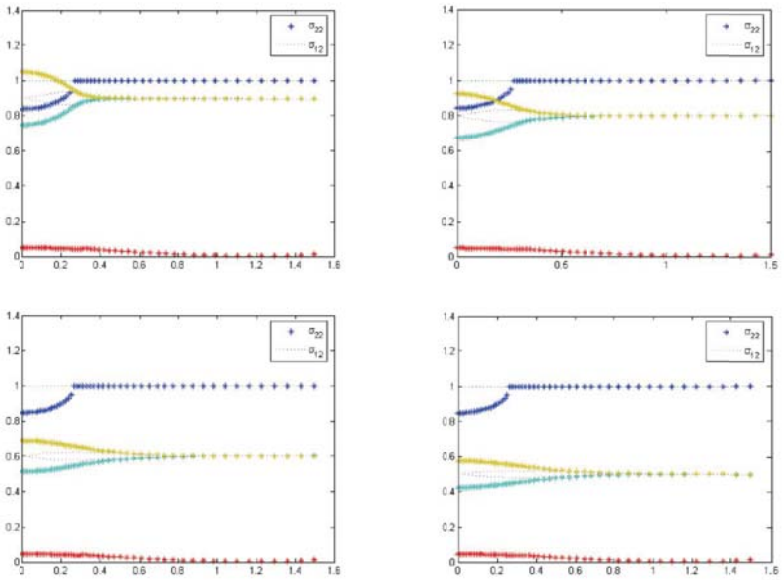


Figure 2: Interlayer stress graphics for multilayered material composed of iron and copper

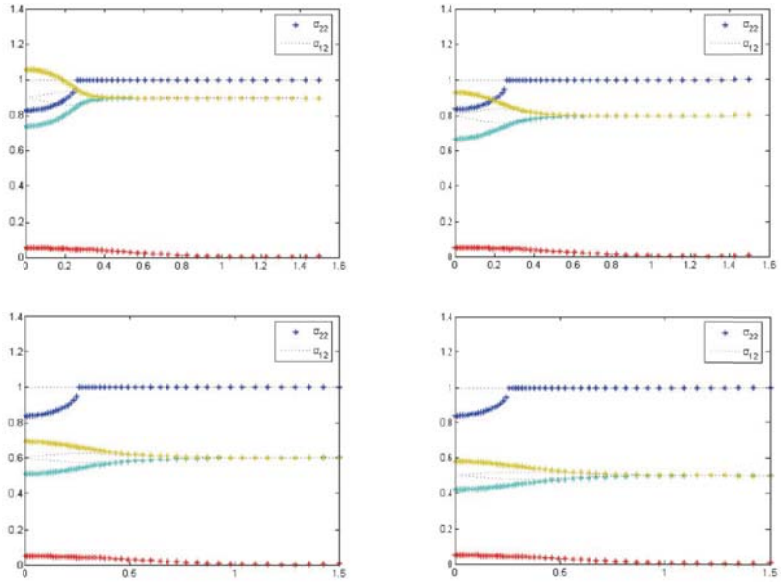


Figure 3: Interlayer stress graphics for multilayered material composed of iron and steel
In these figures one can find normal and tangential components of the interlayer stresses and the stresses on the upper part of the body.

REFERENCES

1. R.C. Batra and W. Jiang, Analytical solution of the contact problem of a rigid indenter and an anisotropic linear elastic layer, International Journal of Solids and Structures 45, 5814-5830 (2008).
2. G. Duvant and J. L. Lions, Inequalities in Mechanics and Physics, Berlin: Springer (1989).
3. V.M. Aleksandrov, Axisymmetric contact problems for a prestressed incompressible elastic layer, Journal of Applied Mathematics and Mechanics 76, 120-124 (2012).
4. V.M. Aleksandrov and D.A. Pozharskii, The three-dimensional problem of a thin inclusion in a composite elastic wedge, Journal of Applied Mathematics and Mechanics 75, 589-594(2011).
5. F.M. Borodich, Contact problems at nano/microscale and depth sensing indentation techniques, Mater. Sci. Forum 662, 53-76 (2011).
6. F.M. Borodich, B.A. Galanov, Y.I. Prostov and M.M. Suarez-Alvarez, Influence of the noslipboundary condition on indentation of an elastic half-space by a rigid cone inpresence of molecular adhesion. PMMJ. Appl. Math. Mech. 76, 744-753 (2012).
7. A. Hasanov and Z. Seyidmamedov, Qualitative behaviour of solutions of Signorini problem with perturbing the unknown boundary II. The multigrid method, Applied Mathematics and Computation, 109, 261-271, (2000).
8. Z. Seyidmamedov, Finite-element analysis of frictionless contact problem for a laminated medium, Mathematics and Computers in Simulation 58, 111-123 (2002).

A NEW APPROACH TO OPERATIONS ON NEUTROSOPHIC SOFT SETS

Taha Yasın Ozturk[1], **Cıgdem Gunduz Aras[2]**, Sadı Bayramov[3]

[1]Department of Mathematics, Kafkas University, Kars, 36100-Turkey
taha36100@hotmail.com
[2]Department of Mathematics, Kocaeli University, Kocaeli, 41380-Turkey
carasgunduz@gmail.com
[3]Department of Algebra and Geometry, Baku State University, Baku, AZ 1148-Azerbaican
[3]baysadi@gmail.com

Abstract:

In this study, we re-define some operations on neutrosophic soft sets differently from the studies [4,9].

Keywords: Neutrosophic soft set, neutrosophic soft interior, neutrosophic soft closure.
General area of research: Mathematics
ICFAS2018-ID: 1123

1. INTRODUCTION

The contribution of mathematics to the present-day technology in reaching to a fast trend cannot be ignored. The treories presented differently from classical methods in studies such as fuzzy set [15], intuitionistic set [7], soft set [11], neutrosophic set [13], etc. Have great importance in this contribution of mathematics in recent years. Many works have been done on these sets by mathematicians in many areas of mathematics [2,3,4,5,6,8,12,14]. In addition, many studies on different combination of these set theories have been presented [1,9,10]. One of them is Neurosophic soft sets [13]. Neutrosophic soft topological spaces was presented by Bera in his work [4].

In our study, the intersection, union, difference operations are re-defined on the neutrosophic soft sets in contrast to the studies [4,9.

2. PRELIMINARIES

In this section, we will give some preliminary information for the present study.

Definition 1. [13] A neutrosophic set A on the universe of discourse X is defined as:

$$A = \{< x, T_A(x), I_A(x), F_A(x)) >: x \in X\},$$

where $T, I, F: X \rightarrow]^{-}0,1^{+}[$ and $^{-}0 \leq T_A(x) + I_A(x) + F_A(x) \leq 3^{+}$.

Definition 2. [11] Let X be an initial universe, E be a set of all parameters and $P(X)$ denotes the power set of X. A pair (F, E) is called a soft set over X, where F is a mapping given by $F: E \rightarrow P(X)$.
In other words, the soft set is a parameterized family of subsets of the set X. For e$\in E$, $F(e)$ may be considered as the set of e-elements of the soft set (F, E), or as the set of e-approximate elements of the soft set, i.e.,

$$(F, E) = \{(e, F(e)): e \in E, F: E \rightarrow P(X)\}.$$

Firstly, neutrosophic soft set defined by Maji [9] and later this concept has been modified by Deli and Bromi [8] as given below:

Definition 3. Let X be an initial universe set and E be a set of parameters. Let $P(X)$ denote the set of all neutrosophic sets of X. Then a neutrosophic soft set $(\check{F}, E)$ over X is a set defined by a set valued function $\check{F}$ representing a mapping $\check{F}: E \rightarrow P(X)$ where $\check{F}$ is called approximate function of the neutrosophic soft set $(\check{F}, E)$. In other words, the neutrosophic soft set is a parameterized family of some elements of the set $P(X)$ and therefore it can be written as a set of ordered pairs,

$$(\check{F}, E) = \{(e, < x, T_{\check{F}(e)}(x), I_{\check{F}(e)}(x), F_{\check{F}(e)}(x)\}(x) >: x \in X): e \in E\}$$

where $T_{\check{F}(e)}(x), I_{\check{F}(e)}(x), F_{\check{F}(e)}(x) \in [0,1]$, respectively called the truth-membership, indeterminacy-membership, falsity-membership function of $\check{F}(e)$. Since supremum of each T, I, F is 1 so the inequality $0 \leq T_{\check{F}(e)}(x) + I_{\check{F}(e)}(x) + F_{\check{F}(e)}(x) \leq 3$ is obvious.

Definition 3. [4]. Let $(\check{F}, E)$ be neutrosophic soft set over the universe set X. The complement of $(\check{F}, E)$ is denoted by $(\check{F}, E)^c$ and is defined by:

$$(\check{F}, E)^c = \{(e, < x, F_{\check{F}(e)}(x), 1 - I_{\check{F}(e)}(x), T_{\check{F}(e)}(x)\}(x) >: x \in X): e \in E\}.$$

Obvious that, $\left((\check{F}, E)^c\right)^c = (\check{F}, E)$.

Definition 5. [9] Let $(\check{F}, E)$ and $(\check{G}, E)$ be two neutrosophic soft sets over the universe set X. $(\check{F}, E)$ is said to be neutrosophic soft subset of $(\check{G}, E)$ if $T_{\check{F}(e)}(x) \leq T_{\check{G}(e)}(x), I_{\check{F}(e)}(x) \leq I_{\check{G}(e)}(x), F_{\check{F}(e)}(x) \geq F_{\check{G}(e)}(x), \forall e \in E, \forall x \in X$. It is denoted by $(\check{F}, E) \subseteq (\check{G}, E)$.
$(\check{F}, E)$ is said to be neutrosophic soft equal to $(\check{G}, E)$ if $(\check{F}, E)$ is neutrosophic soft subset of $(\check{G}, E)$ and $(\check{G}, E)$ is neutrosophic soft subset of $(\check{F}, E)$. It is denoted by $(\check{F}, E) = (\check{G}, E)$.

3. A NEW APPROACH TO OPERATIONS ON NEUTROSOPHIC SOFT SETS

In this section, the operations of union, intersection, difference on neutrosophic soft sets are defined differently from the studies [4,9].

Definition 6. Let $(\widetilde{F_1}, E)$ and $(\widetilde{F_2}, E)$ be two neutrosophic soft sets over the universe set X. Then their union is denoted by $(\widetilde{F_1}, E) \cup (\widetilde{F_2}, E) = (\widetilde{F_3}, E)$ and is defined by:

$$(\widetilde{F_3}, E) = \{(e, < x, T_{\widetilde{F_3}(e)}(x), I_{F_3(e)}(x), F_{\widetilde{F_3}(e)}(x) >: x \in X): e \in E\}$$

where

$$T_{\widetilde{F_3}(e)}(x) = max\{T_{\widetilde{F_1}(e)}(x), T_{\widetilde{F_2}(e)}(x)\},$$
$$I_{\widetilde{F_3}(e)}(x) = max\{I_{\widetilde{F_1}(e)}(x), I_{\widetilde{F_2}(e)}(x)\},$$
$$F_{\widetilde{F_3}(e)}(x) = min\{F_{\widetilde{F_1}(e)}(x), F_{\widetilde{F_2}(e)}(x)\}.$$

Definition 7. Let $(\widetilde{F_1}, E)$ and $(\widetilde{F_2}, E)$ be two neutrosophic soft sets over the universe set X. Then their intersection is denoted by $(\widetilde{F_1}, E) \cap (\widetilde{F_2}, E) = (\widetilde{F_3}, E)$ and is defined by:

$$(\widetilde{F_3}, E) = \{(e, < x, T_{\widetilde{F_3}(e)}(x), I_{F_3(e)}(x), F_{\widetilde{F_3}(e)}(x) >: x \in X): e \in E\}$$

where

$$T_{\widetilde{F_3}(e)}(x) = min\{T_{\widetilde{F_1}(e)}(x), T_{\widetilde{F_2}(e)}(x)\},$$
$$I_{\widetilde{F_3}(e)}(x) = min\{I_{\widetilde{F_1}(e)}(x), I_{\widetilde{F_2}(e)}(x)\},$$
$$F_{\widetilde{F_3}(e)}(x) = max\{F_{\widetilde{F_1}(e)}(x), F_{\widetilde{F_2}(e)}(x)\}.$$

Definition 8. Let $(\widetilde{F_1}, E)$ and $(\widetilde{F_2}, E)$ be two neutrosophic soft sets over the universe set X. Then "$(\widetilde{F_1}, E)$ difference $(\widetilde{F_2}, E)$ " operation on them is denoted by $(\widetilde{F_1}, E) \backslash (\widetilde{F_2}, E) = (\widetilde{F_3}, E)$ and is defined by $(\widetilde{F_3}, E) = (\widetilde{F_1}, E) \cap (\widetilde{F_2}, E)^c$ as follows:

$$(\widetilde{F_3}, E) = \{(e, < x, T_{\widetilde{F_3}(e)}(x), I_{F_3(e)}(x), F_{\widetilde{F_3}(e)}(x) >: x \in X): e \in E$$

where

$$T_{\widetilde{F_3}(e)}(x) = min\{T_{\widetilde{F_1}(e)}(x), T_{\widetilde{F_2}(e)}(x)\},$$
$$I_{\widetilde{F_3}(e)}(x) = min\{I_{\widetilde{F_1}(e)}(x), 1 - I_{\widetilde{F_2}(e)}(x)\},$$
$$F_{\widetilde{F_3}(e)}(x) = max\{F_{\widetilde{F_1}(e)}(x), F_{\widetilde{F_2}(e)}(x)\}.$$

REFERENCES

1. K. Atanassov, Intuitionistic fuzzy sets, Fuzzy Sets and Systems 20 (1986) 87-96.
2. S. Bayramov, C. Gunduz, On intuitionistic fuzzy soft topological spaces, TWMS J. Pure Appl. Math. 5(1), (2014) 66--79.
3. T. Bera, N.K. Mahapatra, On neutrosophic soft function, Ann. Fuzzy Math. Inform. 12(1), (2016) 101--119.
4. T. Bera T., N.K. Mahapatra, Introduction to neutrosophic soft topological space, Opsearch, 54(4), (2017) 841--867.

5. N. Cağman N., S. Karataş and S. Enginoğlu, Soft topology, Comput. Math. Appl. (2011) 351-358.
6. C.L. Chang, Fuzzy topological spaces, J. Math. Anal. Appl. 24(1), (1968) 182--190.
7. D. Coker, A note on intuitionistic sets and intuitionistic points, Tr. J. of Mathematics, 20, (1996) 343-351.
8. I. Deli, S. Broumi, Neutrosophic soft relations and some properties, Ann. Fuzzy Math. Inform. 9(1), (2015) 169--182.
9. P.K. Maji, Neutrosophic soft set, Ann. Fuzzy Math. Inform. 5(1), (2013) 157--168.
10. P.K. Maji, R. Biswas and A.R. Roy, Fuzzy soft sets, J. Fuzzy Math. 9 (3) (2001) 589--602.
11. D. Molodtsov, Soft Set Theory-First Results, Comput. Math. Appl.37 (1999) 19-31.
12. A.A. Salma, S.A. Alblowi, Neutrosophic set and neutrosophic topological spaces, IOSR J. Math. 3(4), (2012) 31--35.
13. F. Smarandache, Neutrosophic set, a generalisation of the intuitionistic fuzzy sets, Int. J. Pure Appl. Math. 24, (2005) 287--297.
14. M. Shabir, M. Naz, On soft topological spaces, Comput. Math. Appl. 61 (2011) 1786-1799.
15. L.A. Zadeh, Fuzzy Sets, Inform. Control 8, (1965) 338-353.

SEPARATION AXIOMS ON NEUTROSOPHIC SOFT SETS

Cıgdem Gunduz Aras[1], Taha Yasın Ozturk[2] ,Sadı Bayramov[3]

[1]Department of Mathematics, Kocaeli University, Kocaeli, 41380-Turkey
carasgunduz@gmail.com
[2]Department of Mathematics, Kafkas University, Kars, 36100-Turkey
taha36100@hotmail.com
[3]Department of Algebra and Geometry, Baku State University, Baku, AZ 1148-Azerbaican
baysadi@gmail.com

Abstract:

The neutrosophic soft topology based on the redefined operations of the neutrosophic soft union and intersection; the neutrosophic soft null and absolute set above will be defined differently from the study [5]. In the present paper, we give T_i- neutrosophic soft spaces.

Keywords: Neutrosophic soft set, neutrosophic soft separation axiom.
General area of research: Mathematics
ICFAS2018-ID: 1124

1. INTRODUCTION

The concept of neutrosophic set was introduced by Smarandache [11]. This theory is a generalization of classical sets, fuzzy set theory [13], intuitionistic fuzzy set theory [1] etc. Some works have been done on neutrosophic sets by some researchers in many area of mathematics [4,10]. Many practical problems in economics, engineering, environment, social science, medical science etc. cannot be dealt with by classical methods, because classical methods have inherent difficulties. The reason for these difficulties may be due to the inadequacy of the theories of parameterization tools. Each of these theories has its inherent difficulties as what were pointed out by Molodtsov in [9]. Molodtsov initiated a completely new approach for modeling uncertainties and applied successfully in directions such as smoothness of functions, game theory, operations research, Riemann-integration, Perron integration, and so on. Firstly, neutrosophic soft set defined by Maji [8] and later this concept has been modified by Deli and Bromi [7]. Later neutrosophic soft topological spaces was presented by Bera in [5].

The firstly aim of this paper is to give the concept of separation axioms of neutrosophic soft topological spaces.

2. PRELIMINARIES

In this section, we will give some preliminary information for the present study.

Definition 1. [13] A neutrosophic set A on the universe of discourse X is defined as:

$$A = \{< x, T_A(x), I_A(x), F_A(x)) >: x \in X\},$$

where $T, I, F: X \rightarrow]^{-}0,1^{+}[$ and $^{-}0 \leq T_A(x) + I_A(x) + F_A(x) \leq 3^{+}$.

Definition 2. [11] Let X be an initial universe, E be a set of all parameters and $P(X)$ denotes the power set of X. A pair (F, E) is called a soft set over X, where F is a mapping given by $F: E \rightarrow P(X)$.
In other words, the soft set is a parameterized family of subsets of the set X. For e$\in E$, $F(e)$ may be considered as the set of e-elements of the soft set (F, E), or as the set of e-approximate elements of the soft set, i.e.,

$$(F, E) = \{(e, F(e)): e \in E, F: E \rightarrow P(X)\}.$$

Firstly, neutrosophic soft set defined by Maji [9] and later this concept has been modified by Deli and Bromi [8] as given below:

Definition 3. Let X be an initial universe set and E be a set of parameters. Let $P(X)$ denote the set of all neutrosophic sets of X. Then a neutrosophic soft set $(\check{F}, E)$ over X is a set defined by a set valued function $\check{F}$ representing a mapping $\check{F}: E \rightarrow P(X)$ where $\check{F}$ is called approximate function of the neutrosophic soft set $(\check{F}, E)$. In other words, the neutrosophic soft set is a parameterized family of some elements of the set $P(X)$ and therefore it can be written as a set of ordered pairs,

$$(\check{F}, E) = \{(e, < x, T_{\check{F}(e)}(x), I_{\check{F}(e)}(x), F_{\check{F}(e)}(x)\}(x) >: x \in X): e \in E\}$$

where $T_{\check{F}(e)}(x), I_{\check{F}(e)}(x), F_{\check{F}(e)}(x) \in [0,1]$, respectively called the truth-membership, indeterminacy-membership, falsity-membership function of $\check{F}(e)$. Since supremum of each T, I, F is 1 so the inequality $0 \leq T_{\check{F}(e)}(x) + I_{\check{F}(e)}(x) + F_{\check{F}(e)}(x) \leq 3$ is obvious.

3. NEUTROSOPHIC SOFT SEPARATION AXIOMS

Definition 4. Let $NSS(X, E)$ be the family of all neutrosophic soft sets over the universe set X. Then neutrosophic soft set $x^{e}{}_{(\alpha,\beta,\gamma)}$ is called a neutrosophic soft point, for every $x \in X, 0 < \alpha, \beta, \gamma \leq 1$, $e \in E$, and defined as follows:

$$x^{e}{}_{(\alpha,\beta,\gamma)}\ (e')(y) = \begin{cases} (\alpha, \beta, \gamma) & if\ e' = e\ and\ y = x, \\ (0,0,1) & if\ e' \neq e\ or\ y \neq x. \end{cases}$$

Definition 5. A neutrosophic soft set $(\check{F}, E)$ over the universe set X is said to be null neutrosophic soft set if $T_{\check{F}(e)}(x) = 0, I_{\check{F}(e)}(x) = 0, F_{\check{F}(e)}(x) = 1$; $\forall e \in E, \forall x \in X$. It is denoted by $0_{(X,E)}$.

Definition 6. Let (X, τ, E) be a neutrosophic soft topological space over X and ${x^e}_{(\alpha,\beta,\gamma)}$ and ${y^{e'}}_{(\alpha\prime,\beta\prime,\delta\prime)}$ are distinct neutrosophic soft points. If there exist neutrosophic soft open sets $(\check{F}, E)$ and $(\check{G}, E)$ such that

$${x^e}_{(\alpha,\beta,\gamma)} \in (\check{F}, E) \text{ and } {x^e}_{(\alpha,\beta,\gamma)} \cap (\check{G}, E) = 0_{(X,E)} \text{ or}$$
$${y^{e'}}_{(\alpha\prime,\beta\prime,\delta\prime)} \in (\check{G}, E) \text{ and } {y^{e'}}_{(\alpha\prime,\beta\prime,\delta\prime)} \cap (\check{F}, E) = 0_{(X,E)},$$

then (X, τ, E) is called a neutrosophic soft T_0 −space.

Definition 7. Let (X, τ, E) be a neutrosophic soft topological space over X and ${x^e}_{(\alpha,\beta,\gamma)}$ and ${y^{e'}}_{(\alpha\prime,\beta\prime,\delta\prime)}$ are distinct neutrosophic soft points. If there exist neutrosophic soft open sets $(\check{F}, E)$ and $(\check{G}, E)$ such that

$${x^e}_{(\alpha,\beta,\gamma)} \in (\check{F}, E) \text{ and } {x^e}_{(\alpha,\beta,\gamma)} \cap (\check{G}, E) = 0_{(X,E)} \text{ and}$$
$${y^{e'}}_{(\alpha\prime,\beta\prime,\delta\prime)} \in (\check{G}, E) \text{ and } {y^{e'}}_{(\alpha\prime,\beta\prime,\delta\prime)} \cap (\check{F}, E) = 0_{(X,E)},$$

then (X, τ, E) is called a neutrosophic soft T_1 −space.

Definition 8. Let (X, τ, E) be a neutrosophic soft topological space over X and ${x^e}_{(\alpha,\beta,\gamma)}$ and ${y^{e'}}_{(\alpha\prime,\beta\prime,\delta\prime)}$ are distinct neutrosophic soft points. If there exist neutrosophic soft open sets $(\check{F}, E)$ and $(\check{G}, E)$ such that

$${x^e}_{(\alpha,\beta,\gamma)} \in (\check{F}, E) \text{ and } {y^{e'}}_{(\alpha\prime,\beta\prime,\delta\prime)} \in (\check{G}, E) \text{ and}$$
$$(\check{F}, E) \cap (\check{G}, E) = 0_{(X,E)},$$

then (X, τ, E) is called a neutrosophic soft T_2 −space.

REFERENCES

1. K. Atanassov, Intuitionistic fuzzy sets, Fuzzy Sets and Systems 20 (1986) 87-96.
2. S. Bayramov, C. Gunduz, On intuitionistic fuzzy soft topological spaces, TWMS J. Pure Appl. Math. 5(1), (2014) 66--79.
3. S. Bayramov and C. Gunduz , A new approach to separability and compactness in soft topological spaces, TWMS Journal of Pure and Applied Mathematics 9(21) (2018).
4. T. Bera, N.K. Mahapatra, On neutrosophic soft function, Ann. Fuzzy Math. Inform. 12(1), (2016) 101--119.
5. T. Bera T., N.K. Mahapatra, Introduction to neutrosophic soft topological space, Opsearch, 54(4), (2017) 841--867.
6. N. Cağman N., S. Karataş and S. Enginoğlu, Soft topology, Comput. Math. Appl. (2011) 351-358.
7. I. Deli, S. Broumi, Neutrosophic soft relations and some properties, Ann. Fuzzy Math. Inform. 9(1), (2015) 169--182.
8. P.K. Maji, Neutrosophic soft set, Ann. Fuzzy Math. Inform. 5(1), (2013) 157--168.
9. D. Molodtsov, Soft Set Theory-First Results, Comput. Math. Appl.37 (1999) 19-31.

10. A.A. Salma, S.A. Alblowi, Neutrosophic set and neutrosophic topological spaces, IOSR J. Math. 3(4), (2012) 31--35.
11. F. Smarandache, Neutrosophic set, a generalisation of the intuitionistic fuzzy sets, Int. J. Pure Appl. Math. 24, (2005) 287--297.
12. M. Shabir, M. Naz, On soft topological spaces, Comput. Math. Appl. 61 (2011) 1786-1799.
13. L.A. Zadeh, Fuzzy Sets, Inform. Control 8, (1965) 338-353.

SOFT S-METRIC SPACES

Cıgdem Gunduz Aras[1], **Sadı Bayramov[2]**, Vefa Cafarlı[3]

[1]Department of Mathematics, Kocaeli University, Kocaeli, 41380-Turkey
caras@kocaeli.edu.tr
[2,3]Department of Algebra and Geometry, Baku State University, Baku, AZ 1148-Azerbaican
[2]baysadi@gmail.com, [3]ceferli_vefa@mail.ru

Abstract:

The purpose of this paper is to contribute for investigating on soft $S-$ metric space which is based on soft point of soft sets and give some of their properties. In addition to, we define the concepts of soft open ball, soft closed ball, soft bounded, convergence sequence and Cauchy sequence in soft $S-$metric space. Finally, we give definitions of soft uniformly continuous mapping and soft sequentially continuous mapping.

Keywords: Soft S-metric Spaces, soft sequential compact metric space
General area of research: Mathematics
ICFAS2018-ID: 1125

1. INTRODUCTION

Metric spaces wide area provides a powerfull tool to the study of optimization and approximation theory, variational inequalities and so many. After Molodtsov [12] initiated a novel concept of soft set theory as a new mathematical tool for dealing with uncertainties, applications of soft set theory in other disciplines and real life problems was progressing rapidly, the study of soft metric space which is based on soft point of soft sets was initiated by Das and Samanta [4].

Topological structures of soft set have been studied by some authors. M. Shabir and M. Naz [16] have initiated the study of soft topological spaces which are defined over an initial universe with a fixed set of parameters and showed that a soft topological space gives a parameterized family of topological spaces. Theoretical studies of soft topological spaces have also been researched by some authors in [3,7,8,11,14,17] etc.

The purpose of this paper is to contribute for investigating on soft S- metric space which is based on soft point of soft sets and give some of their properties. Further, we focus on compact sets in soft S- metric space and explore the differences and similarities between the point set topology and soft topology. In addition to, we define the concepts of sequential compact and totally bounded in soft S- metric space and prove some important theorems on this space. Finally, we give the Lebesque number for a soft open cover in soft S- metric space and we show that soft

compact S- metric space and soft sequentially compact S- metric space are equivalent structures. Moreover, we introduce soft uniformly continuous mapping and examine some of its properties.

2. PRELIMINARIES

We briefly give some basic definitions of concepts which serve a background to this work. Throughout this paper, X denotes initial universe, E denotes the set of all parameters, $P(X)$ denotes the power set of X.

Definition 1. [12] A pair (F, E) is called a soft set over X, where F is a mapping given by $F: E \to P(X)$.
In other words, the soft set is a parameterized family of subsets of the set X. For $a \in E$, $F(a)$ may be considered as the set of a-elements of the soft set (F, E), or as the set of a-approximate elements of the soft set.

Definition 2. [9] A soft set (F, E) over X is said to be a null soft set denoted by Φ if for all $a \in E,\ F(e) = \emptyset$.

Definition 3. [9] A soft set (F, E) over X is said to be an absolute soft set denoted by $\check{X}$ if for all $a \in E,\ F(e) = X$.

Definition 4. [16] Let τ be the collection of soft sets over X. Then τ is said to be a soft topology on X if
(1) $\Phi, \check{X}$ belongs to τ,
(2) the union of any number of soft sets in τ belongs to τ,
(3) the intersection of any two soft sets in τ belongs to τ.
The triplet (X, τ, E) is called a soft topological space over X.

Definition 5. [16] Let (X, τ, E) be a soft topological space over X. Then members of τ are said to be a soft open sets in X.

Proposition 6. [16] Let (X, τ, E) be a soft topological space over X. Then the collection

$$\tau_a = \{F(a): (F, E) \in \tau\}$$

for each $a \in E$, defines a topology on X.

Definition 7. [2,4] Let (F, E) be a soft set over X. The soft set (F, E) is called a soft point, denoted by (x_a, E), if for the element $a \in E$, $F(a) = \{x\}$ and $F(a') = \emptyset$ for all $a' \in E - \{a\}$ (briefly denoted by x_a).
It is obvious that each soft set can be expressed as a union of soft points. For this reason, to give the family of all soft sets on X it is sufficient to give only soft points on X.

Definition 8. [2] Two soft points x_a and $y_{a'}$ over a common universe X, we say that the soft points are different if $x \neq y$ or $a \neq a'$.

Definition 9. [2] The soft point x_a is said to be belonging to the soft set (F, E), denoted by $x_a \in (F, E)$, if $x_a(a) \in F(a)$, i.e., $\{x\} \subseteq F(a)$.

Definition 10. [2] Let (X,τ,E) be a soft topological space over X. A soft set $(F,E)\subseteq(X,E)$ is called a soft neighborhood of the soft point $x_a\in(F,E)$ if there exists a soft open set (G,E) such that $x_a\in(G,E)\subseteq(F,E)$.

Definition 11. [4] Let $\mathbb{R}$ be the set of all real numbers, $B(\mathbb{R})$ be the collection of all non-empty bounded subsets of $\mathbb{R}$ and E be taken as a set of parameters. Then a mapping $F:E\to B(\mathbb{R})$ is called a soft real set. It is denoted by (F,E). If (F,E) is a singleton soft set, then it will be called a soft real number and denoted $\check{r},\check{s},\check{t}$ etc. Here$\check{r},\check{s},\check{t}$ will denote a particular type of soft real numbers such that $\check{r}(a)=r$, for all $a\in E$. $\check{0}$ and $\check{1}$ are the soft real numbers, where $\check{0}$ (a)=0, $\check{1}$ (a)=1 for all $a\in E$ respectively.

Definition 12. [15] Let X be a nonempty set and $S:X^3\to[0,\infty)$ be a function satisfying the following conditions for all $x,y,z,t\in X$,
(1) $S(x,y,z)=0$ if and only if $x=y=z$,
(2) $S(x,y,z)\leq S(x,x,t)+S(y,y,t)+S(z,z,t)$.
Then S is called an $S-$ metric on X and the pair (X,S) is called an S- metric space.

3. SOFT $S-$ METRIC SPACES

In this section, we introduce soft $S-$metric spaces and study some important results of its. Let $\check{X}$ be the absolute soft set, E be a non-empty set of parameters and $SP(\check{X})$ be the collection of all soft points of $\check{X}$. Let $\mathbb{R}(E)^*$ denote the set of all non-negative soft real numbers.

Definition 13. A soft $S-$metric on $SP(\check{X})$ is a mapping $S:SP(\check{X})\times SP(\check{X})\times SP(\check{X})\to\mathbb{R}(E)^*$ that satisfies the following conditions, for each soft points $x_a,\ y_b,\ z_c,\ u_d\in SP(\check{X})$,
S1) $S(x_a,y_b,z_c)\geq\check{0}$,
S2) $S(x_a,y_b,z_c)=\check{0}$ if and only if $x_a=y_b=z_c$,
S3) $S(x_a,y_b,z_c)\leq S(x_a,x_a,u_d)+S(y_b,y_b,u_d)+S(z_c,z_c,u_d)$.
Then the soft set $\check{X}$ with a soft $S-$ metric is called a soft $S-$ metric space and denoted by $(\check{X},S,E)$.

Remark 14. If $(\check{X},S,E)$ is a soft $S-$ metric space, then (X,S_a) is an $S-$ metric space for each $a\in E$. Here S_a stands for the $S-$metric for only parameter a and (X,S_a) is a crisp $S-$ metric space. It is clear that every soft $S-$ metric space is a family of parameterized $S-$ metric space.

Definition 15. Let $(\check{X},S,E)$ is a soft $S-$ metric space and $\check{r}$ be a non-negative soft real number. For $\check{r}>\check{0}$ and $x_a\in SP(\check{X})$, we define the soft open ball $B_S(x_a,\check{r})$ and soft closed ball $\boldsymbol{B}_S(x_a,\check{r})$ and with center x_a and a radius $\check{r}$ as follows:

$$B_S(x_a,\check{r})=\{y_b\in SP(\check{X}):S(y_b,y_b,x_a)<\check{r}\},$$
$$\boldsymbol{B}_S(x_a,\check{r})=\{y_b\in SP(\check{X}):S(y_b,y_b,x_a)\leq\check{r}\}.$$

Definition 16. Let $(\check{X},S,E)$ is a soft $S-$ metric space and (F,E) be a soft set.

(a) If for and $x_a \in (F,E)$ there exists $\check{r}>\check{0}$ such that $B_S(x_a,\check{r}) \subset (F,E)$, then the soft set (F,E) is called a soft open set in $(\check{X},S,E)$.

(b) The soft set (F,E) is said to be soft $S-$ bounded if there exists $\check{r}>\check{0}$ such that $S(x_a,x_a,y_b)<\check{r}$ for all $x_a,y_b \in (F,E)$.

(c) A soft sequence $\{x_{a_n}^n\}$ in $(\check{X},S,E)$ converges to x_b if and only if $S(x_{a_n}^n,x_{a_n}^n,x_b)\to\check{0}$ as $n\to\infty$ and we denote this by $\lim_{n\to\infty} x_{a_n}^n = x_b$.

(d) A soft sequence $\{x_{a_n}^n\}$ in $(\check{X},S,E)$ is called a Cauchy sequence if for $\check{\varepsilon}>\check{0}$, there exists $n_0 \in \mathbb{N}$ such that $S(x_{a_n}^n,x_{a_n}^n,x_{a_m}^m)<\check{\varepsilon}$ for each $n,m \geq n_0$.

(e) The soft $S-$ metric space $(\check{X},S,E)$ is said to be complete if every Cauchy sequence is convergent.

Remark 17. It is easily seen that the conditions of base of soft topology is satisfied for soft open balls. This topology is called soft topology induced by the soft $S-$ metric.

Definition 18. Let $(\check{X},S,E)$ and $(\check{Y},S',E')$ be two soft $S-$ metric spaces and $(f,\varphi):(\check{X},S,E)\to(\check{Y},S',E')$ be a soft mapping. The mapping $(f,\varphi):(\check{X},S,E)\to(\check{Y},S',E')$ is a soft continuous mapping at the soft point $x_a \in SP(\check{X})$ if for every soft open ball $B_S(f(x)_{\varphi(a)},\check{\varepsilon})$ of $(\check{Y},S',E')$, there exists a soft open ball $B_S(x_a,\check{\delta})$ of $(\check{X},S,E)$ such that $f\left(B_S(x_a,\check{\delta})\right)\subset B_S(f(x)_{\varphi(a)},\check{\varepsilon})$. If (f,φ) is a soft continuous mapping at every soft point x_a of $(\check{X},S,E)$, then it is said to be soft continuous mapping on $(\check{X},S,E)$.

Definition 19 The soft mapping $(f,\varphi):(\check{X},S,E)\to(\check{Y},S',E')$ is said to be soft sequentially continuous at the soft point $x_a \in SP(\check{X})$ iff for every sequence of soft point $\{x_{a_n}^n\}$converging to the soft point x_a in the soft $S-$ metric space $(\check{X},S,E)$, the sequence $(f,\varphi)(\{x_{a_n}^n\})$ in $(\check{Y},S',E')$ converges to a soft point $(f,\varphi)(x_a) \in SP(\check{Y})$.

REFERENCES

1. M.I. Ali, F. Feng, X.Y. Liu, W.K. Min, M. Shabir, On some new operations in soft set theory, Comput. Math. Appl., 57 (2009), 1547-1553.
2. S. Bayramov, C. Gunduz, Soft locally compact spaces and soft paracompact spaces, J. Math.System Sci., 3 (2013), 122-130.
3. S. Bayramov, C. Gunduz and L. Mdzinarishvili, Singular homology theory in the category of soft topological spaces, Georgian Math. J., 22 (4) (2015), 457--467.
4. S. Bayramov and C. Gunduz , A new approach to separability and compactness in soft topological spaces, TWMS Journal of Pure and Applied Mathematics 9(21) (2018).
5. S. Das and S.K.Samanta, Soft metric, Ann. Fuzzy Math. Inform. 6(1) (2013), 77-94.
6. S. Gahler, 2-metrische Raume und iher topoloische Struktur, Math. Nachr., 26 (1963), 115-148.
7. C. Gunduz Aras and S. Bayramov, On the Tietze extension theorem in soft topological spaces, Proc. of Inst.Math. and Mech. 43(1) (2017), 105-115.
8. S. Hussain and B. Ahmad, Some properties of soft topological spaces, Comput. Math. Appl. 62 (2011), 4058-4067.

9. P.K. Maji, R. Biswas and A.R. Roy, Soft set theory, Comput. Math. Appl. 45 (2003), 555-562.
10. S.G. Matthews, Partial metric topology, Proc. 8th Summer Conference on General Topology and Applications, Ann. New York Acad Sci., 728 (1994), 183-197.
11. W.K. Min, A note on soft topological spaces, Comput. Math. Appl. 62 (2011), 3524-3528.
12. D. Molodtsov, Soft set theory-first results, Comput. Math. Appl.37 (1999), 19-31.
13. Z. Mustafa and B. Sims, A new approach to generalized metric spaces, J. Nonlinear Convex Anal., 7 (2006), 289-297.
14. T.Y Ozturk and S. Bayramov, Soft mapping spaces, The Scientific World Journal, Article ID 307292, (2014), 8p.
15. S.Sedghi, N.Shobe and A.Aliouche, A generalization of fixed point theorem in S-metric spaces, Mat. Vesnik 64 (2012), 258-266.
16. M. Shabir and M. Naz, On soft topological spaces, Comput. Math. Appl. 61 (2011), 1786-1799.
17. M. Shabir and A. Bashir, Some properties of soft topological spaces, Comput. Math. Appl. 62 (2011), 4058-4067

FIXED POINT THEOREMS ON SOFT S- METRIC SPACES

Cıgdem Gunduz Aras[1], **Sadı Bayramov[2]**, Vefa Cafarlı[3]

[1]Department of Mathematics, Kocaeli University, Kocaeli, 41380-Turkey
caras@kocaeli.edu.tr
[2,3]Department of Algebra and Geometry, Baku State University, Baku, AZ 1148-Azerbaican
[2]baysadi@gmail.com, [3]ceferli_vefa@mail.ru

Abstract:

The purpose of this paper firstly is to contribute for investigating on soft S- metric space which is based on soft point of soft sets and give some of their properties. Secondly, we introduce contractive mappings on soft S- metric spaces and prove a common fixed point theorem for a self-mapping on complete soft S- metric spaces.

Keywords: Soft S- metric space, soft contractive mapping
General area of research: Mathematics
ICFAS2018-ID: 1126

1. INTRODUCTION

Metric space is one of the most important space in mathematic. There are various type of generalization of metric spaces. Recently, Sedghi et al.[12] initiated the notion of S −metric space which is different from other space as a generalization of a metric space. Many authors have studied the existence of fixed points of functions on different metric spaces. Sedgi et al. proved a fixed point theorem for a self-mapping on a complete S −metric space. A number of authors have defined contractive type mapping on a complete metric space which are generalizations of the well known Banach contraction, and which have the property that each such mapping has a unique fixed point in [7,14]

In this paper, we introduce contractive mapping on soft S −metric spaces and study some important results of its. Later we prove a common fixed point theorem for a self-mapping on complete soft S −metric spaces. Let X be the absolute soft set, E be a non-empty set of parameters and $SP(\tilde{X})$ be the collection of all soft points of X. Let $\mathbb{R}(E)$ denote the set of all soft real numbers.

2. PRELIMINARIES

We briefly give some basic definitions of concepts which serve a background to this work. Throughout this paper, X denotes initial universe, E denotes the set of all parameters, $P(X)$ denotes the power set of X.

Definition 1. [11] A pair (F, E) is called a soft set over X, where F is a mapping given by $F: E \to P(X)$.
In other words, the soft set is a parameterized family of subsets of the set X. For $a \in E$, $F(a)$ may be considered as the set of a-elements of the soft set (F, E), or as the set of a-approximate elements of the soft set.

Definition 2. [9] A soft set (F, E) over X is said to be a null soft set denoted by Φ if for all $a \in E$, $F(e) = \emptyset$.

Definition 3. [9] A soft set (F, E) over X is said to be an absolute soft set denoted by $\check{X}$ if for all $a \in E$, $F(e) = X$.

Definition 4. [13] The complement of a soft set (F, E), denoted by $(F, E)^c$, is defined $(F, E)^c = (F^c, E)$, where $F^c: E \to P(X)$ is a mapping given by $F^c(e) = X \backslash F(a)$, $\forall a \in E$ and F^c is called the soft complement function of F.

Definition 5. [13] Let τ be the collection of soft sets over X. Then τ is said to be a soft topology on X if
(1) $\Phi, \check{X}$ belongs to τ,
(2) the union of any number of soft sets in τ belongs to τ,
(3) the intersection of any two soft sets in τ belongs to τ.
The triplet (X, τ, E) is called a soft topological space over X.

Definition 6. [13] Let (X, τ, E) be a soft topological space over X. Then members of τ are said to be a soft open sets in X.

Proposition 7. [13] Let (X, τ, E) be a soft topological space over X. Then the collection

$$\tau_a = \{F(a): (F, E) \in \tau\}$$

for each $a \in E$, defines a topology on X.

Definition 8. [1,4] Let (F, E) be a soft set over X. The soft set (F, E) is called a soft point, denoted by (x_a, E), if for the element $a \in E$, $F(a) = \{x\}$ and $F(a') = \emptyset$ for all $a' \in E - \{a\}$ (briefly denoted by x_a).
It is obvious that each soft set can be expressed as a union of soft points. For this reason, to give the family of all soft sets on X it is sufficient to give only soft points on X.

Definition 9. [1] Two soft points x_a and $y_{a'}$ over a common universe X, we say that the soft points are different if $x \neq y$ or $a \neq a'$.

Definition 10. [1] The soft point x_a is said to be belonging to the soft set (F, E), denoted by $x_a \in (F, E)$, if $x_a(a) \in F(a)$, i.e., $\{x\} \subseteq F(a)$.

Definition 11. [1] Let (X, τ, E) be a soft topological space over X. A soft set $(F, E) \subseteq (X, E)$ is called a soft neighborhood of the soft point $x_a \in (F, E)$ if there exists a soft open set (G, E) such that $x_a \in (G, E) \subseteq (F, E)$.

Definition 12. [4] Let $\mathbb{R}$ be the set of all real numbers, $B(\mathbb{R})$ be the collection of all non-empty bounded subsets of $\mathbb{R}$ and E be taken as a set of parameters. Then a mapping $F: E \to B(\mathbb{R})$ is called a soft real set. It is denoted by (F, E). If (F, E) is a singleton soft set, then it will be called a soft real number and denoted $\check{r}, \check{s}, \check{t}$ etc. Here$\check{r}, \check{s}, \check{t}$ will denote a particular type of soft real numbers such that $\check{r}(a) = r$, for all $a \in E$. $\check{0}$ and $\check{1}$ are the soft real numbers, where $\check{0}$ (a)=0, $\check{1}$ (a)=1 for all $a \in E$ respectively.

Definition 13. [12] Let X be a nonempty set and $S: X^3 \to [0, \infty)$ be a function satisfying the following conditions for all $x, y, z, t \in X$,
(1) $S(x, y, z) = 0$ if and only if $x = y = z$,
(2) $S(x, y, z) \leq S(x, x, t) + S(y, y, t) + S(z, z, t)$.
Then S is called an $S-$ metric on X and the pair (X, S) is called an S- metric space.

3. CONTRACTIVE MAPPING ON SOFT $S-$ METRIC SPACES

In this section, we firstly define soft $S-$metric spaces and study some important results of its. Secondly, we introduce contractive mappings on soft $S-$metric spaces and prove a common fixed point theorem for a self-mapping on complete soft $S-$metric spaces. Let $\check{X}$ be the absolute soft set, E be a non-empty set of parameters and $SP(\check{X})$ be the collection of all soft points of $\check{X}$. Let $\mathbb{R}(E)^*$ denote the set of all non-negative soft real numbers.

Definition 14. A soft $S-$metric on $SP(\check{X})$ is a mapping $S: SP(\check{X}) \times SP(\check{X}) \times SP(\check{X}) \to \mathbb{R}(E)^*$ that satisfies the following conditions, for each soft points $x_a,\ y_b,\ z_c,\ u_d \in SP(\check{X})$,
S1) $S(x_a, y_b, z_c) \geq \check{0}$,
S2) $S(x_a, y_b, z_c) = \check{0}$ if and only if $x_a = y_b = z_c$,
S3) $S(x_a, y_b, z_c) \leq S(x_a, x_a, u_d) + S(y_b, y_b, u_d) + S(z_c, z_c, u_d)$.
Then the soft set $\check{X}$ with a soft $S-$ metric is called a soft $S-$ metric space and denoted by $(\check{X}, S, E)$.

Remark 15. If $(\check{X}, S, E)$ is a soft $S-$ metric space, then (X, S_a) is an $S-$ metric space for each $a \in E$. Here S_a stands for the $S-$metric for only parameter a and (X, S_a) is a crisp $S-$ metric space. It is clear that every soft $S-$ metric space is a family of parameterized $S-$ metric space.

Definition 16. Let $(\check{X}, S, E)$ is a soft $S-$ metric space and (F, E) be a soft set.
(a) If for and $x_a \in (F, E)$ there exists $\check{r}>\check{0}$ such that $B_S(x_a, \check{r}) \subset (F, E)$, then the soft set (F, E) is called a soft open set in $(\check{X}, S, E)$.
(b) The soft set (F, E) is said to be soft $S-$ bounded if there exists $\check{r}>\check{0}$ such that $S(x_a, x_a, y_b) < \check{r}$ for all $x_a, y_b \in (F, E)$.
(c) A soft sequence $\{x_{a_n}^n\}$ in $(\check{X}, S, E)$ converges to x_b if and only if $S(x_{a_n}^n, x_{a_n}^n, x_b) \to \check{0}$ as $n \to \infty$ and we denote this by $\lim_{n\to\infty} x_{a_n}^n = x_b$.
(d) A soft sequence $\{x_{a_n}^n\}$ in $(\check{X}, S, E)$ is called a Cauchy sequence if for $\check{\varepsilon}>\check{0}$, there exists $n_0 \in \mathbb{N}$ such that $S(x_{a_n}^n, x_{a_n}^n, x_{a_m}^m) < \check{\varepsilon}$ for each $n, m \geq n_0$.

(e) The soft $S-$ metric space $(\check{X},S,E)$ is said to be complete if every Cauchy sequence is convergent.

Remark 17. It is easily seen that the conditions of base of soft topology is satisfied for soft open balls. This topology is called soft topology induced by the soft $S-$ metric.

Definition 18. Let $(\check{X},S,E)$ and $(\check{Y},S',E')$ be two soft $S-$ metric spaces and (f,φ): $(\check{X},S,E)\to(\check{Y},S',E')$ be a soft mapping. The mapping (f,φ): $(\check{X},S,E)\to(\check{Y},S',E')$ is a soft continuous mapping at the soft point $x_a\in SP(\check{X})$ if for every soft open ball $B_S(f(x)_{\varphi(a)},\check{\varepsilon})$ of $(\check{Y},S',E')$, there exists a soft open ball $B_S(x_a,\check{\delta})$ of $(\check{X},S,E)$ such that $f\left(B_S(x_a,\check{\delta})\right)\subset B_S(f(x)_{\varphi(a)},\check{\varepsilon})$. If (f,φ) is a soft continuous mapping at every soft point x_a of $(\check{X},S,E)$, then it is said to be soft continuous mapping on $(\check{X},S,E)$.

Definition 19. The soft mapping (f,φ): $(\check{X},S,E)\to(\check{Y},S',E')$ is said to be soft sequentially continuous at the soft point $x_a\in SP(\check{X})$ iff for every sequence of soft point $\{x_{a_n}^n\}$converging to the soft point x_a in the soft $S-$ metric space $(\check{X},S,E)$, the sequence $(f,\varphi)(\{x_{a_n}^n\})$ in $(\check{Y},S',E')$ converges to a soft point $(f,\varphi)(x_a)\in SP(\check{Y})$.

Definition 20. Let $(\check{X},S,E)$ be a soft $S-$ metric space. A map

$$(f,\varphi)\colon(\check{X},S,E)\to(\check{X},S,E)$$

is said to be a soft contraction mapping if there exists a soft real number $\check{q}\in\mathbb{R}(E)$, $\check{0}\le\check{q}<\check{1}$ ($\mathbb{R}(E)$ denotes the soft real numbers set) such that

$$S((f,\varphi)(x_a),(f,\varphi)(x_a),(f,\varphi)(y_b))\le\check{q}S(x_a,x_a,y_b)$$

for all $x_a,y_b\in SP(\check{X})$.

Proposition 21. Let $(\check{X},S,E)$ be soft $S-$ metric space. If (f,φ): $(\check{X},S,E)\to(\check{X},S,E)$ is a soft contraction mapping, then f_a: $(X,S_a)\to(X,S_{\varphi(a)})$ is a contraction mapping in $S-$metric space, for each $a\in E$.

Theorem 22. Let $(\check{X},S,E)$ be a complete soft $S-$ metric spaces and (f,φ): $(\check{X},S,E)\to(\check{X},S,E)$ be a soft contraction mapping. Then (f,φ) has a unique fixed soft point $u_c\in SP(\check{X})$. Moreover, for any $x_a\in SP(\check{X})$, we have $\lim_{n\to\infty}(f,\varphi)^n(x_a)=u_c$ with

$$S((f,\varphi)^n(x_a),(f,\varphi)^n(x_a),u_c)\le\frac{2\check{q}}{\check{1}-\check{q}}S(x_a,x_a,(f,\varphi)(x_a)).$$

REFERENCES

1. S. Bayramov, C. Gunduz, Soft locally compact spaces and soft paracompact spaces, J. Math.System Sci., 3 (2013), 122-130.
2. S. Bayramov and C. Gunduz , A new approach to separability and compactness in soft topological spaces, TWMS Journal of Pure and Applied Mathematics 9(21) (2018).

3. S. Bayramov, C. Gunduz and L. Mdzinarishvili, Singular homology theory in the category of soft topological spaces, Georgian Math. J., 22 (4) (2015), 457--467.
4. S. Das and S.K.Samanta, Soft metric, Ann. Fuzzy Math. Inform. 6(1) (2013), 77-94.
5. C. Gunduz Aras and S. Bayramov, On the Tietze extension theorem in soft topological spaces, Proc. of Inst.Math. and Mech. 43(1) (2017), 105-115.
6. S. Hussain and B. Ahmad, Some properties of soft topological spaces, Comput. Math. Appl. 62 (2011), 4058-4067.
7. H. Long-Guang and Z. Xian, Cone metric spaces and fixed point theorems of contractive mappings, J.Math. Anal. Appl. 332 (2007), 1468-1476.
8. P.K. Maji, R. Biswas and A.R. Roy, Soft set theory, Comput. Math. Appl. 45 (2003), 555-562.
9. W.K. Min, A note on soft topological spaces, Comput. Math. Appl. 62 (2011), 3524-3528.
10. D. Molodtsov, Soft set theory-first results, Comput. Math. Appl.37 (1999), 19-31.
11. T.Y Ozturk and S. Bayramov, Soft mapping spaces, The Scientific World Journal, Article ID 307292 (2014), 8p.
12. S.Sedghi, N.Shobe and A.Aliouche, A generalization of fixed point theorem in S-metric spaces, Mat. Vesnik 64 (2012), 258-266.
13. M. Shabir and M. Naz, On soft topological spaces, Comput. Math. Appl. 61 (2011), 1786-1799.
14. B.E Rhoades, A comparison of various definition of contractive mappings, Trans. Amer. Math. Soc. 226 (1977), 257-290.
15. M.I. Yazar, C. Gunduz Aras and S. Bayramov, Fixed point theorems of soft contractive mappings, Filomat, 30 (2) (2016), 269-279.

NEIGHBORHOOD STRUCTURE OF A SOFT ELEMENT

Nazan Çakmak Polat, Gözde Yaylalı, Bekir Tanay

Department of Mathematics, Faculty of Science, Muğla Sıtkı Koçman University, Muğla-TURKEY
ncakmak@mu.edu.tr, gozdeyaylali@ mu.edu.tr, btanay@ mu.edu.tr

Abstract:

Soft Set Theory, which is introduced by Molodtsov in 1999, is one of the branches of mathematics, which aims to describe phenomena and concepts of an ambiguous, undefined and imprecise meaning. To contribute this research area, in this paper we introduce the Neighborhood structure of an soft element in a soft topological space with some examples. Also we study some theoretical results related to soft topology and Neighborhood structure of a soft element.

Acknowledgement: This work is supported by the Scientific Research Project of Muğla Sıtkı Koçman University, SRPO (no:16/001)

Keywords: Type your keywords here, separated by colons
General area of research: Mathematics
ICFAS2018-ID: 1127

1. INTRODUCTION

After the definition of Soft set theory many research work has been done in this field. Some operations on soft sets were defined by Maji et al. [6]. Also, Pei et al. studied some soft operations as well and they discussed the relation between soft sets and information systems in [8]. After that, Çağman and Enginoğlu [4] studied several soft operations to make them more functional for improving several new results.

Soft algebraic structures such as soft groups were given by in [2] as a parameterized family of subgroups. Soft rings are defined by [1].

Çağman et. al. [3] defined the soft topology by modifying the definition of soft set.
Wardowski [10] approached soft sets as classical mathematics by giving definition of soft element. By giving this definition, he redefined the soft mapping and gave the continuity of soft mappings. Using the notion of soft element Ghosh et. al., [5] introduced a binary operation on the set of all nonempty soft elements of a given soft set and then they gave a new definition of soft groups and discussed on some algebraic results related to this soft group definition. The aim of this study is to define the Neighborhood structure of a soft element in a soft topological space by using soft element.

2. PRELIMINARIES

In this section, we recall some basic notions in soft set theory.

Definition 2.1: [7] Let U be an initial universal set and E be a set of parameters. Let $P(U)$ denote the power set of U and $A \subseteq E$. A soft set F_A is called a soft set over U, where f_A is a mapping given by $f_A: E \to P(U)$ such that $f_A(x) = \emptyset$ if $x \notin A$.
Note that the set of all soft sets over U will be denoted by S(U).

Definition 2.2: [4] A soft set F_A over U is said to be an empty soft set denoted by $F_\emptyset$, if for all $e \in E$, $f_A(x) = \emptyset$.

Definition 2.3: [4] A soft set F_A over U is said to be an A-universal soft set denoted by $\widetilde{F_A}$, if for all $e \in E$, $f_A(x) = A$. If $A = E$; then the A-universal soft set is called a universal soft set, denoted by $\widetilde{F_E}$.

Definition 2.4: [4] Let $F_A, F_B \in$ S(U). Then, F_A is a soft subset of F_B, denoted by $F_A \,\widetilde{\subseteq}\, F_B$, if $f_A(e) \subseteq f_B(e)$ for all $e \in E$.

Definition 2.5: [4] Let $F_A, F_B \in$ S(U). Then, the soft union $F_A \,\widetilde{\cup}\, F_B$, the soft intersection $F_A \,\widetilde{\cap}\, F_B$ and the soft difference $F_A \,\widetilde{\setminus}\, F_B$ of F_A and F_B are defined by the approximate functions as;
$f_{A\widetilde{\cup}B}(x) = f_A(x) \cup f_B(x)$, $f_{A\widetilde{\cap}B}(x) = f_A(x) \cap f_B(x)$, $f_{A\widetilde{\setminus}B}(x) = f_A(x) \setminus f_B(x)$
respectively.
The soft complement ${F_A}^{\tilde{C}}$ of F_A is defined by the approximate function $f_{A^{\tilde{C}}} = (f_A(e))^C$, where $(f_A(e))^C$ is the complement of the set $f_A(e)$; that is $f_{A^{\tilde{C}}} = (f_A(e))^C = U/f_A(e)$ for all $e \in E$.
It is easy to see that $({F_A}^{\tilde{C}})^{\tilde{C}} = F_A$ and ${F_\emptyset}^{\tilde{C}} = \widetilde{F_E}$.

Definition 2.6: [3] Let $F_A \in$ S(U). A soft topology on F_A, denoted by $\tilde{\tau}$, is a collection of soft subsets of F_A having the following properties:

i) $F_\emptyset, \widetilde{F_A} \in \tilde{\tau}$,
ii) $F_B, F_C \in \tilde{\tau}$, then $F_B \,\widetilde{\cap}\, F_C \in \tilde{\tau}$,
iii) Λ indexed set and for all $\alpha \in \Lambda$, $F_{B_\alpha} \in \tilde{\tau}$ then $\widetilde{\bigcup}_{\alpha \in \Lambda} F_{B_\alpha} \in \tilde{\tau}$.

The pair $(F_A, \tilde{\tau})$ is called a soft topological space.

Definition 2.7: [3] Let $(F_A, \tilde{\tau})$ be a soft topological space. Then every element of $\tilde{\tau}$ is called soft open set. Clearly $F_\emptyset$ and $\widetilde{F_A}$ are soft open sets.

Definition 2.8: [3] Let $(F_A, \tilde{\tau})$ be a soft topological space and $F_B \,\widetilde{\subseteq}\, F_A$. Then F_B is said to be soft closed if the soft complement of F_B is soft open. $F_\emptyset$ and $\widetilde{F_A}$ are soft closed sets.

Definition 2.9: [10] Let $F_A \in$ S(U). We say that $\alpha = (e, \{u\})$ is nonempty soft element of F_A, if $e \in E$ and $u \in F(e)$. The pair $(e, \emptyset)$, where $e \in E$, will be called an empty soft element of F_A. The fact that $(e, \{u\})$ is a soft element of F_A will be denoted by $(e, \{u\}) \,\widetilde{\in}\, F_A$.

Definition 2.10: Let $(F_A, \tilde{\tau})$ be a soft topological space, $F_B \,\widetilde{\subseteq}\, F_A$ and $\alpha \,\widetilde{\in}\, F_B$. If there exist a soft open set F_C such that $\alpha \,\widetilde{\in}\, F_C \,\widetilde{\subseteq}\, F_B$ then F_B is called soft neighborhood of soft element α.
If F_B is soft open set then F_B is called soft open neighborhood. We denote the set of all soft open neighborhoods of α by $\widetilde{\mathcal{N}}_\alpha$.

Proposition 2.11: Let $(F_A, \tilde{\tau})$ be a soft topological space, , $F_B \,\widetilde{\subseteq}\, F_A$ and $\alpha \,\widetilde{\in}\, F_B$. Then followings are true.

a) $\widetilde{\mathcal{N}}_\alpha \neq F_\emptyset$.
b) $F_B \in \widetilde{\mathcal{N}}_\alpha$ for all $\alpha \,\widetilde{\in}\, F_B$.
c) If $F_B \in \widetilde{\mathcal{N}}_\alpha$and $F_B \,\widetilde{\subseteq}\, F_C$ then $F_C \in \widetilde{\mathcal{N}}_\alpha$.
d) If $F_B, F_C \in \widetilde{\mathcal{N}}_\alpha$ then $F_B \,\widetilde{\cap}\, F_C \in \widetilde{\mathcal{N}}_\alpha$.
e) If $F_B \in \widetilde{\mathcal{N}}_\alpha$ then for all $\gamma \,\widetilde{\in}\, F_C$ there exist $F_C \in \widetilde{\mathcal{N}}_\alpha$ such that $F_B \in \widetilde{\mathcal{N}}_\gamma$.

İspat: The proof of a)-b) is obvious from the Definition 2.10.
e) If $F_B \in \widetilde{\mathcal{N}}_\alpha$ then there exists $F_C \in \tilde{\tau}$ such that $\alpha \,\widetilde{\in}\, F_C \,\widetilde{\subseteq}\, F_B$. Hence F_C in $\widetilde{\mathcal{N}}_\alpha$ so $F_B \in \widetilde{\mathcal{N}}_\gamma$ for all $\gamma \,\widetilde{\in}\, F_C$.
Example 2.12: $U = \{u_1, u_2, u_3\}$, $A = \{x_1, x_2,\}$ and $F_A = \{(x_1, \{u_1, u_2\}), (x_2, \{u_2, u_3\})\}$ is a soft set over U. The soft subsets of F_A are listed below.
$F_{A_1} = \{(x_1, \{u_1\})\}$,
$F_{A_2} = \{(x_1, \{u_2\})\}$,
$F_{A_3} = \{(x_1, \{u_1, u_2\})\}$,
$F_{A_4} = \{(x_2, \{u_2\})\}$,
$F_{A_5} = \{(x_2, \{u_3\})\}$,
$F_{A_6} = \{(x_2, \{u_2, u_3\})\}$,
$F_{A_7} = \{(x_1, \{u_1\}), (x_2, \{u_2\})\}$,
$F_{A_8} = \{(x_1, \{u_1\}), (x_2, \{u_3\})\}$,
$F_{A_9} = \{(x_1, \{u_1\}), (x_2, \{u_2, u_3\})\}$,
$F_{A_{10}} = \{(x_1, \{u_2\}), (x_2, \{u_2\})\}$,
$F_{A_{11}} = \{(x_1, \{u_2\}), (x_2, \{u_3\})\}$,
$F_{A_{12}} = \{(x_1, \{u_2\}), (x_2, \{u_2, u_3\})\}$,
$F_{A_{13}} = \{(x_1, \{u_1, u_2\}), (x_2, \{u_2\})\}$,
$F_{A_{14}} = \{(x_1, \{u_1, u_2\}), (x_2, \{u_3\})\}$,
$F_{A_{15}} = F_A$,
$F_{A_{16}} = \widetilde{\emptyset}$.
The collections of F_A $\tilde{\tau}_1 = \{\widetilde{\emptyset}, F_A\}$, $\tilde{\tau}_2 = \tilde{P}(F_A)$ ve $\tilde{\tau}_3 = \{\widetilde{\emptyset}, F_A, F_{A_2}, F_{A_{11}}, F_{A_{13}}\}$ are soft topology. Nonempty soft elements of F_A are $\{((x_1, \{u_1\}), (x_1, \{u_2\}), (x_2, \{u_2\}), (x_2, \{u_3\})\}$. So set of all Soft neighborhoods for each soft element is given in the below fort he soft topology $\tilde{\tau}_3$.
$\widetilde{\mathcal{N}}_{(x_1,\{u_1\})} = \{F_A, F_{A_{13}}\}$,
$\widetilde{\mathcal{N}}_{(x_1,\{u_2\})} = \{F_A, F_{A_2}, F_{A_{11}}, F_{A_{13}}\}$,
$\widetilde{\mathcal{N}}_{(x_2,\{u_2\})} = \{F_A, F_{A_{13}}\}$,
$\widetilde{\mathcal{N}}_{(x_2,\{u_3\})} = \{F_A, F_{A_{11}}\}$.

Theorem 2.13: If for the each soft element α of a soft set F_A there corresponds a set $\widetilde{\mathcal{N}}_\alpha$ of soft subsets of F_A such that the properties of Proposition 2.11 are satisfied, then there is a unique soft topological structure on F_A such that, for each $\_\ \alpha \,\widetilde{\in}\, F_A$, $\widetilde{\mathcal{N}}_\alpha$ is the set of all soft neighborhoods of α i n this topology.

REFERENCES

1. Acar, U., Koyuncu, F. ve Tanay, B. (2010) Soft sets and soft rings, Comput. Math. Appl., 59: 3458–3463.
2. Aktaş, H. ve Çağman, N. (2007) Soft sets and soft groups, Inform. Sci., 177: 2726-2735.
3. Çağman, N., Karataş, S. Ve Enginoğlu, S. (2011) Soft topology, Computers and Mathematics with Applications. 62(1), 351-358.
4. Çağman, N. Ve Enginoğlu, S. (2010) Soft set theory and uni-int decision, European Journal of Operational Research 207, 848-855.
5. Ghosh, S., Mandal, D. Ve Samantha, T. K. (2016) Soft groups based on soft element, Jordan Journal of Mathematics and Statics, 9 (2), 141-159.
6. Maji P. K., Biswas, R. ve Roy, A. R. (2003) Soft set theory, *Comput. Math.Appl.*, 45: 555-562.
7. Molodtsov, D. (1999) Soft Set Theory-First Results, *Comput. Math.Appl.*, 37: 19-31.
8. Munkres, J. (2000) *Topology*, Prentice Hall, Amerika Birleşik Devletleri, 537.
9. Pei, D. Ve Miao, D. (2005) From Soft Sets to Information Systems, Granular computing, IEEE Inter. Conf. 2, 617–621.
10. Wardowski, D. (2013) On a soft mapping and its fixed points, Fixed Point Theory and Applications, 182, 1-11.

CONCEPT OF A SOFT ELEMENT AND SOFT TOPOLOGICAL SPACE

Nazan Çakmak Polat, Gözde Yaylalı, Bekir Tanay

Department of Mathematics, Faculty of Science, Muğla Sıtkı Koçman University, Muğla-TURKEY
ncakmak@mu.edu.tr, gozdeyaylali@ mu.edu.tr, btanay@mu.edu.tr

Abstract:

In 1999, Molodtsov initiated the novel concept of soft set as a new mathematical tool for dealing with uncertainties. Soft set theory is free from the difficulties where as other existing methods viz. Probability Theory, Fuzzy Set Theory. The purpose of this presentation to examine some properties and results on soft element and soft topological space such as interior and closure of soft set set of all soft cluster points of a soft set and so on. Moreover we give some examples to clarify our definitions.

Acknowledgement: This work is supported by the Scientific Research Project of Muğla Sıtkı Koçman University, SRPO (no:16/001) and Scientific Research Project of Muğla Sıtkı Koçman University, SRPO (no:18/062)

Keywords: Type your keywords here, separated by colons
General area of research: Mathematics
ICFAS2018-ID: 1128

1. INTRODUCTION

Some operations on soft sets were defined by Maji et al. [6]. Also, Çağman and Enginoğlu [4] studied several soft operations to make them more functional for improving several new results. Çağman et. al. [3] defined the soft topology by modifying the definition of soft set. Wardowski [10] approached soft sets as classical mathematics by giving definition of soft element. Following to these studies our purpose for this study to examine some properties and results on soft element and soft topological space such as interior and closure of a soft set and so on. Moreover we give some examples to clarify our definitions.

2. PRELIMINARIES

In this section, we recall some basic notions in soft set theory.

Definition 2.1: [7] Let U be an initial universal set and E be a set of parameters. Let $P(U)$ denote the power set of U and $A \subseteq E$. A soft set F_A is called a soft set over U, where f_A is a mapping given by $f_A: E \to P(U)$ such that $f_A(x) = \emptyset$ if $x \notin$ A .
Note that the set of all soft sets over U will be denoted by S(U).

Definition 2.2: [4] A soft set F_A over U is said to be an empty soft set denoted by $F_\emptyset$, if for all $e \in E$, $f_A(x) = \emptyset$.

Definition 2.3: [4] A soft set F_A over U is said to be an A-universal soft set denoted by $\widetilde{F_A}$, if for all $e \in E$, $f_A(x) = A$. If $A = E$; then the A-universal soft set is called a universal soft set, denoted by $\widetilde{F_E}$.

Definition 2.4: [4] Let $F_A, F_B \in$ S(U). Then, F_A is a soft subset of F_B, denoted by $F_A \,\widetilde{\subseteq}\, F_B$, if $f_A(e) \subseteq f_B(e)$ for all $e \in E$.

Definition 2.5: [4] Let $F_A, F_B \in$ S(U). Then, the soft union $F_A \,\widetilde{\cup}\, F_B$, the soft intersection $F_A \,\widetilde{\cap}\, F_B$ and the soft difference $F_A \,\widetilde{\setminus} F_B$ of F_A and F_B are defined by the approximate functions as;
$f_{A\tilde{\cup}B}(x) = f_A(x) \cup f_B(x)$, $f_{A\tilde{\cap}B}(x) = f_A(x) \cap f_B(x)$, $f_{A\tilde{\setminus}B}(x) = f_A(x) \setminus f_B(x)$ respectively.
The soft complement ${F_A}^{\tilde{C}}$ of F_A is defined by the approximate function $f_{A^{\tilde{C}}} = (f_A(e))^C$, where $(f_A(e))^C$ is the complement of the set $f_A(e)$; that is $f_{A^{\tilde{C}}} = (f_A(e))^C = U/f_A(e)$ for all $e \in E$.
It is easy to see that $({F_A}^{\tilde{C}})^{\tilde{C}} = F_A$ and ${F_\emptyset}^{\tilde{C}} = \widetilde{F_E}$.

Definition 2.6: [3] Let $F_A \in$ S(U). A soft topology on F_A, denoted by $\tilde{\tau}$, is a collection of soft subsets of F_A having the following properties:

i) $F_\emptyset, \widetilde{F_A} \in \tilde{\tau}$,
ii) $F_B, F_C \in \tilde{\tau}$, then $F_B \,\widetilde{\cap}\, F_C \in \tilde{\tau}$,
iii) Λ indexed set and for all $\alpha \in \Lambda$, $F_{B_\alpha} \in \tilde{\tau}$ then $\widetilde{\bigcup}_{\alpha \in \Lambda} F_{B_\alpha} \in \tilde{\tau}$.

The pair $(F_A, \tilde{\tau})$ is called a soft topological space.

Definition 2.7: [3] Let $(F_A, \tilde{\tau})$ be a soft topological space. Then every element of $\tilde{\tau}$ is called soft open set. Clearly $F_\emptyset$ and $\widetilde{F_A}$ are soft open sets.

Definition 2.8: [3] Let $(F_A, \tilde{\tau})$ be a soft topological space and $F_B \,\widetilde{\subseteq}\, F_A$. Then F_B is said to be soft closed if the soft complement of F_B is soft open. $F_\emptyset$ and $\widetilde{F_A}$ are soft closed sets.

Definition 2.9: [3] Let $(F_A, \tilde{\tau}_1)$ and $(F_A, \tilde{\tau}_2)$ be a soft topological spaces. Then followings hold.
If $\tilde{\tau}_2 \supseteq \tilde{\tau}_1$, then $\tilde{\tau}_2$ is soft finer then $\tilde{\tau}_1$.
If $\tilde{\tau}_2 \supset \tilde{\tau}_1$, then $\tilde{\tau}_2$ is soft strictly finer then $\tilde{\tau}_1$.
If $\tilde{\tau}_2 \supset \tilde{\tau}_1$ or $\tilde{\tau}_1 \supset \tilde{\tau}_2$ then $\tilde{\tau}_1$ is comparable with $\tilde{\tau}_2$.

Definition 2.10: [10] Let $F_A \in$ S(U). We say that $\alpha = (e, \{u\})$ is nonempty soft element of F_A, if $e \in E$ and $u \in F(e)$. The pair $(e, \emptyset)$, where $e \in E$, will be called an empty soft element of F_A. The fact that $(e, \{u\})$ is a soft element of F_A will be denoted by $(e, \{u\}) \,\widetilde{\in}\, F_A$. We denote the set of all nonempty soft elements of F_A by $F_A^\bullet$

Example 1: [10] Let $U = \{u_1, u_2, u_3\}$, $E = \{p_1, p_2, \}$. Take a soft set $F_A \in$ S(U) of the form $F_A = \{(p_1, \{u_1, u_2\})\}$. Then all the soft elements of F_A are the following:
$(p_1, \emptyset)$, $(p_1, \{u_1\})$, $(p_1, \{u_2\})$, $(p_2, \emptyset)$.

Proposition 1: [10] For each $F_A \in S(U)$, the followings holds:
$F_A = \tilde{\bigcup}_{(e_i,\{u_j\})\tilde{\in}F_A}\{(e_i,\{u_j\})\}$ and $F_A = \tilde{\bigcup}_{(e_i,\{u_j\})\tilde{\in}F_A^{\bullet}}\{(e_i,\{u_j\})\}$.

Definition 2.11: Let $(F_A, \tilde{\tau})$ be a soft topological space, $F_B \tilde{\subseteq} F_A$ and $\alpha \tilde{\in} F_B$. If there exist a soft open set F_C such that $\alpha \tilde{\in} F_C \tilde{\subseteq} F_B$ then F_B is called soft neighborhood of soft element α.
If F_B is soft open set then F_B is called soft open neighborhood. We denote the set of all soft open neighborhoods of α by $\tilde{\mathcal{N}}_\alpha$.

Example 2: $U = \{u_1, u_2, u_3\}$, $A = \{x_1, x_2,\}$ and $F_A = \{(x_1,\{u_1,u_2\}),(x_2,\{u_2,u_3\})\}$ is a soft set over U. The soft subsets of F_A are listed below.
$F_{A_1} = \{(x_1,\{u_1\})\}$,
$F_{A_2} = \{(x_1,\{u_2\})\}$,
$F_{A_3} = \{(x_1,\{u_1,u_2\})\}$,
$F_{A_4} = \{(x_2,\{u_2\})\}$,
$F_{A_5} = \{(x_2,\{u_3\})\}$,
$F_{A_6} = \{(x_2,\{u_2,u_3\})\}$,
$F_{A_7} = \{(x_1,\{u_1\}),(x_2,\{u_2\})\}$,
$F_{A_8} = \{(x_1,\{u_1\}),(x_2,\{u_3\})\}$,
$F_{A_9} = \{(x_1,\{u_1\}),(x_2,\{u_2,u_3\})\}$,
$F_{A_{10}} = \{(x_1,\{u_2\}),(x_2,\{u_2\})\}$,
$F_{A_{11}} = \{(x_1,\{u_2\}),(x_2,\{u_3\})\}$,
$F_{A_{12}} = \{(x_1,\{u_2\}),(x_2,\{u_2,u_3\})\}$,
$F_{A_{13}} = \{(x_1,\{u_1,u_2\}),(x_2,\{u_2\})\}$,
$F_{A_{14}} = \{(x_1,\{u_1,u_2\}),(x_2,\{u_3\})\}$,
$F_{A_{15}} = F_A$,
$F_{A_{16}} = \tilde{\emptyset}$.
The collections of F_A $\tilde{\tau}_1 = \{\tilde{\emptyset}, F_A\}$, $\tilde{\tau}_2 = \tilde{P}(F_A)$ ve $\tilde{\tau}_3 = \{\tilde{\emptyset}, F_A, F_{A_2}, F_{A_{11}}, F_{A_{13}}\}$ are soft topology. Nonempty soft elements of F_A are $\{((x_1,\{u_1\}),(x_1,\{u_2\}),(x_2,\{u_2\}),(x_2,\{u_3\})\}$. So set of all Soft neighborhoods for each soft element is given in the below fort he soft topology $\tilde{\tau}_3$.
$\tilde{\mathcal{N}}_{(x_1,\{u_1\})} = \{F_A, F_{A_{13}}\}$,
$\tilde{\mathcal{N}}_{(x_1,\{u_2\})} = \{F_A, F_{A_2}, F_{A_{11}}, F_{A_{13}}\}$,
$\tilde{\mathcal{N}}_{(x_2,\{u_2\})} = \{F_A, F_{A_{13}}\}$,
$\tilde{\mathcal{N}}_{(x_2,\{u_3\})} = \{F_A, F_{A_{11}}\}$.

Definition 2.13: Let $(F_A, \tilde{\tau})$ be a soft topological space, $F_B \tilde{\subseteq} F_A$ and $\alpha \tilde{\in} F_B$. If there exist a soft open set F_C such that $\alpha \tilde{\in} F_C \tilde{\subseteq} F_B$ i.e., F_B is soft neighborhood of soft element α, then α is called s soft interior element of F_B.
The set of all soft interior elements of F_B is called soft interior of F_B and it is denoted by F_B°.

Proposition 2: Let $(F_A, \tilde{\tau})$ be a soft topological space and $F_B \tilde{\subseteq} F_A$.
$F_B^{\circ} = \tilde{\bigcup}\{F_C \tilde{\subseteq} F_B : F_C \in \tilde{\tau}\}$.

Example 3: Let **:** $U=\{h_1,h_2,h_3,h_4,h_5,h_6\}$, $E=A=\{e_1,e_2,e_3\}$ and
$F_A=\{(e_1,\{h_1,h_2\}),(e_2,\{h_1\}),(e_3,\{h_5,h_6\})\}$. Then
$F_{A_1}=\{(e_1,\{h_1\})\}$,
$F_{A_2}=\{(e_1,\{h_1,h_2\})\}$,
$F_{A_3}=\{(e_2,\{h_1\})\}$,
$F_{A_4}=\{(e_1,\{h_1,h_2\}),(e_2,\{h_1\})\}$, are some subsets of F_A. Then $\tilde{\tau}=\{\tilde{\emptyset},F_A,F_{A_1},F_{A_2},F_{A_3},F_{A_4}\}$ is a soft topology on F_A. The soft interior of soft subsets of
$F_B=\{(e_1,\{h_2\}),(e_2,\{h_1\})\}$ and $F_C=\{(e_1,\{h_1,h_2\}),(e_3,\{h_5\})\}$ are F_{A_3} and F_{A_2} respectively.

Proposition 3: Let $(F_A,\tilde{\tau})$ be a soft topological space and $F_B,F_C\,\tilde{\subseteq}\,F_A$. The statements that are given in the below are true.
a) ${F_B}^{\circ}\,\tilde{\subseteq}\,F_B$;
b) ${F_B}^{\circ}$ is soft open;
c) F_B is soft open if and only if $F_B={F_B}^{\circ}$;
d)$({F_B}^{\circ})^{\circ}={F_B}^{\circ}$;
e) $F_B\,\tilde{\subseteq}\,F_C$ then ${F_B}^{\circ}\,\tilde{\subseteq}\,{F_C}^{\circ}$.

Proposition 4: Let $(F_A,\tilde{\tau})$ be a soft topological space and $F_B\,\tilde{\subseteq}\,F_A$. If $\alpha\,\tilde{\in}\,\overline{F_B}$ then $F_B\,\tilde{\cap}\,F_C\neq F_{\emptyset}$ is not true for every open neighborhood F_C of α.

Example 4: Let $U=\{u_1,u_2,u_3\}$, $E=\{x_1,x_2,x_3\}$ and
$F_A=\{(x_1,\{u_1,u_3\}),(x_2,\{u_1\}),(x_3,\{u_1,u_2\})\}$. Then
$F_{A_1}=\{(x_1,\{u_1\})\}$,
$F_{A_2}=\{(x_1,\{u_1,u_3\})\}$,
$F_{A_3}=\{(x_1,\{u_1\}),(x_2,\{u_1\})\}$,
$F_{A_4}=\{(x_1,\{u_1,u_3\}),(x_2,\{u_1\})\}$, are some soft subsets of F_A. Then $\tilde{\tau}=\{\tilde{\emptyset},F_A,F_{A_1},F_{A_2},F_{A_3},F_{A_4}\}$ is a soft topology on F_A. If we consider the soft sunset $F_B=\{(x_1,\{u_3\}),(x_3,\{u_1\})\}$ of F_A,
Then $\overline{F_B}=F_A$ and $\alpha=(x_1,\{u_1\})\,\tilde{\in}\,\overline{F_B}$ and F_{A_1} is an open neighborhood of α. But $F_B\,\tilde{\cap}\,F_{A_1}=F_{\emptyset}$.

Proposition 5: Let $(F_A,\tilde{\tau})$ be a soft topological space and $F_B,F_C\,\tilde{\subseteq}\,F_A$. The statements that are given in the below are true.

a) $F_B\,\tilde{\subseteq}\,\overline{F_B}$;
b) ${F_B}^{\circ}$ is soft closed;
c) F_B is soft closed if and only if $F_B=\overline{F_B}$;
d)$(\overline{F_B})=\overline{F_B}$.

REFERENCES

3. Acar, U., Koyuncu, F. ve Tanay, B. (2010) Soft sets and soft rings, Comput. Math. Appl., 59: 3458–3463.
4. Aktaş, H. ve Çağman, N. (2007) Soft sets and soft groups, Inform. Sci., 177: 2726-2735.
5. Çağman, N., Karataş, S. Ve Enginoğlu, S. (2011) Soft topology, Computers and Mathematics with Applications. 62(1), 351-358.

6. Çağman, N. Ve Enginoğlu, S. (2010) Soft set theory and uni-int decision, European Journal of Operational Research 207, 848-855.
7. Ghosh, S., Mandal, D. Ve Samantha, T. K. (2016) Soft groups based on soft element, Jordan Journal of Mathematics and Statics, 9 (2), 141-159.
8. Maji P. K., Biswas, R. ve Roy, A. R. (2003) Soft set theory, *Comput. Math.Appl.*, 45: 555-562.
9. Molodtsov, D. (1999) Soft Set Theory-First Results, *Comput. Math.Appl.*, 37: 19-31.
10. Munkres, J. (2000) *Topology*, Prentice Hall, Amerika Birleşik Devletleri, 537.
11. Pei, D. Ve Miao, D. (2005) From Soft Sets to Information Systems, Granular computing, IEEE Inter. Conf. 2, 617–621.
12. [Wardowski, D. (2013) On a soft mapping and its fixed points, Fixed Point Theory and Applications, 182, 1-11.

A DECISION MAKING ALGORITHM ON THE SOFT SET THEORY WITH ITS COMPUTER APPLICATION

Gözde Yaylalı, Nazan Çakmak Polat, Bekir Tanay

Muğla Sıtkı Koçman University, Faculty of Science, Department of Mathematics, Muğla, Turkey
gozdeyaylali@mu.edu.tr
Muğla Sıtkı Koçman University, Faculty of Science, Department of Mathematics, Muğla, Turkey
ncakmak@mu.edu.tr
Muğla Sıtkı Koçman University, Faculty of Science, Department of Mathematics, Muğla, Turkey
btanay@mu.edu.tr

Abstract:

Economics, engineering, environmental and related scientific fields are always in the need of certain mathematical solutions. Unfortunately, classical mathematical tools are inadequate to satisfy their needs related to the uncertainties derived from complicated problems. Molodtsov introduced the Soft Set Theory to deal these kind of uncertainties.
We applied the notion of the Soft Intervals to construct a decision making method. Using Zhang's study, we prepared a tabular form of the Soft Interval and figured out an interval choice value. Then we proposed a generalization of the Zhang's algorithm, to make a decision. Since this method is based on Soft Intervals, which is the generalization of Interval Soft Set, it becomes more effective. The designed decision making method was applied to the problems that were reported in the earlier decision making methods based on the soft set theory. Same results were obtained successfully. As a matter of fact, the decision making methods should be faster and deal huge data with an ease. To overcome those problem, we coded the designed algorithm in C# and subjected to test the examples.

Keywords: Soft Set: Decision Making: Soft Interval: Interval Soft Set: Ordering on Soft Set
General area of research: Mathematics
ICFAS2018-ID: 1129

1. PRELIMINARIES AND BASIC DEFINITIONS

Definition 1. [4] Let U be an initial universe and E be a set of parameters. Let P(U) be the set of all subsets of U and A be a subset of E. A pair (F,A) is called a soft set over U where $F: A \rightarrow P(U)$ is a set-valued function.

Definition 2. [3] A soft set (F,A) over U is said to be a Null soft set denoted by Φ, if for every $\varepsilon \in A$, $F(\varepsilon)=\emptyset$

Definition 3. [3] For two soft sets (F,A) and (G,B) over a common universe U, we say that (F,A)

is a soft subset of (G, B) and is denoted by $(F, A) \tilde{\subseteq} (G, B)$ if

(i) $A \subset B$ and,

(ii) $\forall \varepsilon \in A$, F (ε) and G(ε) are identical approximations, which means $F(\varepsilon) = G(\varepsilon)$

(G,B) is said to be a soft super set of (F,A), if (F,A) is a soft subset of (G,B).

Definition 4. [1] Let (F, A) and (G, B) be two soft sets over U, then the cartesian product of (F, A) and (G,B) is defined as, $(F, A) \times (G, B) = (H, A \times B)$ where $H : A \times B \to P(U \times U)$ and $H(a, b) = F(a) \times G(b)$, where $(a, b) \in A \times B$ i.e. $H(a, b) = \{(h_i, h_j) | h_i \in F(a), h_j \in G(b)\}$.

Definition 5. [1] Let (F,A) and (G,B) be two soft sets over U, then a soft set relation R from (F,A) to (G,B) is a soft subset of (F,A)×(G,B). In other words, a soft set relation R from (F,A) to (G,B) is of the form $R = (H_1, S)$ where $S \subset A \times B$ and $H_1(a, b) = H(a, b)$ for all (a,b)∈S where (H,A×B)=(F,A)×(G,B).

Definition 6. [1] Let R be a soft set relation on (F, A), then

1. R is reflexive if $H_1(a, a) \in R, \forall a \in A$.
2. R is symmetric if $H_1(a, b) \in R \Rightarrow H_1(b, a) \in R$.
3. R is transitive if $H_1(a, b) \in R, H_1(b, c) \in R \Rightarrow H_1(a, c) \in R$ for every $a, b, c \in A$.

Definition 7. [2] A soft set relation R on (F, A) is antisymmetric if $F(a) \times F(b) \in R$ and $F(b) \times F(a) \in R$ for every $F(a), F(b) \in (F, A)$ imply $F(a) = F(b)$.

Definition 8. [2] A soft set relation ≤ on (F, A) which is reflexive, antisymmetric and transitive is called a partial ordering of (F, A). The triple (F, A, ≤) is called a partially ordered soft set.

Definition 9. [5] Consider a soft set (F, A) equipped with reflexsive, transitive soft set relation ≤. This soft set relation is called preorder and (F, A) is a preordered soft set.

Definition 10. [2] Let ≤ be an ordering of (F,A) and F(a) and F(b) be any two elements in (F,A). If F(a) ≤ F(b) or F(b) ≤ F(a), then F(a) and F(b) are comparable in the ordering ≤. If they are not comparable, then F(a) and F(b) are incomparable.

Definition 11. [7] Let R be a soft set relation on a soft set (F,A). If for no a∈A, the soft set relation F(a)RF(a) holds, the soft set relation R is called nonreflexive.

Definition 12. [7] A soft set relation R on a soft set (F, A) is called simple order soft set relation if it is comparable, nonreflexive and transitive. (F,A) is called a simple ordered soft set with the simple order soft set relation R.

Definition 13. [7] Let ≤ be a soft set relation on (F,A), then restriction of a soft set relation ≤ to a soft subset (G,B) is defined by: $G(a) \leq_{(G,B)} G(b) :\Leftrightarrow F(a) \leq F(b)$ for all a, b∈B.

Definition 14. [7] Suppose that (F,A) is a soft set having a simple order soft set relation ≺ and F(a) and F(b) be elements of (F,A) such that F(a) ≺ F(b). Then the soft closed interval is a soft subset (G,B) of (F,A) where $B = \{x | F(a) \prec F(x) \prec F(b) \text{ or } F(x) = F(a) \text{ or } F(x) = F(b)\}, G = F|_B$ and denoted by $[F(a), F(b)] = \{F(x) | F(a) \prec F(x) \prec F(b) \text{ or } F(x) = F(a)$

or $F(x) = F(b)\}$.

Remark 1. [7] If we take (F,A) with a partially ordered soft set relation ≤, instead of a simple order soft set relation ≺, we can write previous soft closed interval as follows: $[F(a), F(b)] = \{F(x) | F(a) \leq F(x) \leq F(b)\}$.

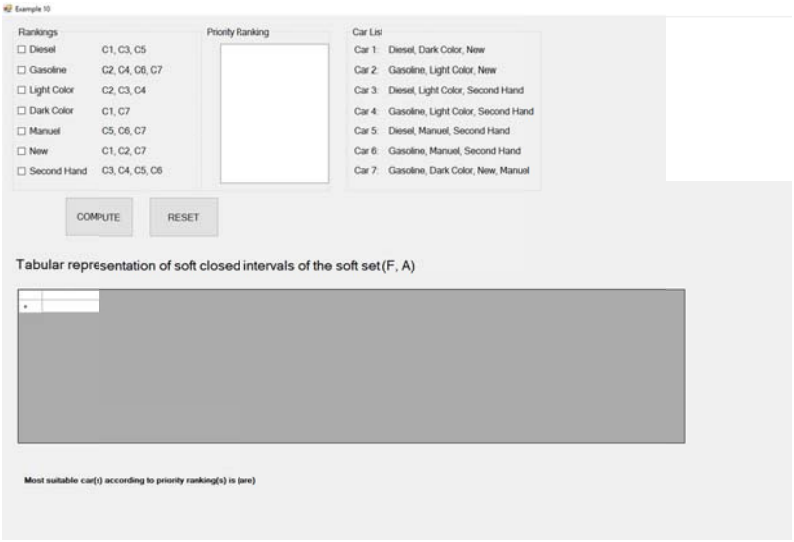
2. DECISION MAKING (DM) BY USING SOFT INTERVALS (SIS) AND COMPUTER APPLICATION OF PROPOSED DECISION MAKING (DM) METHOD

To shorthen the evaluation time of our DM method and to deal huge data, we need to utilize computers. The computer application of our proposed algorithm was written in C# (Microsoft Visual Studio Professional 2015 Trial version, programming language). Following examples were solved by both hand and computer. Both methods successfully provided the same objects.

Example 1. Let $U = \{c_1, c_2, c_3, c_4, c_5, c_6, c_7\}$ be a set of cars and E be the parameter set such that E={e_1=diesel, e_2=gasoline, e_3=light color, e_4=dark color, e_5=manuel, e_6=expensive, e_7=new, e_8=second hand}. Let (F,A) soft set as attractiveness of the cars that Mr. X is going to buy. Consider A={e_1=diesel, e_2=gasoline, e_3=lightcolor, e_4=darkcolor, e_5=manuel, e_7=new, e_8=secondhand} and $F(e_1) = \{c_1, c_3, c_5\}, F(e_2) = \{c_2, c_4, c_6, c_7\}, F(e_3) = \{c_2, c_3, c_4\}, F(e_4) = \{c_1, c_7\}, F(e_5) = \{c_5, c_6, c_7\}, F(e_7) = \{c_1, c_2, c_7\}, F(e_8) = \{c_3, c_4, c_5, c_6\}$.
Let Mr. X has the priority ranking in order of manuel, diesel, new, second hand and light color cars. According ranking, we can define a soft set relation on (F,E) as follows:
≺= {F(e_1)×F(e_5),F(e_7)×F(e_5),F(e_8)×F(e_5),F(e_3)×F(e_5),F(e_5)× F(e_5), F(e_1) × F(e_1),F(e_7) × F(e_1),F(e_8) × F(e_1),F(e_3) × F(e_1),F(e_3) × F(e_3), F(e_7) × F(e_7),F(e_8) × F(e_7),F(e_3) × F(e_7),F(e_8) × F(e_8),F(e_3) × F(e_8)}

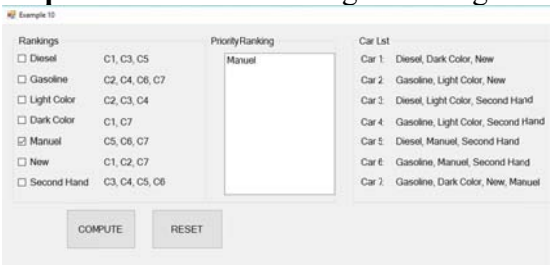
Soft set relation ≺ is comparable, reflexive, transitive and antisymmetric, thus it is partially ordered soft set relation. Then all soft closed intervals are as follows:
[F(e_3), F(e_8)], [F(e_3), F(e_7)] , [F(e_3), F(e_1)], [F(e_3), F(e_5)], [F(e_8), F(e_8)], [F(e_8), F(e_7)], [F(e_8), F(e_1)], [F(e_8), F(e_5)], [F(e_7), F(e_7)], [F(e_7),F(e_1)], [F(e_7),F(e_5)], [F(e_1),F(e_1)], [F(e_1),F(e_5)], [F(e_3),F(e_3)], [F(e_5),F(e_5)].

Now let us apply the computer application. The result object i.e. car5 was obtained faster. Some evaluation steps are represented by screenshots as given below:
The beginning page of the computer application of Example 1 is in the following figure.

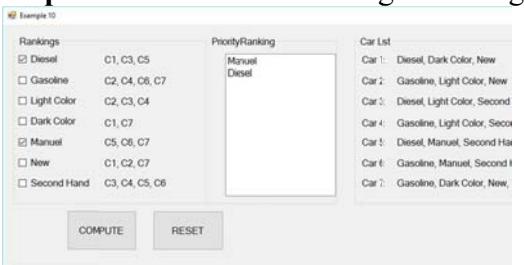


In the Figure 1 "Rankings" part is the soft set of Example 1 and "Priority Ranking" part is the order of the given soft set. This order depends on the user's priority.
Let us apply Mr. X's priority rankings to the computer application as follows:

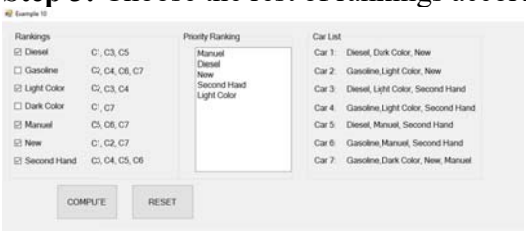
Step 1: Choose first ranking according to Mr. X's priority



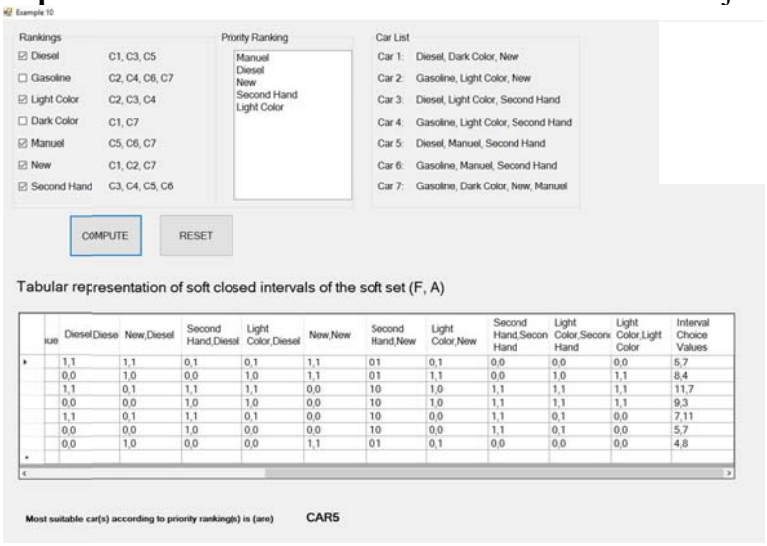
Step 2: Choose second ranking according to Mr. X's priority



Step 3: Choose the rest of rankings according to Mr. X's priority



Step 4: Press the COMPUTE button and find the result object.



Acknowledgements
The authors thank to Kemal Meler for the guidance and helps in learning the programing language C#.

REFERENCES

1. K.V. Babitha , J.J. Sunil Soft Set Relations and Functions, Comput. Math. Appl. 60: 1840-1849 (2010)
2. K.V. Babitha, J.J. Sunil Transitive Closures and Ordering on Soft Sets, Comput. Math. Appl. 62: 2235-2239 (2011)
3. P.K. Maji, R. Biswas, A.R. Roy Soft set theory, Comput. Math. Appl. 45: 555- 562 (2003)
4. D. Molodtsov Soft Set Theory-First Results, Comput. Math. Appl. 37:19-31 (1999)
5. B. Tanay , G. Yaylalı New structures On Partially Ordered Soft Sets and Soft Scott Topology, Ann. Fuzzy Math. Inform., 7: 89-97 (2014)
6. YY. Yao Interval-set Algebra for Qualitative Knowledge Representation, Proceedings of the 5th International Conference on Computing and Information, 370-375 (1993)
7. G. Yaylalı, B. Tanay Intervals, Soft Ordered Topology and Some Results, 27. National Mathematics Symposium UMS 2014 (2014)
8. G. Yaylalı, B. Tanay A Method for Decision Making by Using Soft Intervals, International Conferences on Recent Advances in Pure and Applied Mathematics 2015
9. X. Zhang On Interval Soft Sets with Applications, International Journal of Computational Intelligence Systems, 7:1, 186-196 (2014)

RELATION BETWEEN AUXILIARY SOFT SET RELATION AND SOFT SCOTT TOPOLOGY

Gözde Yaylalı, Nazan Çakmak Polat, Bekir Tanay

Muğla Sıtkı Koçman University, Faculty of Science, Department of Mathematics, Muğla, Turkey
gozdeyaylali@mu.edu.tr
Muğla Sıtkı Koçman University, Faculty of Science, Department of Mathematics, Muğla, Turkey
ncakmak@mu.edu.tr
Muğla Sıtkı Koçman University, Faculty of Science, Department of Mathematics, Muğla, Turkey
btanay@mu.edu.tr

Abstract:

Soft Set Theory was introduced by Molodtsov to deal with uncertainties. Also, there are increasingly many studies about the soft set theory. Scott topology is well known in theoretical computer science and topological lattice theory. Soft Scott topology was introduced by using soft set relation. To define soft Scott topology, directed and directed complete soft set were introduced by Tanay and Yaylali. We know that, way-below soft set relation has a very important role in the soft Scott topology. Since Auxiliary soft set relation is a general form for the way-below soft set relation, we study relation between auxiliary soft set relation and soft Scott topology. We obtain some results.

Acknowledgement: This work is supported by the Scientific Research Project of Muğla Sıtkı Koçman University, SRPO (no: 16/073) and the Scientific Research Project of Muğla Sıtkı Koçman University, SRPO (no:18/062)

Keywords: Soft Set Theory: Soft Set Relation: Way-Below Soft Set Relation: Auxiliary Soft Set Relation: Soft Scoot Topology
General area of research: Mathematics
ICFAS2018-ID: 1130

1 PRELIMINARIES AND BASIC DEFINITIONS

Definition 1. [4] Let U be an initial universe and E be a set of parameters. Let P(U) be the set of all subsets of U and A be a subset of E. A pair (F,A) is called a soft set over U where $F: A \to P(U)$ is a set-valued function.

In some studies a soft set (F,A) was shown as $(F, A) = \{(a, F(a)) \mid a \in A\}$, but in some studies F(a) was written instead of (a, F(a)) just as a notation for make it shorter. In this paper, we will use F(a) as a notation instead of (a, F(a)).

Definition 2. [5] A soft set (F,A) over U is said to be a Null soft set denoted by Φ, if for every $\varepsilon \in A$, F(ε) = ∅

Definition 3. [5] For two soft sets (F,A) and (G,B) over a common universe U, we say that (F,A) is a soft subset of (G, B) and is denoted by $(F, A) \,\widetilde{\subseteq}\, (G, B)$ if

(i) A ⊂ B and,

(ii) $\forall \varepsilon \in A$, F(ε) and G(ε) are identical approximations, which means F(ε) = G(ε)

(G,B) is said to be a soft super set of (F,A), if (F,A) is a soft subset of (G,B).

Definition 4. [5] Union of two soft sets (F,A) and (G,B) over the common universe U is the soft set (H,C), where $C = A \cup B$, and for each $e \in C$,

$$H(e) = \begin{cases} F(e), \text{if } e \in A - B \\ G(e), \text{if } e \in B - A \\ F(e) \cup G(e), \text{if } e \in A \cap B \end{cases}$$

We write $(F, A) \,\widetilde{\cup}\, (G, B) = (H, C)$.

Definition 5. [5] Intersection of two soft sets (F,A) and (G,B) over a common universe U is the soft set (H,C), where C=A∩B and for each $e \in C, H(e) = F(e) \cap G(e)$. We write $(F, A) \,\widetilde{\cap}\, (G, B) = (H, C)$.

Definition 6. [1] Let (F,A) and (G,B) be two soft sets over U, then the cartesian product of (F, A) and (G,B) is defined as, $(F, A) \times (G, B) = (H, A \times B)$ where $H : A \times B \to P(U \times U)$ and H(a,b) = F (a) × G(b), where (a, b)∈ A×B i.e. $H(a, b) = \{(h_i, h_j) \mid h_i \in F(a), h_j \in G(b)\}$

Definition 7. [1] Let (F, A) and (G, B) be two soft sets over U, then a soft set relation R from (F, A) to (G, B) is a soft subset of (F, A) × (G, B). In other words, a soft set relation R from (F,A) to (G,B) is of the form $R = (H_1, S)$ where $S \subset A \times B$ and $H_1(a, b) = H(a, b)$ for all $(a, b) \in S$ where $(H, A \times B) = (F, A) \times (G, B)$.

Definition 8. [1] Let R be a soft set relation on (F, A), then

1. R is reflexive if $H_1(a, a) \in R, \forall a \in A$.
2. R is symmetric if $H_1(a, b) \in R \Rightarrow H_1(b, a) \in R$.
3. R is transitive if $H_1(a, b) \in R, H_1(b, c) \in R \Rightarrow H_1(a, c) \in R$ for every $a, b, c \in A$.

Definition 9. [2] A soft set relation R on (F,A) is antisymmetric if $F(a) \times F(b) \in R$ and $F(b) \times F(a) \in R$ for every $F(a), F(b) \in (F, A)$ imply $F(a) = F(b)$.

Definition 10. [2] A soft set relation ≤ on (F,A) which is reflexive, antisymmetric and transitive is called a partial ordering of (F,A). The triple (F,A,≤) is called a partially ordered soft set.

Definition 11. [8] Consider a soft set (F,A) equipped with reflexsive, transitive soft set relation ≤. This soft set relation is called preorder and (F,A) is called a preordered soft set.

Definition 12. [2] Let (G, B, ≤) be a partially ordered soft set. Then,

a) For $b \in B$, G(b) is the least element of (G,B) in the ordering '≤' if G(b) ≤ G(x) for all $x \in B$.

b) For $b \in B$,G(b) is the greatest element of (G,B) in the ordering '≤' if $G(x) \leq G(b), \forall x \in B$.

Definition 13. [8] Let ≤ be an ordering of (F,A), let $(G,B) \widetilde{\subseteq} (F,A)$. For $a \in A$, F(a) is an upper bound of (G,B) in the ordered soft set (F,A,≤) if G(x) ≤ F(a) for all $x \in B$. For $a \in A$, F(a) is called supremum of (G,B) in (F,A,≤) (or the least upper bound) if it is the least element of the set of all upper bounds of (G,B) in (F,A,≤).

Definition 14. [8] Let (F,A) be a soft set. (F,A) is called a finite soft set, if it is a soft set with a finite parameter set.

Definition 15. [8] Let (F,A) be a preordered soft set. A soft subset (G,B) of (F,A) is directed provided it is nonnull and every finite soft subset of (G,B) has an upperbound in (G,B).

Definition 16. Let (F,A) be a soft set with a preorder soft set relation ≤. For $(G,B) \widetilde{\subseteq} (F,A)$

i) [8]↓(G,B)=(H,C) where $C = \{a \in A : F(a) \leq G(b) \; for \; some \; b \in B\}$ and H =F|$_C$.
ii) [8]↑(G,B)=(K,D)where $D = \{a \in A : G(b) \leq F(a) \; for \; some \; b \in B\}$ and K=F|$_D$.
iii) [8] (G,B) is a lower soft set iff (G,B) =↓(G,B).
iv) [8] (G,B) is an upper soft set iff (G,B) =↑(G,B).
v) [8] (G,B) is an soft ideal iff it is a directed lower soft set.

Definition 17. [8] A partially ordered soft set is said to be directed complete soft sets if every directed soft subset has a supremum.

Definition 18. [10] Let (F,A) and (G,B) be two non-empty soft sets. Then a soft set relation f from (F,A) to (G,B) is called a soft set function whose domain is (F,A) if every element in domain of f has a unique element in the range. If $F(a) f G(b)$ then we write $f(F(a)) = G(b)$.

Definition 19. [6] A soft topology $\tilde{\tau}$ on a soft set (F,A) is a family of soft subsets of (F,A) satisfying the following properties

i) $\Phi, (F,A) \in \tilde{\tau}$;
ii) If $(G,B), (H,C) \in \tilde{\tau}$, then $(G,B) \widetilde{\cap} (H,C) \in \tilde{\tau}$;
iii) If $(F_\alpha, A_\alpha) \in \tilde{\tau}$ for all α ∈ Λ, an index set, then $\widetilde{\cup}_{\alpha \in \Lambda} (F_\alpha, A_\alpha) \in \tilde{\tau}$. If $\tilde{\tau}$ is a soft topology on a soft set (F, A), then (F, A, $\tilde{\tau}$) is called the soft topological space.

Definition 20. [6] If $\tilde{\tau}$ is a soft topology on (F,A), then the member of $\tilde{\tau}$ is called an open soft set in $(F, A, \tilde{\tau})$.

Definition 21. [3] Let $(F, A, \tilde{\tau})$ be a soft topological space and $(F,B) \widetilde{\subseteq} (F,A)$. Then, the soft interior of (F,B), denoted $(F,B)^o$, is defined as the soft union of all soft open subsets of (F,B). Note that $(F,B)^o$ is the biggest soft open set that is contained by (F,B).

2 THE WAY-BELOW SOFT SET RELATION AND AUXILIARY SOFT SET RELATION

Definition 22. [9] Let (F,A,≤) be a partially ordered soft set. We say that F(a) way-below F(b) iff for all directed soft subsets $(G,B) \widetilde{\subseteq} (F,A)$ for which sup(G,B) exists, the soft set relation F(b)≤sup(G,B) always implies the existence of a G(d) in (G,B) with F(a) ≤ G(d). F(a) way-below

F(b) is denoted by F(a) ≪ F(b).

Note that 1. $\twoheaddownarrow F(a) = \{F(b) \mid b \in A \; with \; F(b) \ll F(a)\}$
$\twoheaduparrow F(a) = \{F(b) \mid b \in A \; with \; F(a) \ll F(b)\}$

Definition 23. i) [7] A partially ordered soft set (F,A,≤) is called soft continuous if it satisfies the axiom of approximation:
(∀F(a) in (F,A)) F(a) =$\vee^{\uparrow}\twoheaddownarrow$ F(a) i.e. for all F(a) in (F,A), the soft set ↡ F(a) which is (H,C) such that $C = \{b \in A \mid F(b) \ll F(a)\}$ and $H = F \mid_C$, is directed and $F(a) = sup(H, C)$.
ii) [7] A directed complete partially ordered soft set is soft continuous as a partially ordered soft set will be called soft set domain.

Definition 24. [11] The soft set relation ≺ on a partially ordered soft set (F, A, ≺) is called auxiliary soft set relation, or an auxiliary soft order, if it satisfies the following conditions for all $a, b, c, d \in A$.

i) F(a) ≺ F(b) implies F(a) ≤ F(b);
ii) F(c) ≤ F(a) ≺ F(b) ≤ F(d) implies F(c) ≺ F(d);
iii) If a smallest element F(0) exists, then F(0)≺F(a).

Theorem 1. [11] The way-below soft set relation is an auxiliary soft set relation.
From this theorem, we can say that the auxiliary soft set relation is the generalization of the way-below soft set relation.

Definition 25. [11] An auxiliary soft set relation ≺ on a directed complete partially ordered soft set (F, A) (and the soft set function $s_{\prec}$:(F, A) → Low(F, A) associated with it) is called approximating iff the soft set (H,C)= $s_{\prec}$ where $C = \{c \in A : F(c) \prec F(a)\}$ and $H = F|_C$ (we will notate it $s_{\prec}$ ={F(c): F (c) ≺ F (a)}) is directed (hence a soft ideal) and $F(a) = sup\{F(c) : F(c) \prec F(a)\} = \sup s_{\prec}(F(a))$ for all $a \in A$.

3 RELATIONS BETWEEN SOFT SCOTT TOPOLOGY AND AUXILIARY SOFT SET RELATION

Definition 26. [8] Let (F,A) be a directed complete partially ordered soft set and $(G, B) \widetilde{\subseteq} (F, A)$. Then (G,B) is called a Scott soft open set iff the following two conditions are satisfied:

i) (G,B)=↑(G,B);
ii) $sup(D, C) \in (G, B)$ implies $(D, C) \widetilde{\cap} (G, B) \neq \Phi$ for all directed complete soft sets $(D, C) \widetilde{\subseteq} (F, A)$.

Theorem 2. [8] The collection of all Scott soft open sets of (F,A) is a soft topology.

Definition 27. [8] The collection of all Scott soft open sets of (F,A) is called soft Scott topology on (F,A) and this topology will be denoted by σ(F,A).
Main result of this paper is the following theorem, which gives us a relation between soft Scott topology and auxiliary soft set relation.

Theorem 3. In a directed complete partially ordered soft set (F,A,≤), let $\text{int}_{\sigma((F,A))}$(G,B) denote the σ((F,A))-interior of a soft set (G,B). Define F(a) ≺F(b) iff $F(b) \in \text{int}_{\sigma((F,A))} \uparrow$F(a). Then the followings are hold.

a) ≺ is an auxiliary soft set relation.
b) F(a) ≺ F(b) implies F(a) ≪ F(b).
c) F(a) ≺ F(b) and F(a) ≪ F(b) are equivalent for all $a, b \in A$ iff ↟ F(a) is Scott soft open for all $a \in A$.
d) The soft set relation ≺ is an approximating iff ≪ is approximating that is, iff (F,A) is a soft domain.

Acknowledgement: This work is supported by the Scientific Research Project of Muğla Sıtkı Koçman University, SRPO (no: 16/073) and the Scientific Research Project of Muğla Sıtkı Koçman University, SRPO (no:18/062)

REFERENCES

1. K.V. Babitha, J.J. Sunil. Soft Set Relations and Functions. Comput. Math.Appl., 2010, 60: 1840- 1849, doi:10.1016/j.camwa.2010.07.014
2. K. V. Babitha, J. J. Sunil, Transitive Closures and Ordering on Soft Sets, Comput. Math. Appl. 62 (2011) 2235-2239
3. N. Çağman, S. Karataş, S. Enginoglu, Soft topology, Comput. Math. Appl. 62 351-258 (2011)
4. D. Molodtsov, Soft Set Theory-First Results, Comput. Math. Appl. 37 (1999) 19-31.
5. P.K. Maji, R. Biswas, A.R. Roy, "Soft set theory", Comput. Math. Appl. 45 555-562 (2003)
6. S. Roy, T.K. Samanta, An Introduction of a Soft Topological Spaces Proceeding of UGC sponsored National seminar on Recent trends in Fuzzy set theory, Rough set theory and Soft set theory at Uluberia College on 23rd and 24th September, 2011 ISBN 978-81-922305-5-9, 9-12, 2011.
7. A.F. Sayed,Continuity of partially ordered soft sets via soft Scott topology and soft sobrification, Bulletin of Mathematical Sciences and Applications, 3-3 98-113 (2014)
8. B. Tanay, G. Yaylalı, New structures on partially ordered soft sets and soft Scott topology, Ann. Fuzzy Math. Inform., 7 (2014), 89-97.
9. B. Tanay and G. Yaylalı, "Soft Way Below Relation" International Conference on Recent Advanced in Pure and Applied Mathematics 2014, Antalya Turkey.
10. G. Yaylalı, B. Tanay, Soft lattices and some results on orderings on soft set, J. Adv. Res. Pure Math., 7 (2015), 45-60.
11. G. Yaylalı, B. Tanay, On The Approximating Auxiliary Soft Set Relation, International Conference on Mathematics and Engineering 10-12 May 2017, İstanbul, Turkey.

TURBULENT BOUNDARY LAYER WITH POWER LAW IN 2-D

Özgül İlhan, Niyazi Şahin

Mugla Sıtkı Kocman University, Department of Mathematics, Mugla, 48000, Turkey
oilhan@mu.edu.tr
Yıldırım Beyazıt University, Department of Mathematics-Computer, Ankara, 06010, Turkey
nsahin@ybu.edu.tr

Abstract:

The problem of predicting features of turbulent flows occurs in many applications such as geophysical flows, turbulent mixing, pollution dispersal and even in the design artificial hearts. One promising approach is large eddy simulation (LES) in which the larger two-dimensional unsteady turbulent motions are directly represented, whereas the effects of the smaller scale motions are modelled. Turbulence driven by interaction of a flow with a wall is a major problem in LES. Mathematically, this is the problem of specifying appropriate boundary conditions for the flow averages which depend on the behavior of the unknown flow near the wall. In the light of works of Navier [1] and Maxwell [2] we develop boundary conditions as follows,

$$\bar{u}\cdot n=0 \text{ and } \beta(\delta,\mathrm{Re},|\bar{u}\cdot\tau|)\bar{u}\cdot\tau+2\,\mathrm{Re}^{-1}\,n\cdot D(\bar{u})\cdot\tau=0 \qquad (1)$$

A mathematical signification of no-penetration and slip with resistance is boundary condition (1). It is often called Navier's slip law [1]. In 1879, Maxwell [2] derived the Navier-Stokes equations from the kinetic theory of gases by averaging process and corrected the boundary condition (1).
In this study, an improved near wall models for LES is developed in the light of [3]. The aim is to develop a physical appropriate Near Wall Model which is appropriate for simple turbulent channel flows. For developing the ideas, we consider solutions (u,p) nondimensionalized incompressible Navier-Stokes equations. Having extended all functions outside Ω by zero, the large eddies are given by convolution. The Gaussian filter is used for convolution.
In this study, we derive friction coefficient β appropriate for 2-D turbulent flows and study asymptotic behavior as the averaging radius $\delta\to 0$ and as the Reynolds number $\mathrm{Re}\to\infty$.

The Logarithmic Law In 2-D

We consider the flat plane $\Omega\subseteq\mathbb{R}^2$ is the half plane $\Omega=\{(x,y),y>0\}$. Let be $u=(u,v)$. So the $\frac{1}{\alpha}-th$ power law is given by Schlichting [4],

$$u=U_\infty(\frac{y}{\delta})^{\frac{1}{\alpha}},\quad v=0 \quad \text{for } y>0 \qquad (2)$$

where U_∞ is free stream velocity. One of the most common laws is given by $\alpha = 7$.
We want to compute the friction coefficient $\beta(\delta, \mathrm{Re})$ for the boundary layer model (2). Because of this, we extend u by zero into the lower half plane $y < 0$. Since the outward pointing normal vector on $\partial\Omega = \{y = 0\}$ is $n = (0, -1)$, the tangential vector can be choosen as $\tau = (1, 0)$.

$$\boldsymbol{u} \cdot \tau = u \text{ and } \boldsymbol{n}^T (2\,\mathrm{Re}^{-1} D(\bar{u})) \cdot \tau = -\mathrm{Re}^{-1} \frac{\partial \bar{u}}{\partial y}$$

and the friction coefficient can be calculated as follow

$$\beta(\delta, \mathrm{Re}) = \mathrm{Re}^{-1} \frac{\frac{\partial \bar{u}}{\partial y}(x, 0)}{\bar{u}(x, 0)} \tag{3}$$

First, we calculate $\bar{u}(x, 0)$, we derive

$$\bar{u}(x,0) = g_\delta * u(x,0) = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} g_\delta(x - x', y - y') u(x', y') dx' dy'$$

$$= U_\infty \left(\frac{\gamma}{\delta^2 \pi}\right) \delta^{1 - \frac{1}{\alpha}} \sqrt{\frac{\pi}{\gamma}} \frac{1}{2} \left(\frac{\gamma}{\delta^2}\right)^{-\frac{\alpha+1}{2\alpha}} \Gamma\left(\frac{\alpha+1}{2\alpha}\right)$$

Similarly, we can obtain

$$\frac{\partial \bar{u}}{\partial y}(x, 0) = U_\infty^{\frac{1}{\alpha}} \delta^{-1} \frac{1}{2\alpha\sqrt{\pi}} \gamma^{-\frac{1}{2\alpha} + \frac{1}{2}} \Gamma\left(\frac{1}{2\alpha}\right)$$

Thus the friction coefficient is computed from (3) as follow

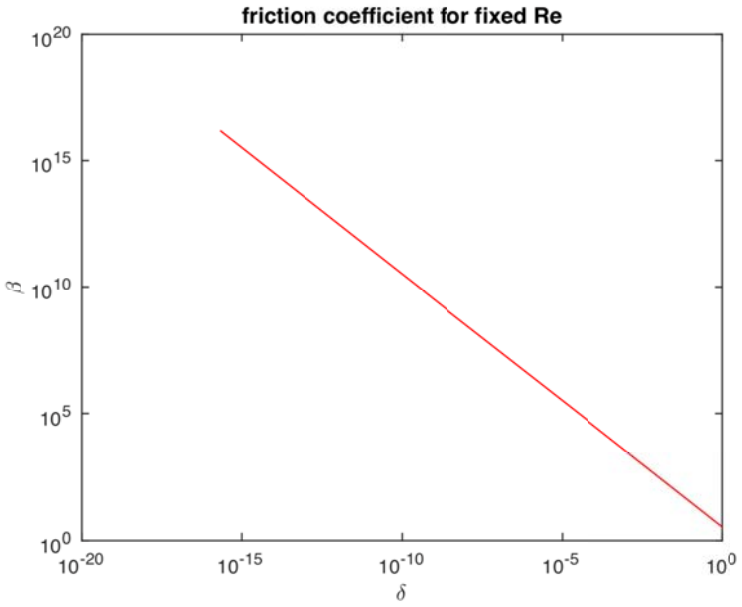
$$\beta(\delta, \mathrm{Re}) = \frac{1}{\mathrm{Re}} \frac{U_\infty^{\frac{1}{\alpha} - 1} \gamma^{\frac{1}{2}} \Gamma\left(\frac{1}{2\alpha}\right)}{\alpha \delta \Gamma\left(\frac{\alpha+1}{2\alpha}\right)} \tag{4}$$

Proposition: Let $\beta(\delta, \mathrm{Re})$ be given in (4). For fixed Reynolds number Re, we get

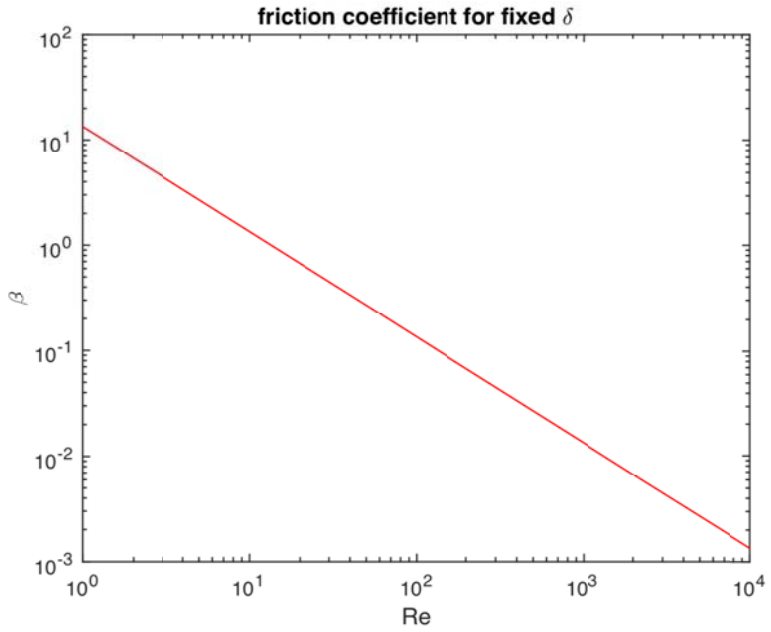
$$\lim_{\delta \to 0} \beta(\delta, \mathrm{Re}) = \infty$$

and fixed filter width δ,

$$\lim_{\mathrm{Re} \to \infty} \beta(\delta, \mathrm{Re}) = 0.$$



(a)



(b)

Figure 1. a) Behavior of $\beta(\delta, \mathrm{Re})$ with respect to Re for constant $\delta(=1)$, $\gamma = 6$.
b) Behavior of $\beta(\delta, \mathrm{Re})$ with respect to δ for constant $\mathrm{Re}(=1)$, $\gamma = 6$.

Keywords: Boundary layer: Turbulent flows: Power law: Large eddy simulation.
General area of research: Mathematics
ICFAS2018-ID: 1131

REFERENCES:

1. C.L.M.H. Navier, Memoire sur les lois du movement des fluiales, Mem. Acad. Royal Society 6, 389-440, (1823).
2. J.C. Maxwell. On stresses in rarefied gases arising from inequalities of temperature. Royal Society Phil. Trans., 170:249-256, (1879).
3. N. Sahin. Derivation, Analysis and Testing of New Near Wall Models for Large Eddy Simulation. PhD thesis, Department of Mathematics, Pittsburgh University, 2003.
4. H. Schlichting, Boundary-Layer Theory, McGraw-Hill, New York, (1979).

TURBULENT BOUNDARY LAYER WITH LOGARITHMIC LAW AND BOX FILTER IN 3-D

Özgül İlhan, Niyazi Şahin

Mugla Sıtkı Kocman University, Department of Mathematics, Mugla and 48000, TURKEY
oilhan@mu.edu.tr
Yıldırım Beyazıt University, Department of Mathematics-Computer, Ankara and 06000, TURKEY
nsahin@ybu.edu.tr

Abstract:

The problem of predicting the behavior of turbulent flows is common in engineering applications [1] and finite element method is a useful method for solutions [2,3]. When only long time statics are needed, calibrated conventional turbulence models are useful. Otherwise when dynamic features of the flow are needed large eddy simulation (LES) is powerful techniques. LES investigates to predict local, spatial flow averages over a preassigned length scale δ. LES needs at least two basic improvements in current that must be integrated over long time intervals, better subgrid models are necessary. Such problems often occur in geophysical applications. Turbulence which is caused by interaction of a flow with a wall occurs in complex geometries. This is the problem of the specifying boundary conditions for flow averages. Further, if LES is to be used as a part of design process, the boundary treatments used do not require full griding and resolution of the turbulent boundary layers. Therefore, in LES, the question of finding appropriate boundary conditions when using a constant length δ is known as Near Wall Modelling and a boundary condition is known as Near Wall Model. We consider exactly this problem herein.

In this study, an improved near wall models for LES is developed in the light of [4]. The aim is to develop a physical appropriate NWM which is appropriate for simple turbulent channel flows. For developing the ideas, we consider solutions (u, p) nondimensionalized incompressible Navier-Stokes equations. Having extended all functions outside Ω by zero, the large eddies are given by convolution. The Box filter is used for convolution.
The boundary condition $\overline{u} = 0$ on $\partial\Omega$ is the most commonly used. This does not agree with physical intuition of large eddies: hurricanes and tornadoes do slip along the ground and lose energy as they slip [1]. Motivated by this example and earlier work of Navier and Maxwell the form of NWMs is as follows

$$\overline{u} \cdot n = 0 \text{ and } \beta \overline{u} \cdot \tau_i + 2\,\mathrm{Re}^{-1}\, n \cdot D(\overline{u})\tau_i = 0 \text{ on } \partial\Omega \qquad (1)$$

where n is outward unit normal, $\{\tau_1, \tau_2, ..., \tau_{d-1}\}$ is an orthonormal system of tangential vectors and β is the effective friction coefficient which must be determined.
In this study, we derive friction coefficient β appropriate for 3-D turbulent flows and study asymptotic behavior as the averaging radius $\delta \to 0$ and as the Reynolds number $\mathrm{Re} \to \infty$.

The Logarithmic Law In 3-D

We consider the model situation that $\Omega \subseteq \mathbb{R}^3$ is the half plane $\Omega = \{(x, y, z), y > 0\} \subseteq \mathbb{R}^3$.
The universal velocity-distrubition law for very large Reynolds numbers has the form,

$$u = \begin{cases} 5.75u_* \ln \dfrac{yu_*}{\nu} + 5.5u_* & 0 \le y \le \eta \\ u_* & \eta < y \end{cases}, \quad v = w = 0, \quad 0 \le y \tag{2}$$

where u_* is friction velocity, ν is kinematic viscosity and $\eta = \eta(\delta)$ is boundary layer thickness. We want to compute the friction coefficient $\beta(\delta, \mathrm{Re})$ for the boundary layer model (2). Because of this, we extend $u = v = w = 0$ by zero into the lower half plane $y < 0$. Since the outward pointing normal vector on $\partial\Omega = \{y = 0\}$ is $n = (0, -1, 0)$, the tangential vectors can be choosen as $\tau_1 = (1, 0, 0)$ and $\tau_2 = (0, 1, 0)$. So from the Eq. (1) the friction coefficient can obtain as follow

$$\beta(\delta, \mathrm{Re}) = \mathrm{Re}^{-1} \frac{\dfrac{\partial \bar{u}}{\partial y}(x, 0, z)}{\bar{u}(x, 0, z)} \tag{3}$$

First, we calculate $\bar{u}(x, 0, z)$, using Eq. (2), we derive

$$\begin{aligned} \bar{u}(x,0,z) &= g_\delta * u(x,0,z) = \int_{-\infty}^{\infty}\int_{0}^{\infty}\int_{-\infty}^{\infty} g_\delta(x-x', y-y', z-z')u(x', y', z')dx'dy'dz' \\ &= \frac{5.75u_*\pi\eta\delta(1+\ln 4)}{8} - \frac{5.75u_*\pi\delta^2(1+\ln 8)}{36} + \frac{5.75u_*\pi\delta(\delta-3\eta)}{12} \\ &+ \frac{5.75u_*\delta(\delta-3\eta)\pi(ln(-\frac{u_*}{4\nu}) + \ln(\frac{u_*}{\nu}))}{24} + \frac{5.5u_*\delta\pi(\delta-3\eta)}{12} + \frac{u_*\pi\delta\eta}{4} \\ &+ \frac{5.75u_*\delta^3\pi(-2+\ln 4) + 23\eta^3\pi u_*(ln(-\delta-2\eta) - \ln(\delta-2\eta) + \ln(-\delta+2\eta) + \ln(\delta+2\eta))}{24\delta} \end{aligned} \tag{4}$$

It can be written,

$$\frac{\partial u}{\partial y}(x,y,z) = \begin{cases} \dfrac{5.75u_*\dfrac{u_*}{\nu}}{y\dfrac{u_*}{\nu}} & 0 < y < \eta \\ 0 & \eta < y \end{cases} = \begin{cases} \dfrac{5.75u_*}{y} & 0 < y < \eta \\ 0 & \eta < y \end{cases}$$

So, we can obtain,

$$\frac{\partial \bar{u}}{\partial y}(x,0,z) = g_\delta * \frac{\partial u}{\partial y} = \int_{-\infty}^{\infty}\int_{0}^{\infty}\int_{-\infty}^{\infty} g_\delta(x-x',y-y',z-z')\frac{\partial u}{\partial y}(x',y',z')dx'dy'dz' \\ = \frac{5.75u_*}{\delta}(4\sqrt{-\eta}\eta^{\frac{3}{2}} - 2\eta\sqrt{\delta^2-4\eta^2} + \delta^2 \arccos\frac{2\eta}{\delta}) \tag{5}$$

Using Eq. (4) and (5), we get the friction coefficient for the turbulent boundary layer wall law,

$$\beta(\delta,\mathrm{Re}) = \frac{1}{\mathrm{Re}} \frac{\frac{5.75u_*}{\delta}(4\sqrt{-\eta}\eta^{\frac{3}{2}} - 2\eta\sqrt{\delta^2-4\eta^2} + \delta^2 \arccos\frac{2\eta}{\delta})}{\bar{u}(x,0,z)} \tag{6}$$

Proposition Let $\beta(\delta,\mathrm{Re})$ be given in Eq. (6). For fixed Reynolds number Re, we get

$$\lim_{\delta\to 0}\beta(\delta,\mathrm{Re}) = \infty$$

and fixed filter width δ,

$$\lim_{\mathrm{Re}\to\infty}\beta(\delta,\mathrm{Re}) = 0$$

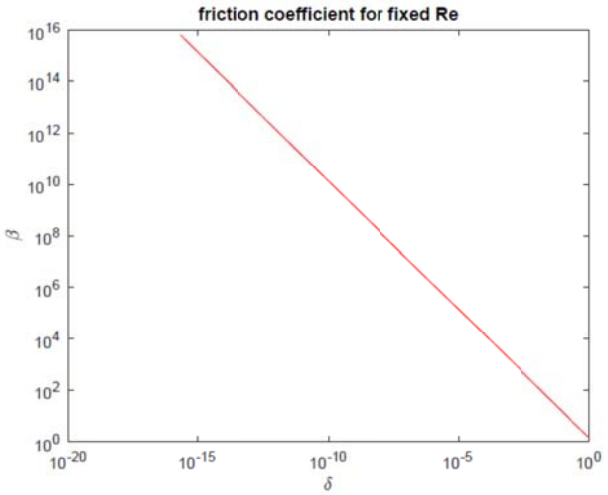


Figure1. Logarithmic Law Boundary Layer: behavior of $\beta(\delta,\mathrm{Re})$ with respect to Re for constant $\delta(=1)$.

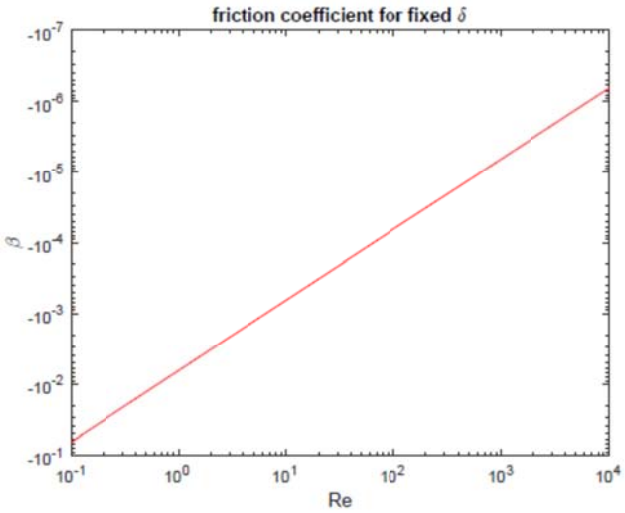


Figure2. Logarithmic Law Boundary Layer: behavior of $\beta(\delta,\mathrm{Re})$ with respect to δ for constant $\mathrm{Re}(=1)$.

Keywords: Boundary layer: Turbulent flows: Logarithmic law: Large eddy simulation.
General area of research: Mathematics
ICFAS2018-ID: 1139

REFERENCES

1. M. Günal, A. Ismael, Experimental Investigation of Turbulent Flow Field at Downstream-Facing Round Nosed Pier, Acta Phys. Pol. A. 130 (2016). *DOI: 10.12693/APhysPolA.130.126*
2. B. Nagy, Thermal Calculation of Ground Contact Structures: New Methods Based on Parametrized Transient Finite Element Thermal Modeling, Acta Phys. Pol. A. 128 (2015) page B-164. DOI: 10.12693/APhysPolA.128.B-164
3. E. Esener, S. Ercan, M. Firat, Determination of the Fatigue Behavior of a Wheel Rim Using Finite Element Analysis, Acta Phys. Pol. A. 132 (2017) *DOI: 10.12693/APhysPolA.132.617*.
4. N. Sahin. Derivation, Analysis and Testing of New Near Wall Models for Large Eddy Simulation. PhD thesis, Department of Mathematics, Pittsburgh University, 2003.

USING THE AFPT METHOD IN PROGRAM DESIGN

Filiz Yağcı, İbrahim Güney

Uludağ University, Art and Science Faculty, Bursa, Turkey
gfiliz@uludag.edu.tr
İstanbul Sabahattin Zaim, Education Faculty, İstanbul, Turkey
ibrahimguney16@gmail.com

Abstract:

In this study, we presented the AFPT method which we designed and developed making use of FLA(Flower of Logic Array), HOB(Honey Bee of human thought) system management, which could be an alternative to algorithms and flow diagrams. Furthermore, for the vase object which consists of 16 Bezier patches that we chose as an example, we performed its drawing in computer environment using the AFPT program design management. We created the F activity space using the (FLA, HOB) system management Unlu[8]. Afterwards, we defined the state machines that realize the F activity space. We introduced the Mealy machine and the Moore machine which performs the activity of drawing the object. For these machines, we gave the semantics rules of the formal language used for communication between the machines. Finally we performed the design of the object in computer environment, using the Matlab programming language.

Keywords: Flow Diagram, Program Design, Moore and Mealy Machine
General area of research: Mathematics
ICFAS2018-ID: 1157

1. INTRODUCTİON

Generally flow diagrams or algorithm structures are used in the design or explanation of a program. Algorithm is the path that is to be followed in order to solve a problem. The operations that need to be performed in order to solve a problem are expressed using word with no chance for alternative interpretations. These expressions determine which data will be entered into the computer and how, how the problem will be solved, which steps will be taken to reach the result and how the variable will be utilized in these steps. The form of the algorithm that is visually expressed using signs and symbols, the method which leads to the solution of the problem is called a flow charts. These charts control the program's flow and make the coding of the program easier.

We presented the AFPT method which we designed and developed making use of FLA(Flower of Logic Array), HOB(Honey Bee of human thought) system management, which could be an alternative to algorithms and flow diagrams. AFPT program design management is an integrated system which consists of abstract (state) machines and formal language. The steps that are followed in the design stage are as follows:

1) Analyzing and getting to know the problem we want to solve,
2) Determining the activities that will let us optimally process the information obtained from the analysis,
3) Separating these activities to equivalence classes and determining the mathematical operations of their activities,
4) Designing optimal state machines that will run the activities of the determined privileged states,
5) Designing the optimal design of an integrated mathematical state machine which can consider each state machine that is designed as a sub-machine, and can call for this machine under specific states,
6) Coding the optimally designed integrated state machines and their sub-machines using a high-level language, allowing for obtaining the desired results in the computer environment.

We presented the AFPT program to allow people with mathematical thinking styles to carry out their program designs easily and in a detailed manner, and to clearly define the framework of the program.

2. PRELIMINARIES

In the theory of computation, a Mealy machine is a finite state machine whose output values are determined both by its current state and the current inputs**.** This is in contrast to a Moore machine , whose output values are determined solely by its current state..

Definition 2.1:A Mealy machine is a 6-tuple, $(S, S_0, \Sigma, \Lambda, T, G)$, consisting of the following:

. a finite set of finite set of states S
. a start state (also called initial state) S_0 which is an element of S
. a finite set called the input alphabet Σ
. a finite set called the output alphabet Λ
. a transition function $T : S \times \Sigma \rightarrow S$ mapping pairs of a state and an input symbol to the corresponding next state.
. an output function $G : S \times \Sigma \rightarrow \Lambda$ mapping pairs of a state and an input symbol to the corresponding output symbol.

In some formulations, the transition and output functions are coalesced into a single function $T : S \times \Sigma \rightarrow S \times \Lambda$[1*].

Definition 2.2: In the theory of computation, a **Moore machine** is a finite-state machine whose output values are determined solely by its current state. This is in contrast to a Mealy machine, whose output values are determined both by its current state and by the values of its inputs[1].

A Moore machine can be defined as a 6-tuple $(S, S_0, \Sigma, \Lambda, T, G)$ consisting of the following:

. a finite set of states S,
. a start state (also called initial state) S_0 which is an element of S
. a finite set called the input alphabet Σ
. a finite set called the output alphabet Λ
. a transition function $T : S \times \Sigma \rightarrow S$ mapping a state and the input alphabet to the next state
. an output function $G : S \times \Sigma \rightarrow \Lambda$ mapping each state to the output alphabet

3. CARRYING OUT THE DESIGN OF THE OBJECT USING AFPT DESIGN METHOD

Detailed submission guidelines can be found on the journal web pages. All authors are responsible for understanding these guidelines before submitting their manuscript.

3.1. F Activity Space

The F activity space which enables the drawing of the vase object consisting of 16 Bezier patches in computer environment is defined as follows:

F = { AÇ, KAPA, GPO, EKK, BIF, IA, RH, VAZO, CLOSE, BIF, LCB, VO, CMMCB, MCB, TCM, CM, NKA, KNO, ECBP, RND, TEKRAR, BG, DTG, DTA, INPUT, MBG, ID, RD, SD, MD, MTG, KOORDINAT, KONTROL }

Each subset in the F activity space that carries a specific feature, and can be represented by an abstract (state) machine is called an activity equivalence class. The equivalence classes of the activities:

F1 = { F11, F12 } = AÇ / KAPA : Program opening and closing activity;
F11 = {F111, F112, F113, F114, F115 } = AÇ : Program opening activity;
F111 = GPO : Graphic display building activity ;
F112 = EKK : Axes closing activity;
F113 = IA : Light settings activity;
F114 = RH : Color map setting activity;
F115 = VAZO : Activity in the first image of the object creation;
F12 = CLOSE : Program closing activity;

3.2. Creation of Abstract Machines

The realization of the above two types of activities used in state machine. In this section; M11, 5-state Mealy machine that performs opening activity and M22, Moore machine that plot the object will introduce.
Mathematical definition of the M11 opening machine:

G11 = { <figure>, <Axis3doff>, <light>, <colormap>, <vazo> } : Input Set
Ç11 = { GPO, EKK, IA, RH, VAZO } : Output Set
D11 = { D111 , D112, D113 , D114, D115 } : State Set
h11 : D11 x G11 → D11 : State change function
g11 : D11 x G11 → Ç11 : Output function

5-state Mealy machine that performs opening activity M11 = (G11, Ç11, D11, h11, g11) have

h11 = { h11(D11, <figure>) = D111, h11(D12, <figure>) = D112,
h11(D13, <figure>) = D113, h11(D14, <figure>) = D114,
h11(D15, <figure>) = D115 ,
h11(D11, <Axis3doff>) = D112, h11(D12, <Axis3doff>) = D112,
h11(D13, <Axis3doff>) = D113, h11(D14, <Axis3doff>) = D114,
h11(D15, <Axis3doff>) = D115 ,
h11(D11, <light>) = D113, h11(D12, <light>) = D113,
h11(D13, <light>) = D113, h11(D14, <light>) = D114,

h11(D15, <light>) = D115 ,
h11(D11, <colormap>) = D114, h11(D12, <colormap>) = D114,
h11(D13, <colormap>) = D114, h11(D14, <colormap>) = D114,
h11(D15, <colormap>) = D115 ,
h11(D11, <vazo>) = D115, h11(D12, <vazo>) = D112,
h11(D13, <vazo>) = D113, h11(D14, <vazo>) = D114,
h11(D15, <vazo>) = D115 }

that change state activity and

g11 = { g11(D11, <figure>) =GPO, g11(D12, <figure>) = EKK,
g11(D13, <figure>) = IA, g11(D14, <figure>) = RH,
g11(D15, <figure>) = VAZO , g11(D11, <Axis3doff>) = EKK,
g11(D12, <Axis3doff>) = EKK, g11(D13, <Axis3doff>) = IA,
g11(D14, <Axis3doff>) = RH, g11(D15, <Axis3doff>) = VAZO ,
g11(D11, <light>) = IA, g11(D12, <light>) = IA}

that is execution of the output activity .

The machine that plot the object; M22

G22 = { <vazokor>, <koordinat>, <byama> } : Input Set
Ç22 = { NKA, KNO, ECBP } : Output Set
D22 = { D221 , D222, D223 } : State Set

h22 : D21 x G21 → D21 : State change function
g22: D2 2→ Ç22 : Output function

3-state Moore machine that performs opening activity M21 = (G22, Ç22, D22,h22, g22) have

h22 = { h22(D221, <vazokor>) = D221, h22(D222, <vazokor>) = D222,
h22(D223, <vazokor>) = D223, h22(D221, <koordinat>) = D222,
h22(D222, <koordinat>) = D222, h22(D223, <koordinat>) = D223,
h22(D221, <byama>) = D223, h22(D222, <byama>) = D223,
h22(D223, <byama>) = D223 }

that change state activity and

g22 = { h22(D221, <vazokor>) = NKA, g22(D222, <koordinat>) = KNO,
g22(D223, <byama>) = ECBP }

that is execution of the output activity .

3.3. Formal Semantics of language rules

In this chapter, state machines designed for optimal integration and establishes the communication that exists between its sub-state machines are the rules of formal semantics of the language. Program design from the M22 machines machines on the established rules of semantics introduced.

M22 machine founded on the formal semantics of the language rules:

M22 ⇔

(a) h22 = { h22(D221, <vazokor>) = D221 }
: Bring the D221 M221 that is state machine

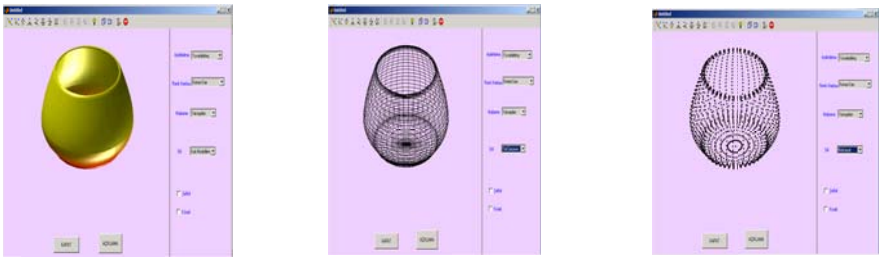
(b) h22 = { h22(D222, <vazokor>) = D222, h22(D221, <koordinat>) = D222,
h22(D222, <koordinat>) = D222 }
: Bring the D222 M221 that is state machine

(c) h22 = { h22(D223, <vazokor>) = D223, h22(D223, <koordinat>) = D223,
h22(D221, <byama>) = D223, h22(D222, <byama>) = D223,
h22(D223, <byama>) = D223 }
: Bring the D223 M221 that is state machine
(d) NKA = { g22(D221, <vazokor>) }
: Put a vase coordinates processing;
(e) KNO = { g22(D222, <koordinat>)}
: Read the checkpoints in any order;
(f) ECBP = { g22(D223, <byama>) }
: Calculate Bezier patches;

3.4. Programming the Vase Object Using the Matlab Programming Language

In this chapter, each machine that was designed using the Matlab language was coded so as to form a sub-program. The reason for choosing the Matlab language was; the surface characteristics panel of this language enables making some changes such as color, lighting and opacity, regarding the general look of the graphic [5]. Although standard colors can be selected for the surface color, it is also possible to define special colors. The selections on the lighting menu are in order: shadeless, flat lighting, round lighting and soft blended lightning. In this program we used the other lighting method, except for shadeless. The opacity change feature allows for the visibility of the surfaces that remain under the visible surface in 3-dimensional graphics. It is possible to set the alpha coefficient as 1.0 (opaque), 0.5 (semi-permeable) and 0 (full permeable). In the program, we used full permeability feature in the transparent selection, and opaque, bright and metal selections for the surface material. There are 15 color maps in the Matlab program. We used the winter, autumn, copper and hsv color maps in the program.

We made benefited from [3, 4, 6, 7] sources and found the formulas for the Bezier patches and used these in the program.



(a) (b) (c)

Fig 1. Bezier patch of the object 16 created in (a) solid modeling view, (b) wire-frame image and (c) image point

4. CONCLUSION AND DISCUSSIONS

The flow diagram and algorithm method used in the design of programs allows us to see the data inputs, operations, operational priorities and data outputs of the program. The AFPT method which we offer as an alternative creates the realization map of the problem in the computer environment, using mathematical expressions. This mathematical map allows for easier expression, understanding and coding of the operations, sub operations and operation orders, in comparison to the other two classic methods. The stronger and more advantageous aspect of our method in comparison to these other two methods is that it allows to more easily

and quickly determine and remedy the errors occurring in the running of the main program. Our goal in our next study is to create a matrix presentation of the state machines, in order to ease the use of AFPT program design management.

REFERENCES

1. W.M.L. Holcombe, Algebraic automata theory, Cambridge Studies in Advanced Mathematics1, Cambridge University Press, (1982).
2. D.Angluin, Learning regular sets from queries and counterexamples, Information and Computation 2(1987), 87–106.
3. M. Machines Shahbaz and R. Groz, Inferring Mealy, Second World Congress, Eindhove, The Netherlands, Springer(2009), 207-223.
4. F.Aarts, H. Kuppens, J. Tretmans, F.Vaandrager, S. Verwer, Improving active Mealy machine learning for protocol conformance testing, Mach Learn(2014), 189–224.
5. G. H. Mealy, A Method for Synthesizing Sequential Circuits, Bell System Technical J. 34(1955), 1045–1079.
6. E. F. Moore, GedanhenExperiments on Sequential Machines, in Automata Studies Ed. by C. Shannon and J. McCarthy , University Press, Princeton, 1956.
7. V. M. Glushkov, Syntheis of Digital Automata, Fizmatgiz, Moscow, 1962.
8. A. S. Klimovich and V. V. Solov'ev, Transformation of a Mealy Finite–State Machine into a Moore Finite–State Machine by Splitting Internal States, Journal of Computer and Systems Sciences International, Vol. 49, No. 6(2010), 900–908.
9. F.Ünlü , F.Yağcı, (BSM, BSD) Makine ve Dil Tasarımı, 1. Sistem Mühendisliği ve Savunma Uygulamaları Sempozyumu (1995), Kara Harp Okulu, Ankara.
10. J.Hoschek, Approximation of surfaces of revolution by developable surfaces, Computer-Aided Design, Vol. 30, No.10(2000), 757 - 763.
11. C.W. Mastin, Three - Dimensional Bezier Interpolasyon in solid modelling and grid generation, Computer Aided Geometric Design 14(1997), 797-805.
12. Uzunoğlu M. , Kızıl A. , Onar Ö.Ç., Her Yönüyle Matlab, Türkmen kitapevi, VII-69 - VII-92, 2003.
13. V.Weisa, L.Andorb, G. Rennera, T. Varadya, Advanced surface fitting technique. Computer Aided Geometric Design 19(2001), 19-42.
14. F. Gülsoy, İstatiksel Manifoldların Uygulanması ve Simulasyonu, Doctoral Thesis(2005), 6 -10.

PLASMA SCALE LENGTH AND QED EFFECTS ON ACCELERATED ENERGY SPECTRA OF PARTICLES IN ULTRA INTENSE LASER PLASMAS

Özgür Culfa

The Department of Phyics, Karamanoglu MehmetBey University, Karaman,70200, TURKEY
ozgurculfa@kmu.edu.tr

Abstract:

We present a study of particle acceleration when next generation multi- petawatt lasers with the irradiances of ~ 10^{23} W cm $^{-2}$, hitting solid targets. It has already been shown that pre-formed plasma in front of the target surface can increase both the maximum energy reached by the accelerated particles and the efficiency of particle acceleration due to nonlinear plasma processes. In this study, we have checked the effect of this pre-formed plasma on particle acceleration in the presence of non-linear quantum electro- dynamics (QED) effects at the irradiances of ~ 10^{23} W cm $^{-2}$. For the calculations, we used 2D EPOCH PIC simulations.

Keywords: Laser-Plasma Interactions, PIC Simulations, Particle Acceleration,QED Effect
General area of research: Physics
ICFAS2018-ID: 1190

1. INTRODUCTION

Such high power lasers with irradiances of I > 10^{23} W cm^{-2} generate extremely strong electromagnetic fields around $E_L > 10^{15}$ V m^{-1}. Such high electric fields can accelerate electrons sufficiently and large amount of their energy is radiated as gamma-rays, by non-linear Compton Scattering, within a single laser cycle. Resulting in the radiation reaction (RR) force becomes important in defining the electron trajectories [1]. Furthermore, quantum aspects of the radiation emission are vital[2-4] and the emitted photons by accelerated electrons create electron - positron pairs on interaction with the laser fields. This process is called multi- photon Briet-Wheeler pair production[5-7]. These emission processes will dominate the dynamics of plasmas generated by next generation 10 PW lasers [8-10]. Recent computational and theoretical studies have shown that quantum radiation reaction and multi photon Briet-Wheeler pair production have a strong effect on particle acceleration in next generation 10 PW laser-solid interactions [11, 12].

We have used the EPOCH particle-in-cell (PIC) code which includes the aforementioned QED effects[13, 14]. It is well known that the laser pre-pulse will form a pre-plasma in front of target which effects the energy and efficiency of accelerated electrons [15-17]. In this work, we have studied the influence of pre-plasma and non-linear QED processes on particle acceleration in next generation multi-petawatt laser plasma interactions (I □ 10^{23} Wcm^{-2}).

2. EPOCH 2D PIC CODE SIMULATIONS:

We performed 2D EPOCH simulations of laser solid interactions with absence and presence of pre-plasma and QED effects. The simulation box size was 105 μm × 80 μm with a mesh resolution of 4000 × 3000 cells with 50 particles of electrons and protons in a cell. The laser parameters was like that; laser irradiance is $5x10^{23}$ W cm^{-2} , 25 fs pulse duration, 4 μm focal spot and 0.82 μm wavelength. We have also added an incidence angle of 40 degree to the laser. The maximum electron density was limited to CH – target solid density (70 n_c where n_c is the critical density). In the case of pre-plasma , an exponential density profile was assumed with scale length L = 10 μm with a cut off to zero density at 0.1 n_c.

Figure 1 gives the simulated electron number density for no pre-plasma case (L=0 μm) and when there is a pre-plasma (L = 10 μm case) with presence and absence of QED processes. When there is no pre-plasma, the laser radiation pressure is effective to accelerate electrons away through the target. When presence of preplasma case, the laser drills a hole into the plasma but there is no evidence of laser filamentation, either with or without QED effect, as is observed both experimentally and computationally of lower intensity laser-plasma interactions [15-17].

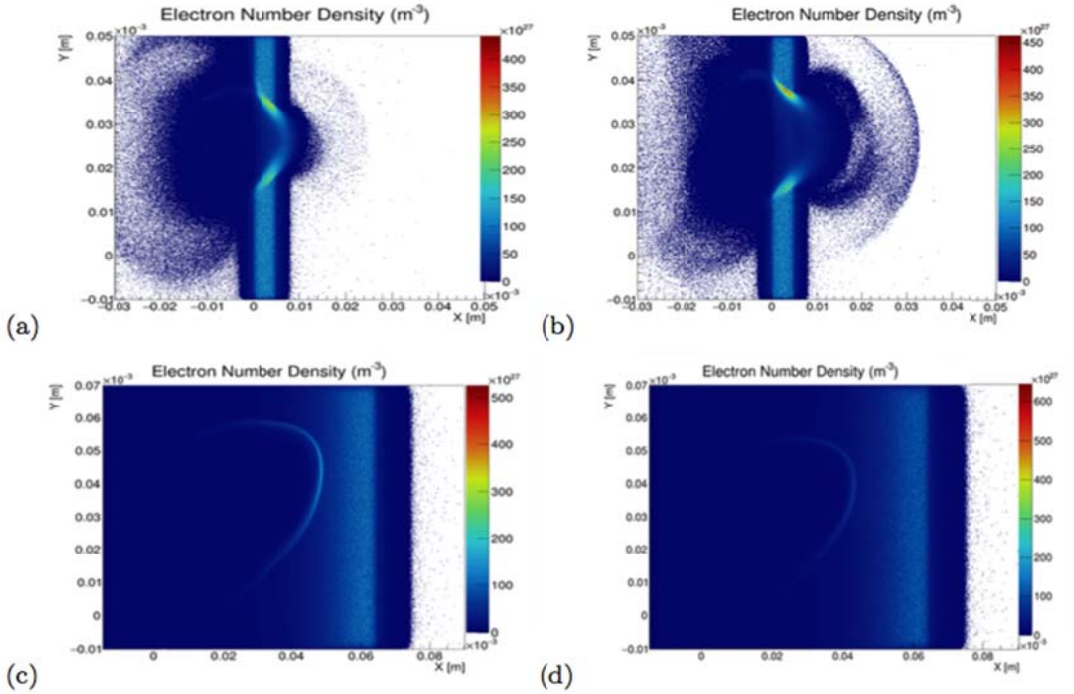


Figure 1. Simulated number density of electrons from EPOCH 2D PIC simulations for a) 0 μm scale length without QED effects, b) 0 μm scale length with QED effects c) 10 μm scale length without QED effects and d) 10 μm scale length with QED effects.

3. PARTICLE ACCELERATION

To investigate the influence of QED and plasma density scale length on particle acceleration, electron and proton energy spectra were examined. The energy spectra of electrons and protons

with and without preformed plasma at the front surface are shown in figure 2 a and b when QED effects are off while figure 2 c and d shows the proton and electron energy spectra when QED effects are included.

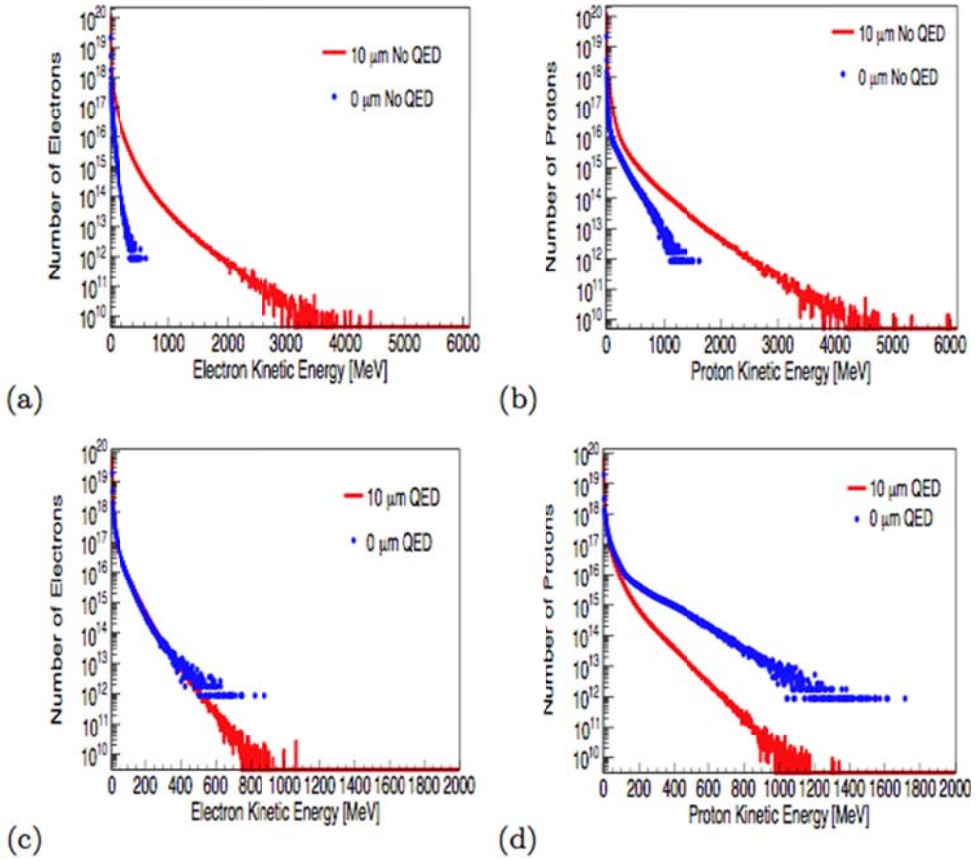


Figure 2. a) Electron and b) proton energy spectra for 0 and 10 m scale length without QED effects, c) electron and d) proton energy spectra for 0 and 10 μm scale length with QED effects,

In the case with absence of pre-plasma the electron and ion energies remain approximately constant with and without QED effects. However, with a pre-plasma QED effects lead to significant cooling of both the electrons and protons (see figure 3). For no QED case , results are like it is expected – preformed plasma causes more efficient laser absorption and so more energetic electrons and ions are produced[18, 19]. In the QED case, strong laser absorption in the preformed plasma reverses this trend so the electrons are not accelerated to higher energies by having the preformed plasma and the ions actually have less energy.

Figure 3 clearly shows that adding QED effects in our simulations changes the electron and proton energy spectra for preformed plasma case (L=10μm). The general trend is for QED effects to drops the temperature of the protons and electrons when the case of presence of preformed plasma. In the former case radiation reaction damps the electron motion, increasing laser absorption reducing the radiation pressure to accelerate the protons by RPA.

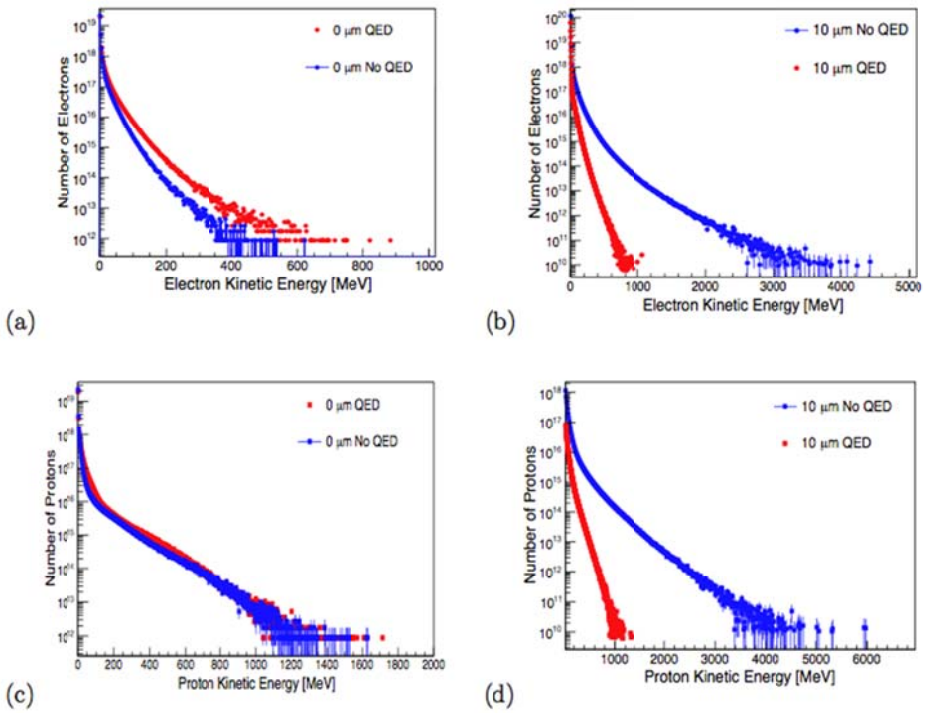


Figure 3. Re plotting of figure 2 to highlight the affect of QED processes on the electron and proton energy spectra. a) and b) show the electron energy spectra for 0 and 10 μm scale length, respectively and c) and d) show the proton energy spectra for 0 and 10 μm scale length, respectively.

4. CONCLUSION

In conclusion, we have studied the influence of QED on particle acceleration in next generation 10 PW laser matter interactions with the laser intensity of 5×10^{23} W cm^{-2}. On simulating the case of presence and absence of a pre- plasma, we have found that increasing laser irradiances did not change physical mechanisms and results obtained from the simulations without QED are as expected - pre-plasma causes higher laser absorption and generates more energetic electrons and ions. In the case of QED plasmas, strong laser absorption in the preformed-plasma reverses this trend and the electrons cannot be accelerated to higher energies by having the preformed-plasma and the ions actually have less energy comparing to QED case.

Acknowledgments:
The research was supported by TUBITAK research project 116F042 and by Karamanoglu Mehmetbey University Research Project 40-M-16. This work was in part funded by the UK EPSRC grants EP/G054950/1, EP/G056803/1, EP/G055165/1 EP/M018156/1 and EP/ M022463/1.

REFERENCES

1. P.A.M Dirac. Proc.R.Soc.A, 167:148, 1938.
2. J.G. Kirk, A.R. Bell, and I. Arka. Plasma.Phys.Cont.Fusion, 51:085008, 2011. 14

3. I.V. Sokolov, J. A. Nees, V.P. Yanovsky, N.M. Naumova, and G.A. Mourou. Phys.Rev.E, 81:036412, 2010.
4. R.Duclous, J.G. Kirk, and A.R. Bell. Plasma.Phys.Cont.Fusion, 53: 015009, 2011.
5. G. Breit and John A. Wheeler. Phys.Rev., 46:1087, 1934.
6. A.R. Bell and J.G. Kirk. Phys.Rev.Lett., 101:200403, 2008.
7. A. M. Fedotov, N. B. Narozhny, G. Mourou, and G. Korn. Phys.Rev.Lett., 105:080402, 2010.
8. E. N. Nerush, I. Yu. Kostyukov, A. M. Fedotov, N. B. Narozhny, N. V. Elkina, and H. Ruhl. Phys.Rev.Lett., 106:035001, 2011.
9. I.V. Sokolov, N. M. Naumova, and J.A. Nees. Phys.Plasmas., 18:093109, 2011.
10. C.P. Ridgers, C.S. Brady, R. Ducluos, J.G. Kirk, K. Bennett, T.D. Ar- ber, A.P.L. Robinson, and A.R. Bell. Phys.Rev.Lett., 108:165006, 2012.
11. M.Tamburini, F.Pegoraro, A. Di Piazza, C. H. Keitel, and A. Macchi. New J.Phys., 12:123005, 2010.
12. P. Zhang, C. P. Ridgers, and A. G. R. Thomas. New J.Phys., 17:043051, 2015.
13. C.P. Ridgers, J.G. Kirk, R. Duclous, T.G. Blackburn, C.S. Brady, K. Bennette, T.D. Arber, and A.R. Bell. Journal of Computational Physics, 260:273–285, 2014.
14. T D Arber, K Bennett, C S Brady, A Lawrence-Douglas, M G Ramsay, N J Sircombe, P Gillies, R G Evans, H Schmitz, A R Bell, and C P Ridgers. Plasma Physics and Controlled Fusion, 57:113001, 2015.
15. O. Culfa, G. J. Tallents, E. Wagenaars, C. P. Ridgers, R. J. Dance, A. K. Rossall, R. J. Gray, P. McKenna, C. D. R. Brown, S. F. James, D. J. Hoarty, N. Booth, A. P. L. Robinson, K. L. Lancaster, S. A. Pikuz, A. Ya. Faenov, T. Kampfer, K. S. Schulze, I. Uschmann, and N. C. Woolsey. Hot electron production in laser solid interactions with a controlled pre-pulse. Phys.Plasmas, 21:043106, 2014.
16. O. Culfa, G. J. Tallents, A. K. Rossall, E. Wagenaars, vd. Plasma scale-length effects on electron energy spectra in high-irradiance laser plasmas. Phys.Rev.E, 93:043201, 2016.
17. O. Culfa, G. J. Tallents, M.E. Korkmaz, A.K. Rossall, E. Wagenaars, C.P. Ridgers, C.R.Murphy, N. Booth, D.C. Carroll, L.A. Wilson, K.L. Lancaster, and N.C. Woolsey. Plasma scale length effects on protons generated in ultra intense laser plasmas. Laser and Particle Beams, 35: 58–63, 2017.
18. M.I.K.Santala, M.Zeph, I.Watts, F.N.Beg, E.Clark, M.Tatarakis, K.Krushelnick, A.E.Dangor, T.McCanny, I.Spencer, R.P.Singhal, K.W.D.Ledingham, S.C.Wilks, A.C.Machacek, J.S.Wark, R.Allott, R.J.CLarke, and P.A.Norreys. Phys.Rev.Lett, 84:1459–1462, 2000.
19. J Peebles, M S Wei, A V Arefiev, C McGuffey, R B Stephens, W Theobald, D Haberberger, L C Jarrott, A Link, H Chen, H S McLean, A Sorokovikova, S Krasheninnikov, and F N Beg. New Journal of Physics, 19:023008, 2017.

A BIOLOGY INSPIRED EPIDEMIC MODEL ON FINANCIAL NETWORKS

Mehmet Ali Balcı, Ömer Akgüller

Muğla Sıtkı Koçman University, Faculty of Science, Department of Mathematics, Muğla 48000, Turkey
mehmetalibalci@mu.edu.tr
Muğla Sıtkı Koçman University, Faculty of Science, Department of Mathematics, Muğla 48000, Turkey
oakguller@mu.edu.tr

Abstract:

In this study, we present an epidemic model that characterizes the behavior of a financial network of globally operating stock markets. Since the long time series have a global memory effect, we represent our model by using the fractional calculus. This model operates on a network, where vertices are the stock markets and edges are constructed by the correlation distances. Thereafter, we find an analytical solution to commensurate system and use the well-known finite difference method to obtain the solution of incommensurate system of fractional differential equations. Our findings are confirmed and complemented by the data set of the relevant stock markets between 2006 and 2016. Rather than the hypothetical values, we use the Hurst Exponent of each time series to approximate the fraction size and graph theoretical concepts to obtain the variables.

Keywords: Fractional Calculus, Differential Model, Network Analysis, Numerical Solution
General area of research: Mathematics
ICFAS2018-ID: 1012

MODIFICATION AND CHARACTERIZATION OF POLY(ACRYLONITRILE) FIBERS BY GRAFTING OF ACRYLIC ACID

Zeynep Okay, Meryem Kalkan Erdoğan, Meral Karakışla and **Mehmet Saçak**

Department of Chemistry, Faculty of Science, Ankara University, Tandoğan, Ankara 06100, Turkey
sacak@science.ankara.edu.tr

Abstract:

Poly(acrylonitrile) (PAN) fiber is one of the most important synthetic textile material and found wide usage in textile industry due to having some superior properties such as high rubbing and tensile strength, good antibacterial and pest resistance. But, it has also some disadvantageous properties such as low humidity absorption, electrostatic charge deposition and low dyeing with some dye types leading to limitations the use of PAN in requested application areas. These drawbacks of PAN fiber could be eliminated by various surface modification techniques in literature. Among these techniques, graft modification is one of the most facile and one step way to impart good requested properties of monomers to PAN fiber chemically. In this work, the surface of PAN fibers were modified with a hydrophilic COOH functional groups containing monomer, acrylic acid, by graft copolymerization in aqueous medium using benzoyl peroxide as initiator at 85 ^{o}C. The effect of some polymerization conditions such as concentrations of initiator and monomer was investigated on grafting yield (%) of the PAN fiber. It was observed that the grafting yield of PAN fiber reached to 8.7% when $6x10^{-4}$ mol/L benzoyl peroxide and 1.0 mol/L acrylic acid was used in the polymerization. The grafting of acrylic acid to PAN fiber was supported by ^{1}H-NMR analysis. The structural and morphological characterization was performed with ATR-FTIR and SEM techniques, respectively. It was obtained from SEM images that PAN fiber surface was covered with a homogenous thin PAA layer in addition to some PAA aggregates located in some regions.

Keywords: surface modification: acrylic fiber: acrylic acid: grafting
General area of research: Chemistry, Polymer Chemistry
ICFAS2018-ID: 1014

PARAMETER ESTIMATION OF MARKOV SWITCHING BILINEAR MODEL USING THE (EM) ALGORITHM

Kharfouchi Soumia, Maaziz Mohamed

Salah Boubnider University, Constantine, Algeria
s_kharfouchi@yahoo.fr
Salah Boubnider University, Constantine, Algeria
mili.maaziz@gmail.com

Abstract:

Markov Switching models have known a strong growth since their introduction by James Hamilton in the late 1980's. These models are used as an essential tool for the analysis of the economic cycles. In this paper, we are interested in a class of bilinear models with markov switching regime (MS − BL). These models first appeared in Bibi and Aknouche (2010). Parameter estimation via maximum likelihood (ML) of the (MS − BL) model has been considered in Bibi and Ghazel (2015). However, construction and numerical maximization in the approach proposed by Bibi and Ghazel (2015) are computationally intractable. Hence, we propose an expectation–maximization (EM) procedure that provides an alternative method for maximizing the likelihood function in such situations. Convergence and consistency of the (EM) algorithm are discussed in this context. Finally, a Monte Carlo study is presented and two real data examples are proposed.

Keywords: Markov-switching Bilinear models, (EM) algorithm, Maximum likelihood
General area of research: Mathematics
ICFAS2018-ID: 1015

Copula Conditional Tail Expectation For Multivariate Financial Risks

Benatia F., Brahimi B., Yahia D.

Laboratory of Applied Mathematics, Mohamed Khider University, Biskra, Algeria
fatahbenatia@hotmail.com

Abstract:

Our goal in this paper is to propose an alternative risk measure which takes into account the fluctuations of losses and possible correlations between random variables. This new notion of risk measures, that we call Copula Conditional Tail Expectation describes the expected amount of risk that can be experienced given that a potential bivariate risk exceeds a bivariate threshold value, and provides an important measure for right-tail risk. An application to real financial data is given.

Keywords: Conditional Tail Expectation; Positive Quadrant Dependence; Copulas; Dependence Measure; Risk Management; Market Models.
General area of research: Mathematics
ICFAS2018-ID: 1016

TECHNOLOGICAL PROPERTIES OF ORIENTED STRANDBOARD BONDED WITH PHENOL-FORMALDEHYDE RESIN SYNTHESİZED WITH BIO-OIL FROM THERMAL AND CATALYTİC PYROLYSİS METHODS

Nadir Ayrilmis[1*], Günay Özbay[2]

[1]Department of Wood Mechanics and Technology, Forestry Faculty, Istanbul University-Cerrahpasa, Sariyer, 34473, Istanbul, Turkey
nadiray@istanbul.edu.tr
[2] Faculty of Engineering, Industry Engineering, Aksaray University, 78050, Aksaray, Turkey

Abstract:

Bio-oil was produced from wood wastes using thermal and catalytic pyrolysis methods. Phenol-formaldehyde (PF) resin was then synthesized with the different amounts of the bio-oil obtained from thermal method (10 to 50 weight %) and alkali catalyst (potassium carbonate, K_2CO_3) (10 to 50 weight %). The wood sawdust was selected as a biomass feedstock, which was pyrolyzed in a vacuum reactor at 500 °C, with and without catalysts. The chemical composition of bio-oils was determined by GC-MS analysis. Bio-based PF (BPF) resins synthesis from bio-oil, phenol, and formaldehyde, were characterized by some chromatographic and specstrocopic methods. Oriented strandboard (OSB) panels were produced with BPF resins and then their technological properties were determined. The chemical properties of the PF resins with bio oil and technological properties OSB panels were compared with the results of lab-scale and commercial PF resin and OSB panels. Some physical and mechanical properties of the thickness swelling of the OSB panels produced by the synthesized resins were determined. As the amount of the K_2CO_3 catalysts increased from 20 wt% in the PF resin, the 24-hour thickness swelling of the OSB panels decreased from 15.4 to 14.3%, but further increment in the K_2CO_3 catalysts content increased the thickness swelling. Although the amount of the thermal bio oil increased from 10 to 40 wt% in the PF resin 14.1 to 17.1%, it was lower than that of the control particleboard (19.3%). As for the mechanical properties, as the amount of the thermal bio-oil and K_2CO_3 catalysts was 10 wt% in the PF resin, the internal bond strength of the OSB panels was higher than that of the control OSB. The results of this study showed that bio-based chemical products could be partially replaced with the petrochemicals in the PF resin production.

Keywords: Bio-oil, Bio-based resin, catalysts Pyrolysis, Wood, OSB, technological properties
General area of research: Wood Mechanics
ICFAS2018-ID: 1018

5th International Congress on Fundamental and Applied Sciences 2018 (ICFAS2018)
Proceeding Book

Quartic B-spline Differential Quadrature Method for solving the Extended Fisher-Kolmogorov Equation

Ali Başhan

Bulent Ecevit University, Faculty of Science and Art, Department of Maths, Zonguldak, 67100, Turkey
Email: alibashan@gmail.com

Abstract:

Some numerical solutions of the extended Fisher-Kolmogorov equation have been obtained by quartic B-spline differential quadrature method. Second order weighting coefficients are obtained directly by quartic B-splines. Since the fourth order derivatives of quartic B-splines do not exist, the fourth order weighting coefficients obtained by matrix multiplication approach. After the discretization of the EFK equation via DQM, ordinary differential equation systems have been obtained and strong stability preserving Runge-Kutta method has been used for time integration. To be able to check the accuracy of the method three test problems have been solved and error norms L_2 and L_∞ are going to be calculated.

Keywords: Partial differential equations, Differential quadrature method, EFK equation, Quartic B-Splines.
General area of research: Mathematics
ICFAS2018-ID: 1019

5th International Congress on Fundamental and Applied Sciences 2018 (ICFAS2018)
Proceeding Book

ON GENERALIZED DERIVATIVES IN THE SENSE OF SOBOLEV AND PROPERTIES OF POMPEIU OPERATOR

Yeşim Sağlam Özkan, Sezayi Hızlıyel

Uludag University, Art and Science Faculty, Bursa,16059 ,Turkey
ysaglam@uludag.edu.tr
Uludag University, Art and Science Faculty, 16059, Bursa, Turkey
hizliyel@uludag.edu.tr

Abstract:

In this work, generalized derivatives in the sense of Sobolev and their properties which play an important role in the analysis of normal form system have been studied. And Pompeiu operator's properties are investigated for complex matrix valued functions.

Keywords: Generalized Beltrami Systems, Q-Holomorphic Functions
General area of research: Mathematics
ICFAS2018-ID: 1030

SIMULTANEOUS DETERMINATION OF PARACETAMOL AND SOMEbADDITIVES IN LIQUID PHARMACEUTICAL FORMULATIONS USING HPLC-DAD METHOD

Şule Dinç Zor, Özlem Aksu Dönmez

Yildiz Technical University Faculty of Science and Arts, Department of Chemistry,
34220 Davutpasa-Istanbul, Turkey
sule_dinc@yahoo.com
oziaksu@yahoo.com

Abstract:

Liquid pharmaceutical formulations are particularly vulnerable to microbial growth owing to the nature of their ingredients. Thus, preservatives are commonly used in order to prevent alteration and degradation of them. Parabens are the well-known preservatives which are used primarily for their antimicrobial properties. However usage of these compounds is toxic at high concentrations and possesses an estrogenic effect. On the other hand, synthetic colorants which are used in order to color the formulations and improve their appearance can cause some health problems such as asthmatic and allergic reactions, hay fever, hyperactivity and headache depending on their doses. Therefore, the allowable amounts of synthetic colorants are regulated under laws in many countries. In conclusion, determinations of preservatives and synthetic colorants in pharmaceuticals are so important for both quality control assurance and consumer health.

In this study, a simple and accurate high performance liquid chromatography (HPLC)-diode array dedector (DAD) method was developed for the determination of paracetamol, methyl paraben, sunset yellow and carmoisine simultaneously in liquid pharmaceutical formulations. Successful separation of all the components was acquired within 5 min using C18 column with mobile phase of phosphate buffer solution (pH 6.5)-acetonitrile in the gradient elution. Flow rate of the mobile phase was 1.6 mL/min with detections at 300, 254 and 230 nm by means of DAD. The method was validated in accordance with ICH guidelines. It was seen that the developed method with acceptable validation results in terms of linearity, precision, accuracy and selectivity can be applied successfully for simultaneous determination of the studied compounds in pharmaceutical formulations.

Key words: RP-HPLC-DAD, paracetamol, methyl paraben, sunset yellow, carmoisine.
General area of research: Chemistry
ICFAS2018-ID: 1031

5th International Congress on Fundamental and Applied Sciences 2018 (ICFAS2018)
Proceeding Book

MASSIVE SCALAR FIELD THEORY ON DISCRETE *n*-SCALES

Furkan Semih Dündar, Metin Arık

Physics Department, Boğaziçi University, İstanbul, 34342, Turkey
furkan.dundar@boun.edu.tr
Physics Department, Boğaziçi University, İstanbul, 34342, Turkey
metin.arik@boun.edu.tr

Abstract:

n-scales are a generalization of time-scales that has been put forward to unify continuous and discrete analyses to higher dimensions. In this paper we investigate massive scalar field theory on *n*-scales. In a specific case of a regular 2-scale, we find that the IR energy spectrum is almost unmodified when there are enough spatial points. This is regarded as a good sign because the model reproduces the known results in the continuum approximation. Then we give field equation on a general *n*-scale. It has been seen that the field equation can only be solved via computer simulations.

Keywords: Massive Scalar Field Theory, *n*-Scales, UV Cut-Off
General area of research: Mathematical Physics
ICFAS2018-ID: 1033

5th International Congress on Fundamental and Applied Sciences 2018 (ICFAS2018)
Proceeding Book

A NEW SCHEME FOR KAWAHARA EQUATION VIA QUINTIC B-SPLINE DIFFERENTIAL QUADRATURE METHOD

Ali Başhan

Bulent Ecevit University, Faculty of Science and Art, Zonguldak, 67100, Turkey
alibashan@gmail.com

Abstract:

A new quintic B-spline differential quadrature scheme has been given. General form of weighting coefficients based on quintic B-splines has been introduced. Kawahara equation has been discretized using both forward difference formula and Crank-Nicolson. For the linearization of equation Rubin and Graves technique has been preferred and differential quadrature method has been applied to obtain algebraic equation system. Four famous test problems, namely single solitary wave, interaction of two solitary waves, interaction of three solitary waves and wave generation have been numerically solved. Then, in order to be able to test the efficiency of the newly applied scheme, the error norms L_2 and L_∞ as well as the three lowest invariants I_1, I_2, and I_3 have been calculated. Besides those, the relative changes of invariants have been reported. Finally, the obtained numerical results with new scheme have been compared with some of the earlier studies available in the literature.

Keywords: Partial differential equations, Differential quadrature method, Quintic B-Splines, Kawahara equation.
General area of research: Mathematics
ICFAS2018-ID: 1035

OPTIMIZATION by BOX-BEHNKEN DESIGN and VALIDATION of a MULTIRESIDUE METHOD for PESTICIDE DETERMINATION in DAIRY PRODUCTS using LC-MS/MS

Özün Görel Manav[1], **Şule Dinç-Zor[2]**, and Güzin Alpdoğan[2]

[1]TUBITAK Marmara Research Center, 41470, Kocaeli, Turkey
[2]Yıldız Technical University, Faculty of Science and Arts, Department of Chemistry, Istanbul, Turkey
Email: sule_dinc@yahoo.com

Abstract:

Dairy products which are essential and valuable food may be contaminated by pesticides during their production and/or originated from milk. It is difficult to determine trace levels of these contaminants in complex matrices such as milk and dairy products for analysts. In recent years, use of LC-MS/MS in pesticide analysis has increased due to its suitability for analyzing thermally labile or polar pesticides.

The aim of this study is to determine the optimum conditions for liquid chromatographic analysis of pesticide multiresidue in dairy products (cheese, cream and yogurt) by means of experimental design. A three-level Box-Behnken design (BBD) with three-factor was employed for the optimization of analysis method. Three independent variables of the study were initial percentage of the mobile phase A (30, 40 and 50%), flow rate of the mobile phase (0.1, 0.2 and 0.3 mL/min) and concentration of ammonium formate (0, 0.5, 1 mM). Mean recoveries of the pesticide residues in the chromatograms were used for the response of the variables. BBD containing 15 total runs was performed to determine the model coefficients and investigate the variables and their interactions. According to the results, optimum values for the investigated variables were determined as 40.5 % for the initial percentage of mobile phase A, 0.176 mL/min for flow rate and 0.575 mM for the concentration of ammonium formate. In addition, response surface graphs were drawn in order to illustrate the variable effects on recoveries. Finally, validation of the method was performed as described in Document No. SANCO/12495/2011.

This study is supported by a grant (Project Number: 2014-01-02-DOP02) from Scientific Research Projects Committee of Yildiz Technical University

Keywords: Experimental design, pesticide multiresidue, cream, cheese, yogurt, LC-MS/MS.
General area of research: Chemistry
ICFAS2018-ID: 1036

THE DISTRIBUTION OF ELASTIC PARAMETERS IN MODERN MODELS OF THE EARTH

Hatam Guliyev, Babek Sultanov

Institute of Geology and Geophysics of the NAS of Azerbaijan, ave. H. Javid 119, Baku 1073, Azerbaijan
hatamguliyev@gmail.com
Institute of Geology and Geophysics of the NAS of Azerbaijan, ave. H. Javid 119, Baku 1073, Azerbaijan
bsaultanov@mail.ru

Abstract:

The analytical expressions are obtained to calculate the dependence of propagation velocities of elastic waves in deformed media on the increase of the density of media based on nonlinear elastodynamics in this paper. These dependencies are compared to Birch's experimental diagrams constructed in various scientific centers and universities.
The necessity in such studies is due to the development of differential (sufficient) criteria of reliability of distribution of elastic parameters of the geological medium in modern theoretical models of the Earth. It is known that a measure of the reliability of distribution of elastic parameters is considered the compliance of integral criteria while creating theoretical models. It is accepted that: the calculated model values of mass of average angular momentum and nature of free oscillations of the Earth are equal to the measured values of these quantities. These necessary criteria are insufficient.
H. Guliyev (2017, 2018) shows in existing models of the Earth (through the example of the inner core) that the accepted distribution of linear physico-mechanical parameters of the medium and pressure don't correspond to the fundamental requirements of the mechanics of deformable solid body relating to strength, stability, actuality of velocities of propagation of elastic waves.
The calculations on some materials are carried out using the obtained nonlinear dependencies between velocities and density. The comparison of theoretical results with data of various experimental works is conducted.
The results of the comparison allow avoiding unreliable distributions in new theoretical models of tectono-geodynamic evolution of the Earth that are being created.

Keywords: Nonlinear elastodynamics, elastic properties, elastic waves, Birch's diagram, velocities of waves
General area of research: Mechanics
ICFAS2018-ID: 1037

INVESTIGATION, TRACE ELEMENTS IN GEOTHERMAL WATER OF OUELD DJALI, ALGERIA, USING X-RAY FLUORESCENCE SPECTROMETRY (SXRF)

Aouati Mohamed Khelil,. Bougherara Hassina, Kebabi Brahim

ENS Constantine. Department of Physical-chemistry. University of Constantine3, 25000, Algeria.
aouati.mk@gmail.com
Water Treatment and Pollution Laboratory, (WTPL). Department of Chemistry, Faculty of Exact Sciences. University of Constantine1, 25000, Algeria.
hassina.bougherara@umc.edu.dz
Water Treatment and Pollution Laboratory, (WTPL). Department of Chemistry, Faculty of Exact Sciences. University of Constantine1, 25000, Algeria.
brahim.kebabi@umc.edu.dz

Abstract :

Heavy metals are contaminants with the ability to accumulate inwater. Certain contaminants are also bio available and depend on many characteristics. Study on heavy metals concentration in geothermal water was conducted in ouled djali, Mlla town, Algeria with the aim of evaluating the concentration of heavy metal in this water. The collected sample were transported in glass bottles to the laboratory for analysis using spectrophotometer X-RAY fluorescence. The result from this study revealed significant differences in water heavy metals Concentration of this source. Concentrations of heavy metals (Mg, Al, Si, P, S, Cl, K, Ca, Ti, V, Cr, Mn, Fe, Ni, Cu, Zn, Ga, As, Se, Br, Rb, Sr, Y, Zr, Ba, Pb) were measured using X-Ray Fluorescence (XRF) spectrometer. after preconcentration with Amberlitte XAD-7resin. The following average abundance order of heavy metals was found: Cu >> Mn > Zn > Cr > Ni > Fe in water samples of Ouled Djali. Regular monitoring of heavy metals in geothermal water was recommended as essential to prevent risk future excessive build up.

Keywords: Heavy metals, Ouled Djali, Amebrlite XAD-7, Geothermal water, X-Ray Fluorescence (XRF)
General area of research: Chimistry
ICFAS2018-ID: 1040

LINEAR APPROXIMATION PROCESSES WITH A FASTER RATE OF CONVERGENCE

Octavian Agratini

Babeş-Bolyai University, Department of Mathematics,
Str. Kogălniceanu 1, 400084 Cluj-Napoca, Romania
Email: agratini@math.ubbcluj.ro

Abstract:

A special branch of Approximation Theory if the approximation of functions by using linear sequences of operators, say $(L_n)_{n\geq 1}$, the essential feature being that of positivity.

Operators in questions are often designed as follows

$$(L_n f)(x)=\sum_{k=0}^{\infty} a_k(n;x)\, f(x_{n,k}),\quad n\in\mathbf{N},\quad x\in\mathbf{R}_+, \tag{1}$$

where $a_k(n;\cdot):\mathbf{R}_+\to\mathbf{R}_+$ are continuous functions for each $n\in\mathbf{N}$, $k\in\{0\}\cup\mathbf{N}=\mathbf{N}_0$, and $\Delta_n=(x_{n,k})_{k\geq 0}$ is a net on $\mathbf{R}_+$.

For a wide majority of linear positive operators, the error of approximation is $O(n^{-1/2})$. Is it possible to construct classes of operators having a faster rate of convergence?

Starting from (1) our talk is centered on a general class of discrete operators with the property that the order of approximation is improved, meaning that becomes arbitrarily small. Also, we prove that the same phenomenon holds for quantitative estimates in Voronovskaya type theorems.

As an example, a general class of Bernstein type rational function is analyzed.

We choose $a_k(n;x)=\binom{n}{k}\frac{(\lambda_n x)^k}{(1+\lambda_n x)^n}$ if $k\in\{0,1,...,n\}$ and $a_k(n;x)=0$ if $k>n$. Also $x_{n,k}=\frac{k}{n\lambda_n}$ if $k\in\{0,1,...,n\}$. In the above $(\lambda_n)_{n\geq 1}$ is a strictly decreasing positive sequence with the properties $\lim_{n\to\infty}\lambda_n=0$ and $\lim_{n\to\infty} n\lambda_n=\infty$.

Regarding this class a probabilistic approach is given and the study of its approximation properties in certain weighted spaces is developed.

In the final part of our presentation, following the same aim, an integral generalization in Kantorovich sense is also constructed and studied.

Keywords: Linear positive operator, Bohman-Korovkin theorem, modulus of smoothness, statistical convergence
General area of research: Mathematics
ICFAS2018-ID: 1044

ARTIFICIAL BEE COLONY ALGORITHMS FOR SOLVING AGGREGATE PRODUCTION PLANNING PROBLEMS

Çağrı Sel

Industrial engineering department, Karabük University, 78050, Karabük/Turkey
cagrisel@karabuk.edu.tr

Abstract:

The planning decisions are concerned with the determination of production, inventory, workforce, subcontracting levels and working hours to meet demand requirements over a time-horizon from six months to one year. An aggregate production planning problem incorporates all the planning decisions together at tactical level. In this study, we deal with an aggregate production planning problem. We introduce a generic mathematical model and propose an artificial bee colony algorithm. We compare the results between the two approaches and see that the proposed artificial bee colony algorithm optimizes the solutions within a reasonable computation time for industrial problem sizes. As an overall remark, the proposed artificial bee colony algorithm can be implemented as a decision support tool at tactical planning level in manufacturing industries.

Keywords: Tactical level planning decisions, aggregate production planning, evolutionary optimization algorithms, artificial bee colony algorithms.
General area of research: Engineering applications, Supply chain management
ICFAS2018-ID: 1045

STATUS AND POTENTIAL OF RENEWABLE ENERGY RESOURCES IN TR 61 REGION

Sertaç GÖRGÜLÜ

Mehmet Akif Ersoy University, Faculty of Engineering and Architecture, Burdur 15030, Turkey
sgorgulu@mehmetakif.edu.tr

Abstract:

TR 61 is a region that includes the provinces of Antalya, Isparta and Burdur which are located in Turkey's western Mediterranean area according to Statistical Regional Units Classification made by Turkey Statistical Institute. The region has 36,797 km^2 surface area and it accounts for approximately 4.7% of Turkey. The region consumes 4% of Turkey's electricity consumption.
In terms of renewable energy sources; the region's solar energy and hydroelectric potentials stand out. The installed capacities of renewable energy plants which are established and under construction in the region are 123.06 MW and 1144.28 MW respectively. The installed power of renewable energy plants in the region constitutes approximately 3.1% of the installed power of renewable energy resourced plants of our country. In the region, solar energy potential is particularly high. Therefore, in order to fully use the potential of renewable energy sources, the need to construct new power plants is prominent.
In this study, the status and potential of renewable energy sources of the TR 61 region in the western Mediterranean will be analyzed by considering the data. The potential of the region's contribution to the national economy with the establishment of new power plants will be discussed.

Keywords: TR61, Renewable Energy, Western Mediterranean Region, Turkey
General area of research: Renewable Energy
ICFAS2018-ID: 1046

5th International Congress on Fundamental and Applied Sciences 2018 (ICFAS2018)
Proceeding Book

AN APPLICATION OF BINARY QUADRATIC FORMS

Kubra Nari, Enver Ozdemir, Ergun Yaraneri

Informatics Institute, Istanbul Technical University, Istanbul 34467, Turkey
nari15@itu.edu.tr
Informatics Institute, Istanbul Technical University, Istanbul 34467, Turkey
ozdemiren@itu.edu.tr
Department of Mathematics, Istanbul Technical University, Istanbul 34469, Turkey
yaraneri@itu.edu.tr

Abstract:

In this digital age, a bridge in a cyber-system might cause a great loss of private data and money. Providing security in the cyber-world requires tedious work on designing protocols and algorithms and extensive analysis of each of them. The most common public key crypto system RSA has been extensively analyzed since it was presented in 1977. The security of this elegant crypto system is believed to depend on hardness assumption of integer factorization. Therefore, the research on the cryptanalysis of RSA is to find an algorithm for integer factorization. No effective algorithms for integer factorization have polynomial running time.
In this research, we develop a new integer factorization algorithm which has polynomial running time for certain integers. The algorithm is based on binary quadratic forms of a positive discriminant. We show that for certain kind of integers n which are especially being used in RSA crypto system, if we start with a reduced form $(1, b, c)$ of discriminant n and if we proceed on the cycle, we end up with a form, $(k_1 p, k_2 p, d)$ such that p is a nontrivial divisor of n.
Let n be a given integer such as an RSA modulus. It is known that starting at the reduced form $(1, b, c)$ of discriminant n if we go to the left or right on the cycle of $(1, b, c)$ then right in the middle of the cycle we find an ambiguous form, whose first term is a nontrivial divisor of n. However, the length of the cycle may be large so that reaching to the middle of the cycle may not be computationally feasible. If n has more than two prime factors, we also observe that the cycle of the reduced form $(1, b, c)$ of discriminant n contains unambiguous forms $(a', b',)$ such that $\gcd(a', b') \neq 1$ and so $\gcd(a', b')$ is a nontrivial divisor of n. Moreover, depending on n the forms $(a', b',)$ on the cycle may be very close to the form $(1, b, c)$.
Therefore, to find a nontrivial factor of n we first multiply n with a prime number r and then we consider the cycle of the reduced form $(1, b, c)$ of discriminant nr to find a nontrivial factor of nr. We construct a method that allow us to find appropriate primes r so that one of the above mentioned forms $(a', b',)$ of discriminant nr is very close to $(1, b, c)$ and $\gcd(a', b') \neq 1, r, n$. For such an r we see that $\gcd(a', b')$ and n have a common nontrivial divisor.

Keywords: Integer Factorization, Binary Quadratic Forms
General area of research: Number Theory, Algebra
ICFAS2018-ID: 1047

IMPORTANCE OF HIGHWAY SURFACE MACROTEXTURE AND CURRENT TEST METHODS

Bekir AKTAŞ, Şevket ASLAN

[1] Department of Civil Engineering, Erciyes University, Kayseri, 38039, Turkey
baktas@erciyes.edu.tr, sevketaslan@erciyes.edu.tr

Abstract:

Surface texture of the road pavements plays an important role for surface friction and drainage. Microtexture, macrotexture and megatexture are essential parameters for Pavement Management System. Microtexture defines the surface texture up to 0.5 mm horizontal wavelength of aggregate. Macrotexture results from larger aggregates varying with wavelength from 0.5mm – 50mm. Megatexture points the surface irregularities with between 50mm – 500mm. Macrotexture enables the drainage of the water, thus improving more contact of tire to pavement surface and reducing the hydroplaning occurrence. It also supports the hysteresis component of friction. In this study, importance of macrotexture and current macrotexture measurement test methods are studied and explained briefly.

Sand Patch test is a volumetric method which determines the average depth of the top of the pavement. Generally, passing material #50-#100 or 0.2mm uniform glass spheres sieve is used in this test. After they are spreaded on a circular shape over the pavement surface, the material should fill the voids and level carefully. The average macrotexture depth of the surface is measured by dividing the volume of the material used to spread by the total area of the circle created. The macrotexture is known as Mean Texture Depth. In the test with Circular Track Meter, a laser in high frequency is used to calculate surface profile depth. The laser head moves around a radius of 142mm circular path. The perimeter of the circle is divided into 8 parts of 100mm length. It is often used in conjunction with Dynamic Friction tester in order to better determine International Friction Index. High Speed Texture Laser is generally used in combination with longitudinal profile measuring tool to determine roughness. In order that can gain data if enough quantity and accuracy to measure macrotexture, the laser is needed to be run at a frequency of 32 kHz in the speed of highway. The laser used in high frequency makes it possible to collect both macrotexture metrics and pavement roughness. Outflow Meter is used when the texture depth is too low (<0.3mm). The surface is pre-wetted in 1 min. The time required for the water to drop from the upper reference line to the lower reference line is measured. Very short outflow time is indicative of rough surface and vice versa. Road Surface Analyzer is the replacement of sand patch and outflow parameter. It is able to gather large quantity of values due to a cheaper cost. It reduces the problems of safety and traffic control. It reports the Mean Profile Depth (MPD).

Briefly, these test have typical technique to measured macrotexture parameter of the pavement surface. Depending on the surface type, length of the road network and allowed test time, engineers need to select one or several test methods which are mentioned above.

Keywords: Highway Surface, Macrotexture, Pavement Performance
General area of research: Engineering
ICFAS2018-ID: 1048

5th International Congress on Fundamental and Applied Sciences 2018 (ICFAS2018)
Proceeding Book

BEHAVIOUR OF SOME HIGH-FREQUENCY DISSIPATION NUMERICAL METHODS WHEN SOLVING NONLINEAR PROBLEMS

Elisabete Alberdi Celaya, **Olga Danilkina**

University of the Basque Country (UPV/EHU),
Rafael Moreno Pitxitxi, 2, 48013, Bilbao, Spain
elisabete.alberdi@ehu.eus
University of Dodoma (UDOM), Dodoma, Tanzania
olga.danilkina@gmail.com

Abstract:

After applying the Method of Lines (MOL) to an initial boundary value problem, a stiff system of Ordinary Differential Equations (ODEs) is obtained. When integrating in time the resulting ODE system, numerical methods with good stability properties and controllable high-frequency dissipation are common. In this work we will focus on the Energy Dissipative, Momentum Conserving (EDMC), the HHT-α and the BDF- α methods. We will calculate some parameters such as the spectral radii, the algorithmic damping and the relative error in period of these methods. A nonlinear problem of a mass attached to a fixed point through an elastic spring moving on a plane will be solved by these methods. The methods have been chosen in the way that they have a similar spectral radius in the high-frequency range. When solving the problem with small time-steps, the HHT- α and the BDF- α methods dissipate both, the energy and the momentum. When the problem is solved using greater time-steps, even though the energy grows with both methods, the BDF- α shows better characteristics.

Keywords: Finite Element Method, high-frequency dissipation, nonlinear problems
General area of research: Applied Mathematics
ICFAS2018-ID: 1050

EXISTENCE AND UNIQUENESS OF THE SOLUTION OF ONE NONLOCAL PROBLEM AND ITS NUMERICAL APPROXIMATIONS

Olga Danilkina, Bilali Mataru

The University of Dodoma (UDOM), Dodoma, Tanzania
olga.danilkina@gmail.com, olga.danilkina@udom.ac.tz
The University of Dodoma (UDOM), Dodoma, Tanzania
bilalmataru@yahoo.com

Abstract:

Nonlocal boundary-value problems are introduced as problems with boundary conditions that are partially or completely replaced by additional conditions on the functions connecting the values of the solution at the boundary points and the interior of the domain. Nonlocal problems for PDEs appear while modelling phenomena of different nature such as particle diffusion processes in turbulent plasma, processes of heat diffusion, water conducting processes in porous media, thermo-elasticity, dynamics of ground waters, description of population in mathematical biology and demography. The notion of a loaded equation was first defined in the works of A. M. Nakhushev who gave a detailed classification of loaded equations of various types: differential, integral, integro-differential, functional and their applications.
In this work, we study a nonlocal problem for the loaded parabolic equation with the integral condition and find numerical approximations to the solution using various approaches. We start with the definition of the solution to the problem and prove its existence and uniqueness in the appropriate Sobolev space using Galerkin approximations and apriori estimates. Then we compare different numerical approaches which are suitable for the problem and finally, we apply the Homotopy Analysis Method to obtain a numerical solution to the problem.

Keywords: nonlocal problems; Galerkin approximations; Homotopy Analysis Method
General area of research: Mathematics
ICFAS2018-ID: 1051

5th International Congress on Fundamental and Applied Sciences 2018 (ICFAS2018)
Proceeding Book

TREND ANALYSIS OF FINAL CONSTRUCTION PRICES: THE TURKISH CASE

Savas Bayram

Erciyes University, Faculty of Engineering, Dept. of Civil Engineering, Kayseri, 38280, Turkey
sbayram@erciyes.edu.tr

Abstract:

The 2003 year is accepted as a milestone in the Turkish procurement system. About fifteen years ago, the Public Procurement Law, *nr. 4734* enacted instead of the State Procurement Law, *nr. 2886*. Although the current law was enacted with high expectations, e.g. prevention of the waste of public resources, the number of benchmark field studies conducted under this amendment is limited.

Construction works constitute majority of the Turkish public procurements in monetary terms. This study investigates the trend analysis of the construction prices of public projects. The sample consist a total of 461 public building projects. 272 of these projects were procured in accordance with the State Procurement Law, *nr. 2886* and 189 were procured in accordance with the Public Procurement Law, *nr. 4734*. These projects were completed in three metropolitans of Turkey as; Adana, Ankara and Gaziantep. Data of; completion month-year, contract price and final price of all these projects were collected. Trend analysis of the construction prices of the projects were performed separately for both procurement laws using Mann-Kendall analysis and Spearman's rho analysis.

Keywords: Construction works; final price; Mann-Kendall; procurement; Spearman's rho; trend analysis
General area of research: Civil Engineering
ICFAS2018-ID: 1054

SYNTHESIS, CHARACTERIZATION, AND SPECTRAL PROPERTIES OF A NOVEL SYMMETRICAL INDIUM PHTHALOCYANINE

Nazli Farajzadeh, Hande R. Pekbelgin Karaoglu **Makbule Burkut Kocak**

Istanbul Technical University, Faculty of Science and Letters, Department of Chemistry, Istanbul, 34469, Turkey
farajzadeh15@itu.edu.tr
Istanbul Technical University, Faculty of Science and Letters, Department of Chemistry, Istanbul, 34469, Turkey
pekbelgin@itu.edu.tr
Istanbul Technical University, Faculty of Science and Letters, Department of Chemistry, Istanbul, 34469, Turkey
mkocak@itu.edu.tr

Abstract:

Due to the special electronic, optical and structural properties, phthalocyanines (Pcs) and their derivatives have received great interest in applications like optical data storage, gas and chemical sensors, molecular metals, liquid crystals, solar energy conversion, non linear optical materials, photovoltaic semiconductors, and as photosensitizers for photodynamic therapy of cancer (PDT)in addition to their main application as dyes and pigments [1-3].
NLO materials can play a vital role on manipulating optical signals in telecommunication systems and other optical signal processing applications. In comparison to the different NLO (non-linear optical) absorbers, MPcs (metallophthalocyanines) and their derivatives encompassing highly delocalized aromatic 18 π-electron system have been utilized in a wide range because of the large optical nonlinearities [4].
In this study, a new phthalonitrile with a 4-(trifluoromethoxy)phenoxy group was synthesized and the corresponding tetrasubstituted indium phthalocyanine was prepared. The structures of all these original compounds were characterized by using FT-IR, UV-Vis, Mass, ^{13}C- and ^{1}H-NMR spectroscopic data.

Acknowledgements:
This work was supported by TUBITAK (Project Number: 115R030).

Keywords: trifluoromethoxy, phthalonitrile, indium phthalocynine.
General area of research: Chemistry
ICFAS2018-ID: 1055

[1] Leznoff CC, Lever ABP. Phthalocyanines properties and applications, 1989, 1-4.
[2] Kadish K, Smith KM, Guilard R, editors. The porphyrin handbook, 15-20.
[3] Emre Güzel, Armagan Atsay, and et al., Dyes and Pigments, 2013, 97, 238-243.
[4] Njemuwa Nwaji, Benjamin Jones, and et al., Journal of Photochemistry and Photobiology A: Chemistry,2017, 346, 46–59.

A NEW TYPE OF TETRASUBSTITUTED ZINC PHTHALOCYANINE CONTAINING 3,5 -BIS(TRIFLUOROMETHYL)PHENOXY GROUPS AT PERIPHERAL POSITIONS

Eda Korkmaz, Erem Ahmetali, Hande R. Pekbelgin Karaoğlu, **Makbule Burkut Koçak**

Istanbul Technical University, Department of Chemistry, Istanbul, 34469, Turkey
Email: korkmazed@gmail.com
Istanbul Technical University, Department of Chemistry, Istanbul, 34469, Turkey
Email: Ahmetali.erem@gmail.com
Istanbul Technical University, Department of Chemistry, Istanbul, 34469, Turkey Email:
pekbelgin@itu.edu.tr
Istanbul Technical University, Department of Chemistry, Istanbul, 34469, Turkey
Email: mkocak@itu.edu.tr

Abstract:

Phthalocyanine (Pc) molecules a family of aromatic macrocycles which are useful for a variety of applications. Pc molecules have been traditionally seen interest as dyes and pigments, nowadays they are commerciallyapplied in a vast range of advanced fields encompassing optical limiting devices, photodynamic therapy (PDT), organic field effect transistors (OFETs), organic photovoltaic (OPV) devices, semiconductor devices, molecular electronics, Langmuir-Blodgett films, electrochromic display devices, low-dimensional conductors and synthetic metals, gas sensors, liquid crystals, non-linear optics, optical disks, and electrocatalytic agents [1-4].
The main aim of the present work is the synthesis of new phthalonitrile and its phthalocyanine derivative carrying four 3,5-bis(trifluoromethyl)phenoxy groups at peripheral positions. For this purpose, a novel tetrasubstituted zinc (II) phthalocyanine was synthesized with the cyclotetramerization of 4-(3,5-bis(trifluoromethyl)phenoxy)phtlonitrile. The structures of all these original compounds were identified by using spectroscopic methods.
Acknowledgements:
This work was supported by TUBITAK (Project Number: 115R030)

Keywords: Phthalonitrile, Trifluoromethyl, zinc phthalocynine,
General area of research: Chemisty
ICFAS2018-ID: 1056

1 Leznoff CC, Lever ABP, editors. Phthalocyanines properties and applications, vols. 1-4. Weinheim: VCH; 1989-1996,
2 McKeown, N. B. Phthalocyanine materials: synthesis structure and function, Cambridge University Press, Cambridge 1998,
3 Pekbelgin Karaoğlu H.R., Koca A., Burkut Koçak M., 2012, Synthesis, electrochemical and spectroelectrochemical characterization of novel soluble phthalocyanines bearing chloro and quaternizable bulky substituents on peripheral positions, 92, 1005-1017,
4 Pekbelgin Karaoglu H.R., Gül A., Burkut Koçak, M., 2008, Synthesis and characterization of a new tetracationic phthalocyanine,76, 231-235.

5th International Congress on Fundamental and Applied Sciences 2018 (ICFAS2018)
Proceeding Book

SOLVABILITY OF A MODEL FOR REACTIONS PROCEEDING OVER INHOMOGENEOUS SURFACES

Vladas Skakauskas

Faculty of Mathematics and Informatics, Vilnius University, Naugarduko 24, Vilnius 03225, Lithuania
vladas.skakauskas@mif.vu.lt

Abstract:

We consider a coupled system of nonlinear parabolic PDEs with non-classical boundary conditions. Such equations arise in modelling of chemical reactions between two reactants proceeding over surfaces of the supported catalysts. We proved the existence and uniqueness theorem of classical solutions and studied the long-time behaviour of the solution.

Keywords: Heterogeneous reactions; spillover; surface diffusion
General area of research: Mathematics
ICFAS2018-ID: 1057

5th International Congress on Fundamental and Applied Sciences 2018 (ICFAS2018)
Proceeding Book

SOLVABILITY OF A MODEL FOR SURFACE REACTIONS BETWEEN TWO REACTANTS

Algirdas Ambrazevicius, Vladas Skakauskas

Faculty of Mathematics and Informatics, Vilnius University, Naugarduko 24, Vilnius 03225, Lithuania
algirdas.ambrazevicius@mif.vu.lt
Faculty of Mathematics and Informatics, Vilnius University, Naugarduko 24, Vilnius 03225, Lithuania
vladas.skakauskas@mif.vu.lt

Abstract:

A mathematical model for a surface reaction between two reactants is considered taking into account the surface diffusion of adsorbed particles of both reactants. The model is described by a coupled system of parabolic equations where some of them are defined in a domain and the other ones have to be solved on the domain surface. The existence and uniqueness theorem of a classic solution is proved.

Keywords: coupled parabolic systems; heterogeneous catalysis; reaction-diffusion system
General area of research: Mathematics
ICFAS2018-ID: 1058

ESTIMATION OF WIND CHARACTERISTICS FOR İSTANBUL CITY USING RAYLEIGH DISTRIBUTION METHOD

Ahmet Çağlar, **Sertaç Görgülü**

Akdeniz University, Faculty of Engineering, Antalya 07058, Turkey
acaglar@akdeniz.edu.tr
Mehmet Akif Ersoy University, Faculty of Engineering and Architecture, Burdur 15030, Turkey
sgorgulu@mehmetakif.edu.tr

Abstract:

A number of statistical methods are used to determine the wind energy potential of a certain region. One of these methods is the Rayleigh distribution function. Using Rayleigh distribution function, wind characteristics such as average wind blowing frequency and wind power density can be estimated. Many studies on wind energy potential are performed by researchers for different regions in Turkey. In this study, the mean wind speed frequency density and wind power density for İstanbul city are determined by using Rayleigh distribution function with the help of the data obtained from the corresponding station of the General Directorate of Meteorology. Estimating the wind energy potential of İstanbul region, it is discussed whether the establishment of a possible wind energy plant for İstanbul would be feasible or not.

Keywords: Wind speed, Wind power, Rayleigh distribution, Meteorological data, Wind estimation.
General area of research: Renewable Energy
ICFAS2018-ID: 1060

5th International Congress on Fundamental and Applied Sciences 2018 (ICFAS2018)
Proceeding Book

ACCELERATION WAVES IN A NONLINEAR BIOT THEORY OF POROUS MEDIA

Michele Ciarletta, Brian Straughan, **Vincenzo Tibullo**

Università di Salerno, via Giovanni Paolo II 132, 84084 Fisciano, Italy
mciarletta@unisa.it
Durham University, Stockton Road, Durham, DH1 3LE, United Kingdom
brian.straughan@durham.ac.uk
Università di Salerno, via Giovanni Paolo II 132, 84084 Fisciano, Italy
vtibullo@unisa.it

Abstract:

There is much interest in the propagation of waves in porous and acoustic media. This interest is driven by the many real life applications this topic has.
Many of the early articles dealing with wave propagation in porous media were based on linear theories developed by Biot, see [1].
To develop a fully nonlinear theory of acoustic wave propagation in a porous medium Jordan used what may be termed an equivalent fluid theory and showed that we could analyze such propagation in a completely nonlinear framework by using an acceleration wave analysis. These works assume the solid skeleton remains stationary.
In order to accommodate nonlinear wave motion in a porous medium with the skeleton allowed to deform or vibrate, two approaches have been employed. One is to employ a theory of a mixture of a fluid and of a solid. The other is to employ a theory of nonlinear elasticity where the body includes voids. Biot [2] is critical of employing a mixture theory approach due to inherent difficulties with interacting continua based on a Eulerian description. He writes such a theory… *lacks the required sophistication to account for all significant and essential properties of porous media*.
In this work we wish to address the issue of nonlinear wave motion in a porous body where we allow the body to undergo a finite deformation with an approach which is consistent with the original linear theory of Biot [1]. In order to achieve this we commence with work of Biot [2] where he develops a fully nonlinear theory for a porous medium by incorporating an equation for the pressure inside the pores in the material. Biot presents his theory in the quasi-static and isothermal context, and in particular he neglects the acceleration term in the momentum equation for the elastic body. However, he writes that his theory brings the mechanics of porous media… *to the same level of development of the classical theory of finite deformations in elasticity*. In this paper we generalize Biot [2] work and include the acceleration into the momentum equation.

Keywords: acceleration waves, porous media, nonlinear deformations
General area of research: Mathematics, Mathematical Physics
ICFAS2018-ID: 1064

[1] M. Biot, J. Acoust. Soc. Am. 34 (9A) (1962) 1254–1264.
[2] M. Biot, Indiana Univ. Math. J. 21 (7) (1972) 597–620.

AN ANALYSIS FOR SECTORAL DEVELOPMENT AND VALUE ADDING OF THE LARGEST COMPANIES

Ahmet Yucekaya

Industrial Engineering Department, Faculty of Engineering and Natural Sciences,
Kadir Has University, Istanbul, Turkey
ahmety@khas.edu.tr

Abstract:

The value generation in an industry, sector and company is an important parameter for the development. The value adding level in each sector also creates extra gains that make companies successful. The economic activities in sectors are coded according to the UN ISIC Rev.2 (UN, 2008) and the sectors are classified. We analyze the data for the 500 largest companies in an effort to observe the regional distribution. The annual data of the largest companies in the country is based on the company performances, sectoral changes, ownership structure and value adding levels are examined below. In order to determine the long time performance, we apply a trend analysis for each sector classifying sectors as rising and falling based on their performances. The data illustrates that the country replaces high value adding sectors with the low value adding ones. The overall results depict that the country is becoming a more industrialized; however, new policies and incentives are needed to increase the value adding in each sector.

Keywords: The largest companies, trend analysis, value adding, sectoral analysis
General area of research: Statistics, economy, development
ICFAS2018-ID: 1065

A COMPARATIVE EVALUATION OF CAR PARKING LAYOUT DESIGN OF URBAN AREAS

Bekir Aktaş[1], **Şevket Aslan[2]**

[1] Department of Civil Engineering, Erciyes University, Kayseri, 38039, Turkey
baktas@erciyes.edu.tr
[2] Department of Civil Engineering, Erciyes University, Kayseri, 38039, Turkey
sevketaslan@erciyes.edu.tr

Abstract:

Car parking areas are getting more important in the urban areas because of the increasing vehicle ownership and mobility. Cars spend almost 80% of the service life parked. However, decision makers of the countries are generally focusing on urban transportation mobility; however, parking issues are being relatively neglected. Especially in the city centers, drivers are not able to find available parking lots due to an inadequate amount of parking areas. To increase parking capacity in public areas, it is significantly important to design parking lots considering area geometries for highest capacity, maneuverability and safety. In this study, car parking layout specifications of various countries were compared in terms of layout geometry. The main objective of the parking design is to maximize the total number of parking lots, taking into account traffic flow, safety for pedestrians and site lighting. Parking angle, vehicle projection, aisle width and bay depth parameters play a crucial role for layout design. 45°, 60°, and 90° angles are the most popular angles for parking areas. In addition, 30° and 75° angles are widely used in some areas. When deciding a proper parking lot angle, the type of business at the area must be significantly considered. 90° angle provides the highest number of parking lots and it is advantageous for long-term parking. Difficulty in entering and exiting the parking lots at the angle of 90° makes it more suitable for all-day parking, such as employee parking. Parking lots of 60° angle are better for short-term parking because of the ease of maneuverability it provides. If there are dimension restrictions for aisles and space, a 45° angle parking lot may be more suitable due to smaller change of direction required to enter and exit the parking lot. However, 45° angle reduces the total number of parking lots. Countries have different parking design specifications about parking angle, vehicle projection, aisle width and bay depth parameters. In general, countries in Europe consider bay dimensions width 2.30 – 2.75 m and length 4.50-5.00 m. according to parking angle for automobiles. For bus and heavy vehicles, more width and length dimensions are required. Countries also are specified the dimension according to vehicle types. These dimensions have important effects on the capacity and safety of the parking area and the type of business in the area should be considered before the design.

Keywords: Parking area, parking lot, capacity, design, geometry
General area of research: Engineering
ICFAS2018-ID: 1066

5th International Congress on Fundamental and Applied Sciences 2018 (ICFAS2018)
Proceeding Book

FOOD PLANTS USED IN ENEZ TOWN FROM EDIRNE

Fatma Güneş

Trakya University, Faculty of Pharmacy, Department of Pharmaceutical Botany Edirne 22100, Turkey.
drgunes@*gmail*.com

Abstract:

This study was performed in villages of Enez in order to determine the vernacular plant names. Face to face interviews were performed with local inhabitant of the villages in 2013 – 2014. The field studies revealed that 53 taxa within 24 families are used as food by people. The most common species consumed as food are *Allium cepa* (soğan), *Allium sativum* (sarımsak), *Beta vulgaris* (pancar), *Capsella bursa-pastoris* (kaşıkçalan, kazdişi), *Cucurbita sp*. (kabak-salatalık), *Mentha sp.* (nane), *Papaver rhoeas* (gelincik), *Portulaca rausii* (semizotu), *Prunus sp.* (erik çeşitleri), *Pyrus sp.* (ahlat), *Rosa canina* (kuşburnu), *Rubus sanctus* (karamık), *Rumex sp.* (kuzuculağı ve labada çeşitleri), *Saturea hortensis* (cubrika), *Stellaria media* (kuşotu), *Thymus sp.* (kekik), *Trapa natans* (çökelek), *Urtica sp.* (ısırgan), *Vitis sp.* (asma-üzüm).

Keywords: Etnobotany, Food Plants, Turkey, Enez
General area of research: Biology
ICFAS2018-ID: 1067

5th International Congress on Fundamental and Applied Sciences 2018 (ICFAS2018)
Proceeding Book

SPOILERED PIPELINE NEAR A RIGID BED

Ahmet Alper ÖNER

Professor Dr., Erciyes University Engineering Faculty Civil Engineering Department, Kayseri 38280, TURKIYE
alperoner@erciyes.edu.tr

Abstract:

The effect of the spoiler attached to a pipeline near a rigid bed is investigated numerically at Reynolds number RE_D=9500 with gap ratio G/D=0.2. Governing equations solved by CFD program package Ansys-11.0 and the performance of the SST turbulence closure model with different mesh compositions is carried out. The computational velocity fields and the flow area are compared with the experimental results obtained from PIV measurements. The effect of the spoiler to flow area is examined both numerically and experimentally. The comparisons show that the computed time averaged velocity field and the flow area around the pipeline found to be good agreement with data obtained from experiments.

Keywords: Spoiler, Pipeline, CFD, Flow Area
General area of research: Engineering Applications
ICFAS2018-ID: 1068

POLLEN MORPHOLOGY OF SOME TAXA OF VICIA L. SUBGENUS VICILLA (SCHUR) ROUY (FABACEAE) FROM TURKISH THRACE

Çiler Kartal, Necmettin Güler, İhsan Yalçın

Trakya University, Faculty of Science, Department of Biology, Balkan Campus, Edirne 22030, TURKEY
cilermeric@trakya.edu.tr
nguler@trakya.edu.tr
ihsanyalcin011@gmail.com

Abstract:

In this study, pollen morphologies of 10 taxa belonging to the subgenus *Vicilla* (Schur) Rouy of the genus *Vicia* L. (Fabeae, Fabaceae), [*V. cracca* L. subsp. *cracca*, *V. cracca* L. subsp. *gerardii* Gaudin, *V. cracca* L. subsp. *stenophylla* Vel., *V. cracca* L. subsp. *tenuifolia* (Roth) Gaudin, *V. hirsuta* (L.) S.F.Gray, *V. parviflora* Cav., *V. tetrasperma* (L.) Schreb., *V. villosa* Roth subsp. *dasycarpa* (Ten.) Cav., *V. villosa* Roth subsp. *eriocarpa* (Hausskn.) P.W. Ball, *V. villosa* Roth subsp. *Villosa*], naturally growing in European Turkey (Turkish Thrace) were studied using Light Microscopy (LM) and Scanning Electron Microscopy (SEM). The general palynological characteristics of the selected members of the subgenus were investigated. Pollen type is 3-zonocolparatae, pollen shapes are prolate or subprolate, exine ornamentation psilate, rugulate, and reticulate, and pollen structure is tectate. *V. cracca* subsp. *stenophylla* with subprolate (P/E = 1.2451) pollen shape is separated from the other taxa. *V. villosa* subsp. *eriocarpa* was found to be the taxa with the longest pollen grains with respect to the polar axis (P = 37.3 µm; E = 23.5 µm) while *V. cracca* subsp. *stenophylla* has the largest pollen grains in terms of the equatorial axis (P = 32.0 µm; E = 25.7 µm). *V. parviflora* has the smallest pollen grains (P = 25.5 µm; E = 17.7 µm) in terms of the polar axis and the equatorial diameter. Colpus length (Clg) ranges from 18.3 µm (in *V. hirsuta*) to 23.5 µm (in *V. villosa* subsp. *dasycarpa*). Porus length (Plg) ranges from 5.2 µm (in *V. hirsuta*) to 8.5 µm (in *V. cracca* subsp. *stenophylla*). Ornamentation of the mesocolpium is psilate in *V. cracca* subsp. *gerardii*, rugulate in *V. cracca* subsp. *stenophylla* and *V. cracca* subsp. *tenuifolia* and reticulate in the remaining taxa. In conclusion, palynological properties of the taxa investigated showed that shapes, sizes and exine ornamentation features have different characteristics for each taxon other and morphological features of the pollens could be useful in distinguishing the studied taxa.

Keywords: *Vicia*; *Vicilla*; Fabaceae; Pollen morphology; Turkey
General area of research: Biology
ICFAS2018-ID: 1071

EVALUATION OF CUT SLOPE STABILITY USING TWO DIFFERENT COMPUTER PROGRAMS

Zülküf Kaya, Erdal Uncuoğlu, Aykut Erol and Cengiz Duran Atiş

Assoc. Prof., Erciyes University, Engineering Faculty Civil Eng. Department, Kayseri, 38280, TURKEY
zkaya@erciyes.edu.tr
Assoc. Prof., Erciyes University, Engineering Faculty Civil Eng. Department, Kayseri, 38280, TURKEY
erdalu@erciyes.edu.tr
Res. Assist., Erciyes University, Engineering Faculty Civil Eng. Department, Kayseri, 38280, TURKEY
aykuterol@erciyes.edu.tr
Professor, Erciyes University, Engineering Faculty Civil Eng. Department, Kayseri, 38280, TURKEY
cdatis@erciyes.edu.tr

Abstract:

A stability evaluation should be assessed for cut, man-made slopes, and natural slopes whose gradient exceeds two horizontal to one vertical (2:1). The present article mainly deals with the analysis of the stability of cut slopes for a Service Building, located in Izmir, Turkey. Izmir is in the first-degree hazard zone in the official Earthquake Hazard Map of Turkey. Therefore, analyses were performed for seismic loads. Pseudostatic analysis is one of the simplest approaches used in geotechnical earthquake engineering to analyze the seismic response of slopes. The slopes have been evaluated for safety factor at least 1.3 against seismic failure.

Field studies were carried out at site of construction. Laboratory experiments were conducted to determine the various index and engineering properties of soils. These test results have been used as input parameters for the stability analyses of slope using Geo5 and Slope/W computer programs.

Peak ground acceleration for city of Izmir is taken from MSc thesis prepared by Krister Moberg. Horizontal and vertical pseudostatic (seismic) coefficients, kh and kv, respectively, were computed for horizontal and vertical forces caused by a potential earthquake. Horizontal and vertical seismic coefficients, respectively, are taken ½ of PGA and 2/3 of PGA for analysis.

The factor of safety determined was found to be in the ranges from 1.17 to 1.22, and from 1.299 to 1.312 via Geo5 and Slope/W software for 3:1 slope value, respectively. Therefore, 3:1 slope value was not found to be sufficient. The required factor for safety factor value of 1.3 was achieved for 2:1 slope (h/v) value. This value was found to be appropriate. Therefore, for this case, the factor of safety was determined in the ranges from 1.47 to 1.58 and from 1.319 to 1.417 at Geo5 and Slope/W software for 3:1 slope, respectively.

Keywords: Cut slope, Slope stability, Geo5, Slope/W,
General area of research: Engineering Applications
ICFAS2018-ID: 1074

5th International Congress on Fundamental and Applied Sciences 2018 (ICFAS2018)
Proceeding Book

PERFORMANCE ANALYSIS AND CONTROL OF THE FLOW OVER NACA 0012 AIRFOIL

Mustafa Can Güçlü, Selin Aradag

TOBB University of Economics and Technology, ETU Hydro Lab., Sogutozu cad No:43, Ankara, 06560 Turkey
m.can.gcl@gmail.com
TOBB University of Economics and Technology, ETU Hydro Lab., Sogutozu cad No:43, Ankara, 06560 Turkey
saradag@etu.edu.tr

Abstract:

Aerodynamic performance of airfoils is an important research area in Fluid Mechanics. Due to the energy efficiency considerations of industrial branches such as aviation and automotive, better aerodynamic characteristics are desired when dealing with external flows.

Flow control techniques are employed in order to reduce the stall effect which is caused by the flow separation and the drag force resisting the motion of the body immersed in the fluid, to enhance the convective heat transfer or to accomplish improvement on any other desired physical phenomenon linked to fluid flow.

In the scope of this research, flow over NACA 0012 airfoil for a Mach number of 0.15 is investigated with the help of Computational Fluid Dynamics (CFD) analyses and the results of the baseline case are validated with experiments. Once stall angle is determined for the baseline case, momentum addition inside the boundary layer from the point at which the flow separation starts, is applied as a predetermined, active flow control method: jet blowing. Blowing inside the boundary layer delays the separation and increases maximum lift coefficient, as well as decreasing the drag coefficient.

Keywords: Aerodynamics, CFD, separation, flow control, jet blowing.
General area of research: Fluid Mechanics
ICFAS2018-ID: 1075

OBJECT USAGE IN C PROGRAMMING LANGUAGE

Mirsat Yeşiltepe, Muhammet Kurulay

Yildiz Technical University, Department of Mathematical Engineering, 34220 Esenler - İstanbul, Turkey
mirsaty@yildiz.edu.tr
Yildiz Technical University, Department of Mathematical Engineering, 34220 Esenler - İstanbul, Turkey
mkurulay@yildiz.edu.tr

Abstract:

C programming language utilization rate in Turkey is very little (not among the top 10 languages) but it is the second most widely used programming language in the world [1] [2]. In this work, it will be explained how the programming concepts for object in C language are used [3]. Some of the subheadings to be processed are pointer casting, strict aliasing and polymorphism.

Keywords: Thread, restrict keyword, apaque pointer
General area of research: Computer Science
ICFAS2018-ID: 1076

References

[1] Kara, Merve. "Türkiye'de en popüler programlama dilleri ve diğer geliştirici istatistikleri." Webrazzi. March 02, 2016. Accessed February 03, 2018. https://webrazzi.com/2016/03/02/turkiyede-en-populer-olan-programlama-dilleri-ve-diger-gelistirici-istatistikleri/.
[2] "Most Popular and Influential Programming Languages of 2018." Stackify. December 18, 2017. Accessed February 03, 2018. https://stackify.com/popular-programming-languages-2018/.
[3] Reese, Richard. Understanding and Using C Pointers. OReilly Media, 2013.

5th International Congress on Fundamental and Applied Sciences 2018 (ICFAS2018)
Proceeding Book

ON THE RIORDAN ARRAYS WITH APPLICATIONS IN SOME SPECIAL NUMBERS

F. Yesil Baran, C. Kizilateş, M. Cetin Firengiz, N. Tuglu

Department of Computer Engineering, Amasya University, 05100, Amasya-Turkey
ftm1618ysl@gmail.com
Department of Mathematics, Bulent Ecevit University, 67100 Zonguldak-Turkey
cankizilates@gmail.com
Department of Mathematics Education, Baskent University, Baglıca 06810 Ankara-Turkey
mcetin@baskent.edu.tr
Department of Mathematics, Gazi University, 06500 Ankara-Turkey
tuglunaim@gmail.com

Abstract:

In this paper, by aid of Riordan array we get some the known generating function formulas of harmonic Fibonacci and hyperharmonic Fibonacci numbers. Using these generating functions with the help of the Riordan arrays, a variety of identities for these numbers are derived. Finally, we point out some formulas for these numbers.

Keywords: Hyperharmonic numbers: Hyperharmonic Fibonacci numbers: generating functions: Riordan arrays.
General area of research: Mathematics
ICFAS2018-ID: 1077

5th International Congress on Fundamental and Applied Sciences 2018 (ICFAS2018)
Proceeding Book

A SYMMETRIC ALGORITHM FOR SOME SPECIAL NUMBERS

C. Kizilateş, **F. Yesil Baran**, M. Cetin Firengiz, N. Tuglu

Department of Mathematics, Bulent Ecevit University, 67100 Zonguldak-Turkey
cankizilates@gmail.com
Department of Computer Engineering, Amasya University, 05100, Amasya-Turkey
ftm1618ysl@gmail.com
Department of Mathematics Education, Baskent University, Baglıca 06810 Ankara-Turkey
mcetin@baskent.edu.tr
Department of Mathematics, Gazi University, 06500 Ankara-Turkey
tuglunaim@gmail.com

Abstract: In this study, we examine a symmetric algorithm obtained by the recurrence relation $a_n^k = a_{n-1}^k + a_n^{k-1}$. We point out that this algorithm can be applied to Fibonacci numbers, hyper-Fibonacci numbers, hyperharmonic numbers and hyperharmonic Fibonacci numbers. Using these method, we give some algebraic properties of these numbers.

Keywords: Fibonacci numbers: Hyperharmonic numbers: matrix algorithm: symmetric infinite matrix method
General area of research: Mathematics
ICFAS2018-ID: 1078

MULTI-HOP INTRA CLUSTER RELAYING APPROACH FOR WSNs

Korhan Cengiz

Department of Telecommunications, Trakya University, Prof. Dr. Ahmet Karadeniz Yerleskesi, Trakya Üniversitesi, Edirne, 22030, Turkey
korhancengiz@trakya.edu.tr

Abstract:

Because of the limited supply of energy of the sensor nodes, the lifetime of wireless sensor networks (WSNs) has become a challenging research area. Studies have shown that instead of implementing direct transmission or multi-hop routing, clustering can significantly improve the total energy wastage and lifetime of a wireless sensor network. For this reason, the LEACH and LEACH based protocols have become traditional single-hop cluster based protocols. In this work, multi-hop intra cluster relaying (MHICR) approach which can further extend the lifetime of the network, decrease the energy consumption and increase the throughput significantly is proposed. With MHICR, the lifetime of a wireless sensor network is increased significantly and the throughput is approximately quadrupled while reducing the energy dissipation when compared to LEACH and MODLEACH.

Keywords: Clustering, energy efficiency, routing protocols, wireless sensor networks
General area of research: Electrical-Electronics Engineering
ICFAS2018-ID: 1080

COMPARISON OF OPEN SOURCE AND COMMERCIAL SOFTWARE SIMULATION RESULTS FOR SUPERSONIC CAVITY FLOW

Elcin Ceren Yaldir, Kubra Asena Gelisli, Mehmet Bulent Ozer, Yigit Tascioglu, Selin Aradag

TOBB University of Economics and Technology, ETU Hydro, Sogutozu cad. No:43 Ankara/TURKEY
elcinyaldir@gmail.com
TOBB University of Economics and Technology, ETU Hydro, Sogutozu cad. No:43 Ankara/TURKEY
k.asenagelisli@gmail.com
TOBB University of Economics and Technology, ETU Hydro, Sogutozu cad. No:43 Ankara/TURKEY
ozerb@metu.edu.tr
TOBB University of Economics and Technology, ETU Hydro, Sogutozu cad. No:43 Ankara/TURKEY
ytascioglu@etu.edu.tr
TOBB University of Economics and Technology, ETU Hydro, Sogutozu cad. No:43 Ankara/TURKEY
saradag@etu.edu.tr

Abstract:

The main focus of this research is high speed flow over open cavities. Internal carriage of stores on aircrafts is modeled as a rectangular cavity, which is crucial from an engineering perspective, since internal carriage of bombs and stores decreases the radar signature of the aircraft and aerodynamic heating. Supersonic flow through an open cavity can cause extremely complex flow characteristics. In the cavity region, flow field is compressible, unsteady and turbulent, so it is quite important for aerospace applications to be able to predict the nature of the flow and the characteristics over time, mostly to be able to control it during flight.
In this study, supersonic open cavity flow simulations are performed with commercial and open source software, separately, in order to compare the simulation results and determine the capabilities and limits of OpenFOAM for supersonic flow as an open source software. Unsteady, compressible and time dependent flow conditions are utilized. Simulation results are compared by considering sound pressure levels on cavity walls, Fast Fourier Transform (FFT) results and pressure fluctuations for the time dependent nature of the flow. The simulation results are also compared with experimental data in terms of sound pressure levels on the bottom wall of the cavity geometry. The effects of numerical scheme, time discretization, tolerance and residual restrictions on the results are investigated, as well. According to simulation results, the results for supersonic flow over a rectangular cavity are very close to experimental findings with OpenFOAM when compared to commercial ANSYS-Fluent software, which makes open source codes promising for supersonic flows.
This research is financially supported by Turkish Aerospace Industries (TAI) and the computations are performed using the facilities of TOBB ETU Hydro Energy Research Laboratory (ETU Hydro).

Keywords: Supersonic cavity flow: Open source software: Computational Fluid Dynamics
General area of research: Fluid Mechanics
ICFAS2018-ID: 1081

THE CONCENTRATION DEPENDENCE OF THE INHIBITION EFFICIENCY OF SODIUM TETRABORATE FOR STEEL CORROSION IN ALKALINE MEDIA

Gül Seda Öz, **Semra Bilgiç**

Ankara University Faculty of Science , Department of Chemistry , 06100 ,
Beşevler- Ankara- Turkey
bilgic@science.ankara.edu.tr

Abstract:

Corrosion is the degradation of metals and alloys by chemical and electrochemical reaction. A characteristic sample of corrosion can be given the formation of rust on iron and steel. Corrosion is unwanted phenomenon because it causes several accidents and economic losses.
There are several methods to prevent and /or reduce corrosion such as painting, cathodic protection, anodic protection , adding chemical compounds called inhibitors. Inhibitors can be inorganic and organic compounds.
In this study inhibition effect of sodium tetraborate ($Na_2B_4O_7.10.H_2O$) on the corrosion of steel has been investigated in 3 % and 5% KOH. Corrosion parameters have been determined using Tafel extrapolation and impedance spectroscopy methods by the adding of 1%-7% $Na_2B_4O_7$ in two KOH concentrations. According to the experimental findings the inhibition efficiency of $Na_2B_4O_7$ in both KOH media increases in 1%-4% concentration range whereas it decreases in 5%-7% concentration range.

Keywords: alkaline media
General area of research: Chemistry
ICFAS2018-ID: 1082

5th International Congress on Fundamental and Applied Sciences 2018 (ICFAS2018)
Proceeding Book

GENETIC ALGORITHMS FOR SOLVING THE WELL-KNOWN AGGREGATE PRODUCTION PLANNING PROBLEM OF RED TOMATO TOOLS

Çağrı Sel

Industrial engineering department, Karabük University, 78050, Karabük/Turkey
cagrisel@karabuk.edu.tr

Abstract:

In this study, we deal with an aggregate production planning problem. We introduce a generic mathematical model and propose a genetic algorithm. We compare the results between the two approaches and observe that the proposed genetic algorithm optimises the solutions within a reasonable computation time for industrial problem sizes. The proposed general form genetical algorithm can be implemented as a decision support tool at tactical planning level in manufacturing industries.

Keywords: Supply chain management, tactical level decisions, aggregate production planning, evolutionary optimisation algorithms, metaheuristics and genetic algorithms.
General area of research: Engineering applications, Supply chain management
ICFAS2018-ID: 1083

5th International Congress on Fundamental and Applied Sciences 2018 (ICFAS2018)
Proceeding Book

SOLUTION OF THE FRACTIONAL VOLTERRA INTEGRODIFFERENTIAL EQUATIONS BY LAGUERRE POLYNOMIALS

Dilek Varol Bayram, Ayşegül Daşcioğlu

Department of Mathematics, Faculty of Science and Arts, Pamukkale University, Denizli, 20070, Turkey
dvarol@pau.edu.tr
aakyuz@pau.edu.tr

Abstract:

The main purpose of this study is to present an approximation method based on the Laguerre polynomials to obtain the solutions of the fractional linear Volterra integrodifferential equations. This method transforms the integrodifferential equation to a system of linear algebraic equations by using the collocation points. In addition, the matrix relation for Caputo fractional derivative of Laguerre polynomials is also obtained. Besides, some examples are presented to illustrate the accuracy of the method and the results are discussed.

Keywords: Volterra integrodifferential equations, Laguerre polynomials, Fractional integrodifferential equations
General area of research: Mathematics
ICFAS2018-ID: 1086

5th International Congress on Fundamental and Applied Sciences 2018 (ICFAS2018)
Proceeding Book

A METHOD FOR CONFORMABLE FRACTIONAL FREDHOLM INTEGRODIFFERENTIAL EQUATIONS

Dilek Varol Bayram, Ayşegül Daşcioğlu

Department of Mathematics, Faculty of Science and Arts, Pamukkale University, Denizli, 20070, Turkey
dvarol@pau.edu.tr
aakyuz@pau.edu.tr

Abstract:

In this study, we present approximate solutions of the conformable fractional linear Fredholm integrodifferential equations in terms of Laguerre polynomials. By this method, we transform the integrodifferential equation to a system of linear algebraic equations by using the collocation points. In addition, we derive the matrix relation for conformable fractional derivative of Laguerre polynomials. Besides, some examples are presented to illustrate the accuracy of the method and the results are discussed.

Keywords: Fredholm integrodifferential equations, Laguerre polynomials, Fractional integrodifferential equations
General area of research: Mathematics
ICFAS2018-ID: 1087

INVESTIGATION OF MICELLIZATIONS (WITH ETHYLENE GLYCOL) AND ANTI-UREASE ACTIVITY OF AN AMIDO BASED CATIONIC GEMINI SURFACTANT

İkbal Sarikaya, **Fulya Öz Tuncay**, Selçuk Bilgen

Karadeniz Technical University, Faculty of Science, Department of Chemistry, Trabzon, 61080, Turkey
ikbal.sarikaya@ktu.edu.tr
Karadeniz Technical University, Faculty of Science, Department of Chemistry, Trabzon, 61080, Turkey
fulyaoz@ktu.edu.tr
Karadeniz Technical University, Faculty of Science, Department of Chemistry, Trabzon, 61080, Turkey
selcukbilgen@ktu.edu.tr

Abstract:

Gemini surfactants are made up of two identical amphiphilic moieties covalently connected at the level of head groups by a spacer. Presence of organic solvents in aqueous micellar solution alters the tendency of the surfactant molecules to keep away the contact from the bulk phase and, as a result, it is expected to affect the various micellization parameters such as critical micelle concentration (CMC), degree of counterion dissociation (α), average aggregation number (N_{agg}), etc. This work aims to determine the micellization of a cationic gemini surfactant (*N,N'-bis[3-(dodecanoylamino)propyl]-N,N,N',N'-tetramethylhexane-1,6-diaminium dibromide*) with various concentrations (10%, 20%, 30% v/v) of ethylene glycol (EG) at five different temperatures ranging from 303.15 K to 323.15 K by using the conductivity measurements. Both the addition of EG and rise in temperature result in an increase in the CMC and α. As a result the CMC values of the mixtures are higher than the values of the pure surfactant. Urease is known to be one of the major causes of diseases induced by *Helicobacter pylori*, thus play an important role in the pathogenesis of gastric and peptic ulcer, apart from cancer as well. Keeping in view the great importance of urease inhibitors, here in this study we also investigate the urease inhibitory potential of this surfactant. The gemini surfactant was tested for its *in vitro* urease inhibition against *jack bean urease*. Indophenols method was used for the quantification of ammonia and the enzyme activity was determined by measuring its absorbance at 625 nm. The activity was expressed as percent relative activity with respect to maximum activity, which was accepted as 100%. The gemini surfactant showed excellent inhibitory potential with IC_{50} value of 0.18μM ±0.05, when compared with the standard inhibitor thiourea (IC_{50}=21.20 μM).

Keywords: Critical micelle concentration, gemini surfactant, urease, inhibition
General area of research: Chemistry
ICFAS2018-ID: 1088

GALVANIC CORROSION

Semra Bilgiç

Ankara University Faculty of Science , Department of Chemistry , 06100 ,
Beşevler- Ankara- Turkey
bilgic@science.ankara.edu.tr

Abstract:

Corrosion can be defined as the deteoration of metals and alloys due to a interaction with their environments. There are several types of corrosion such as general corrosion , galvanic corrosion, pitting corrosion , intergranular corrosion , atmospheric corrosion.
Galvanic corrosion, also known as bimetallic corrosion, is an electrochemical process which occurs when two different metals are immersed in electrolytic solution due the difference of electrode potentials of dissimilar metals. One of the metals is anode and other is cathode in the couple. Metals and alloys have different electrode potentials. The less noble metal is anode tends to corrode faster than cathode. The electrolyte acts as a conductive noble metal is protected. Several factors affect galvanic corrosion rate, such as potential difference between metals , cathode efficiency, surface areas of the connected metals , electric resistance difference of the connected metals and electrolyte. When a metal is in contact with a metal which is close in galvanic series. For example , zinc aluminium couple shows 300mV potential in sodium chloride solution whereas zinc copper couple indicates 700 mV. The greater the potential difference , the greater the power to conduct galvanic corrosion**.**

Keywords: alkaline media
General area of research: Chemistry
ICFAS2018-ID: 1089

ANALYSIS AND SOLUTION METHODS FOR SERVICE DISRUPTION IN AUTOMATION SYSTEMS

Uğur Talaş, Salim Ceyhan

Institute of Science, Computer Engineering, Bilecik Şeyh Edebali University
Bilecik, TURKEY
ugur.talas@bilecik.edu.tr
Department of Computer Engineering, Bilecik Şeyh Edebali University
Bilecik, TURKEY
salim.ceyhan@bilecik.edu.tr

Abstract:

All of the universities have student automation systems in which all of the student's education processes are monitored. It is known that in the course selection week at the start of the semester, these systems or underlying structure usually cannot handle the high traffic and service outages are experienced. In this study, the student information system used in Bilecik Şeyh Edebali University is re-analyzed and service disruption eliminated by optimizing software architecture, SQL query structure and server configuration. MVC architecture is used instead of Web Form architecture in the re-designed system. Design of the front-end is implemented with Bootstrap and pages are designed to be responsive for different window, screen sizes. While analyzing the old system it is seen that most calculations are done in C# back-end and these calculations are moved to client side by using JavaScript. This allowed the calculations to be performed by the student computers instead of web server. Complex database queries that are not depended on each other's results for these calculations are queried in parallel with multi-threading method in order to achieve speed. Typical system delay for an operation to be completed is reduced from 1400ms to 120ms and in return, this eliminated service outage by reducing waiting time in the queue for IIS. In addition to software improvements, a load balancer application is employed in order to distribute the client traffic to four servers with a balancer server in front of them instead of running the software in a single server. Even if high client traffic leads to problems, this method allows the system to operate without service interruption by adding additional worker servers in the load-balancing configuration. The solutions described here for eliminating the service outage for the student automation system can be applied to all automation systems that suffer from same problem due to high volumes of traffic.

Keywords: MVC, Multi-thread, Load Balance, Software Performance, Automation System
General area of research: Computer Engineering / Software Development
ICFAS2018-ID: 1090

SYNTHESIS AND CHARACTERIZATION OF NOVEL IMIDAZOLIUM BASED CATIONIC GEMINI SURFACTANTS

İkbal Sarikaya, Selçuk Bilgen, Yasemin Ünver

Karadeniz Technical University, Faculty of Science, Department of Chemistry, Trabzon, 61080, Turkey
ikbal.sarikaya@ktu.edu.tr
Karadeniz Technical University, Faculty of Science, Department of Chemistry, Trabzon, 61080, Turkey
selcukbilgen@ktu.edu.tr
Karadeniz Technical University, Faculty of Science, Department of Chemistry, Trabzon, 61080, Turkey
yasemincan@ktu.edu.tr

Abstract:

Gemini or dimeric surfactants which are generally made up of two hydrocarbon chains and two head groups linked by a rigid or flexible spacer. In recent years, new classes of surfactants have emerged and have attracted the attention of several industrial and academic groups. Generally, gemini surfactants show better surface properties than the corresponding conventional surfactants. The alkyl tail length, size, structure and type of spacers are known to have effect on their physicochemical and surface properties. In this study three novel imidazolium based cationic gemini surfactants (*) with different alkyl tail length and spacers have been synthesized and purified in our laboratory. To our knowledge, no research has investigated the features of are newly synthesized compounds. The synthesized gemini surfactants are characterized by FTIR, ^{1}H NMR, and ^{13}C NMR analyses. This study has been supported by Scientific and Technological Research Council of Turkey (TUBITAK). Grant Number: 117Z605.

*****
3,3'-butane-1,4-diylbis{1-[3-(dodecanoylamino)propyl]-1H-imidazol-3-ium} dibromide,
3,3'-butane-1,4-diylbis{1-[3-(tetradecanoylamino)propyl]-1H-imidazol-3-ium} dibromide,
3,3'-{ethane-1,2-diylbis[oxy(2-oxoethane-2,1-diyl)]}bis{1-[3-(dodecanoylamino)propyl]-1H-imidazol-3-ium} dibromide

Keywords: Gemini surfactant, synthesis, characterization
General area of research: Chemistry
ICFAS2018-ID: 1093

A NUMERICAL APPROACH FOR FRACTIONAL EQUATIONS

Gül Gözde Biçer Şarlak, Dilara Altan Koç, Ayşe Anapali Şenel,
Yalçın Öztürk, Mustafa Gülsu

Muğla Sıtkı Koçman University Faculty of Science Department of Mathematics, Muğla 48000,TURKEY
gozdebicersarlak@mu.edu.tr
Muğla Sıtkı Koçman University Faculty of Science Department of Mathematics, Muğla 48000,TURKEY
dilaraaltan@mu.edu.tr
Muğla Sıtkı Koçman University Faculty of Science Department of Mathematics, Muğla 48000,TURKEY
ayseanapali@mu.edu.tr
Muğla Sıtkı Koçman University, Ula Ali Koçman Vocational High School, Muğla 48000, TURKEY
yozturk@mu.edu.tr
Muğla Sıtkı Koçman University Faculty of Science Department of Mathematics, Muğla 48000,TURKEY
mgulsu@mu.edu.tr

Abstract:

In this study, a numerical method is given for the solution of fractional damped mechanical oscillator equation defined by ,

$$D_*^{\alpha} y(x) + \lambda D_*^{\beta} y(x) + \nu y(x) = f(x),\ t \in [0,1] \tag{1}$$

$$D_*^{i} y(c) = \lambda_i,\ i = 0,1,...,n-1, \tag{2}$$

where $1 < \alpha \le 2, 0 < \beta \le 1, \alpha - \beta > 1$ and $f(x)$ is the forcing function.
We investigate the approximate solution of Eq.(1) with the fractional truncated Bernoulli series as,

$$y_N(x) = \sum_{n=0}^{N} a_n \mathrm{B}_n^{\alpha}(x) \tag{3}$$

where $0 < \alpha \le 1$.
The aim of this study is to present an efficient numerical procedure for solving fractional damped mechanical oscillator equation. This method transforms fractional damped mechanical oscillator equation and the given conditions into matrix equations which correspond to a system of linear algebraic equations. Finally, some experiments and their numerical solutions are given. The results reveal that this method is reliable and efficient.

Keywords: Damped mechanical oscillator equation, Fractional differential equation, Collocation method, Bernoulli polynomials, Approximate solution
General area of research: Mathematics
ICFAS2018-ID: 1095

A NUMERICAL SOLUTION METHOD FOR A CLASS OF SYSTEM OF DELAY DIFFERENTIAL EQUATIONS

Yalçın Öztürk**, Gül Gözde Biçer Şarlak**, Ayşe Anapali Şenel,
Dilara Altan Koç, Mustafa Gülsu

Muğla Sıtkı Koçman University, Ula Ali Koçman Vocational High School, Muğla 48000, TURKEY
yozturk@mu.edu.tr
Muğla Sıtkı Koçman University Faculty of Science Department of Mathematics, Muğla 48000,TURKEY
gozdebicersarlak@mu.edu.tr
Muğla Sıtkı Koçman University Faculty of Science Department of Mathematics, Muğla 48000,TURKEY
ayseanapali@mu.edu.tr
Muğla Sıtkı Koçman University Faculty of Science Department of Mathematics, Muğla 48000,TURKEY
dilaraaltan@mu.edu.tr
Muğla Sıtkı Koçman University Faculty of Science Department of Mathematics, Muğla 48000,TURKEY
mgulsu@mu.edu.tr

Abstract:

In this study, we presented a numerical algorithm for solving a class of system of delay differential equations defined as,

$$y_j^{'}(t) = f_j(t) + \sum_{s=0}^{n}\sum_{k=0}^{m} P_{sk}^{j}(t)\, y_k(t-q_s)\,,\ \ j = 0,1,\ldots m \tag{1}$$

with conditions

$$y_j(a_j) = \lambda_j\,,\ -1 \le a_j \le 1 \tag{2}$$

where q_s and λ_j are constant and $f_j(t)$ and $P_{sk}^{j}(t)$ are analytic functions.

This algorithm based on polynomial approximation, using the first kind Chebyshev polynomial basis with collocation method. In this article, we construct to the shifted Chebyshev series solutions that is;

$$y_j^N(t) = \sum_{r=0}^{N} a_r^j T_r(t)\,,\ T_r(t) = \cos(r\theta)\,,\ r = \cos\theta \tag{3}$$

where $T_r(t)$ denotes the Chebyshev polynomials of the first kind, a_r^j $(0 \le r \le N)$ are unknown Chebyshev coefficients, and N is chosen any positive integer.

This method transforms the system of delay differential equations and the given conditions into matrix equation which corresponds to a system of linear algebraic equation. To show the validity and applicability of the numerical method some linear experiments are examined. We compare of some numerical values such as maximum absolute errors and condition numbers. The results reveal the high accuracy and efficiency of the proposed method.

Keywords: System of delay differential equations; collocation method; convergence analysis; Chebyshev polynomials
General area of research: Mathematics
ICFAS2018-ID: 1096

COMPARISON OF A SERIES OF CATIONIC GEMINI SURFACTANTS FOR THEIR LIPASE INHIBITION POTENCY

Fulya Öz Tuncay, Selçuk Bilgen, İkbal Sarikaya

Karadeniz Technical University, Faculty of Science, Department of Chemistry, Trabzon, 61080, Turkey
fulyaoz@ktu.edu.tr
Karadeniz Technical University, Faculty of Science, Department of Chemistry, Trabzon, 61080, Turkey
selcukbilgen@ktu.edu.tr
Karadeniz Technical University, Faculty of Science, Department of Chemistry, Trabzon, 61080, Turkey
ikbal.sarikaya@ktu.edu.tr

Abstract:

Obesity is defined as an excessive fat accumulation in the body due to the result of high level of food intake and increasingly becoming a global health threat associated with many metabolic diseases. Pancreatic lipase (PL) which can catalyze the hydrolysis of dietary triglycerides is the key enzyme for lipid absorption. So it is an effective way to prevent obesity by inhibition the activity of lipase in the digestive organs. Orlistat, an inhibitor of PL isolated from the *Streptomyces toxytricini*, is the only authorized anti-obesity drug in Europe, although it has some side effects. Therefore, there is an urgent need for developing new and efficacious substituents to control and prevent obesity. In this study, three novel amide based gemini surfactants with different tail lengths and spacers have been investigated for their lipase inhibition potency against porcine pancreatic lipase (PPL). PL inhibition activities of the surfactants have been determined by using *p*-nitrophenyl palmitate as the substrate and the activity assay has been optimized. Accordingly the optimal pH and temperature found to be 8.0 and 37 °C, respectively. For determining lipase inhibitory activity, the surfactants with different concentrations were pre-incubated with the enzyme for 30 min before assaying the enzyme activity. Negative controls were also applied to check the activity with and without inhibitor. The absorbance has been read at 405 nm using a UV-visible spectrophotometer. The corresponding IC_{50} values and inhibition kinetics have been calculated for each sample and Orlistat was used as a positive control.

Keywords: Gemini surfactant, inhibition, pancreatic lipase, kinetics,
General area of research: Chemistry
ICFAS2018-ID: 1098

ENVIRONMENTAL LITERACY AND PERSONAL DEVELOPMENT CONTRIBUTION OF NATURE EDUCATION

Seyit Baran, Arzu Cansaran, Cengiz Yildirim

Institute of Science, Amasya University, 05100, Amasya-Turkey
seyitbaran40@gmail.com
Department of Mathematics and Science Education, Faculty of Education, Amasya University, Amasya, Turkey
arzu.cansaran@amasya.edu.tr
Department of Basic Education, Faculty of Education, Amasya University, Amasya, Turkey
cyildirim05@gmail.com

Abstract:

At the present time, one of the biggest problems of all mankind is environmental problems. The most fundamental source of environmental problems is human and human behavior. It is of great importance that each individual is educated to be environmental literate in order to provide solutions to environmental problems and leave a livable environment for future generations.
In this study, environmental literacy and personal development contributions of environmental literacy have been examined. The present general aim of environmental education have been mentioned. The role of the ECO schools project, programmed at the european scale, in the awareness of students has been investigated.

Keywords: Environmental literacy: personal development: ECO schools
General area of research: Science Education
ICFAS2018-ID: 1099

DETERMINATION OF CRITICAL MICELLE CONCENTRATIONS AND KRAFFT TEMPERATURES OF A SERIES OF NOVEL IMIDAZOLIUM BASED CATIONIC GEMINI SURFACTANTS

Selçuk Bilgen, **İkbal Sarikaya**, Yasemin Ünver

Karadeniz Technical University, Faculty of Science, Department of Chemistry, Trabzon, 61080, Turkey
selcukbilgen@ktu.edu.tr
Karadeniz Technical University, Faculty of Science, Department of Chemistry, Trabzon, 61080, Turkey
ikbal.sarikaya@ktu.edu.tr
Karadeniz Technical University, Faculty of Science, Department of Chemistry, Trabzon, 61080, Turkey
yasemincan@ktu.edu.tr

Abstract:

Gemini surfactants are recently generating rapid interest due to their remarkably superior properties in comparison to conventional monomeric surfactants. Gemini surfactants are composed of two amphiphilic molecules connected by a spacer group at the level of the head groups. In recent years, several new categories of gemini cationics have been developed and investigated; these include pyridinium-, imidazolium-, pyrrolidinium-, piperidinium- and amino acid- based gemini surfactants. Nowadays; imidazolium gemini surfactants are being widely studied because of their inherent nature and potential applications. Many works have shown that the nature of spacer and length of hydrocarbon tail play an important role on the physicochemical properties. In this study, critical micelle concentrations and krafft temperatures of three novel imidazolium based cationic gemini surfactants have been determined. The krafft temperatures have been found 11.2°C, 15.3°C and 24.6°C. These results show us krafft temperature is effected by tail length and type of spacer. The values of critical micelle concentrations have evaluated from the break points of conductivity versus surfactants concentrations isotherms at different temperatures above the krafft temperatures. All the critical micelle concentration values of imidazolium cationic gemini surfactants have been found lower than monomeric types. This study has been supported by Scientific and Technological Research Council of Turkey (TUBITAK). Grant Number: 117Z605.

Keywords: Critical micelle concentration, krafft temperature, surfactant
General area of research: Chemistry
ICFAS2018-ID: 1100

(N^4Z, $N^{4'}Z$)-N^4,$N^{4'}$-BIS(4-(DIMETHYLAMINO)BENZYLIDENE)-[1,1'-BIPHENYL]-4,4'-DIAMINE SYNTHESIS AND ANTICANCER INVESTIGATIONS

Salih PAŞA, Ömer Erdoğan, Çiğdem YENİSEY, Murat BİNGÜL

Department of Science, Faculty of Education, Afyon Kocatepe University, Afyonkarahisar, 03200, Turkey
salihpasa@aku.edu.tr
Department of Biochemistry, Faculty of Medicine, Adnan Menderes University, Aydın, 09100, Turkey
omererdogan2727@gmail.com
Department of Biochemistry, Faculty of Medicine, Adnan Menderes University, Aydın, 09100, Turkey
cyen2006@yahoo.com
School of Pharmacy, Dicle University, Diyarbakır, 21280, Turkey,
muratbingul1983@gmail.com

Abstract:

In this study, a new imine compound was synthesized with the benzidine compound in the biphenyl structure containing two primary amine groups. The resulting compound is "*(N^4Z,$N^{4'}Z$)-N^4,$N^{4'}$-Bis(4-(Dimethylamino) Benzylidene)-[1,1'-Biphenyl]-4,4'-Diamine*". This compound is characterized by various spectroscopic techniques. The structure, also called Schiff base, is commonly used as precursors in many organic-inorganic based synthesis experiments. It still maintains its application areas in the preparation of some medicines, in the production of antimicrobial applications, in the production of stain materials, in electronics industry, in plastic industry, in agriculture, cosmetics and polymer production. In biological studies, these compounds can kill cancer cells by interacting their composition structures such as enzymes, proteins, and DNA. Raja et al. (2012) have found that these compounds can bind to calf thymus DNA very well by synthesizing the Co complex with the imine ligand containing N and O atoms. They also reported that these compounds exhibited good cytotoxic effects on skin cancer and cervical cancer cells. The anticancer property of the compound was investigated. As seen from our research, the novel imine compound has killed the cancer cells beginning from 100 mM concentration. The % cell viability was found 83 %, 63 %, 36 %, 27 % for corresponded concentrations such 100, 200, 400, and 600 mM, respectively. Also cell death (%) was found as 18, 37, 64, and 73, respectively. IC_{50} values were found as 245.79 mM for 24 h. At 100, 200, 400, and 600 mM concentrations the cell viability was found % 71, 67, 15, 10, respectively. Also cell dead was found as 29, 33, 85, 90, respectively. IC_{50} values was found as 288.74 mM for 48 h. Taken together, it was need to research new doses which under IC_{50} values, by the way we have to find the minimal doses which will affect onto tumor cells. Within the results obtained, the relevant compound has shown a positive result by killing 56% of the Ishikawa endometrial cancer cells. It has been understood that cancer cells were killed programmatically by dying through the apoptosis procedure. The fact that the synthesized imine compound exerts an

influence on the cancer cells demonstrates the continued importance of these constructs on anticancer applications.

Keywords: Benzidine: Imine Compound: Anticancer
General area of research: Chemistry
ICFAS2018-ID: 1102

SYNTHESIS, CHARACTERIZATION AND CYTOTOXIC EFFECTS ON ISHIKAWA ENDOMETRIAL CANCERS OF THIO-IMINE BASED BORONIC ACID COMPOUND

Salih Paşa, Ömer Erdoğan, Çiğdem Yenisey, Murat Bingül

Department of Science, Faculty of Education, Afyon Kocatepe University, Afyonkarahisar, 03200, Turkey
salihpasa@aku.edu.tr
Department of Biochemistry, Faculty of Medicine, Adnan Menderes University, Aydın, 09100, Turkey
omererdogan2727@gmail.com
Department of Biochemistry, Faculty of Medicine, Adnan Menderes University, Aydın, 09100, Turkey
cyen2006@yahoo.com
School of Pharmacy, Dicle University, Diyarbakır, 21280, Turkey
muratbingul1983@gmail.com

Abstract:

Treatment methods used in cancer include radiotherapy, chemotherapy, hormone assisted immunotherapy and surgical operations. The most common among these is chemotherapy. It is aimed that chemotherapeutic agents have cytotoxic, apoptotic and antiangiogenic effects on cancer cells to prevent the spread of cancer. The greatest obstacle of this treatment approach is resistance of cancer cells against chemotherapeutic compounds. Drug resistance comes from a rapid adaptation process to the drug damage of cancer cells. Since most of the chemotherapeutic agents are toxic on healthy cells and tissues and the cancerous tissues resist over time, studies on new chemotherapeutic agents continue intensively.

In this work, thio-imine-boronic structure was obtained from the reaction of formyl boronic acid with sulfur containing organic structure. Structure is called as *"(((1Z,1'Z)-(((ethane-1,2-diylbis(sulfanediyl))bis(2,1-phenylene))bis(azanylylidene))bis(methanylylidene))bis(4,1-phenylene))diboronic acid*". This organic-inorganic based structure is characterized by FTIR, ^{1}H NMR, TGA, SEM-EDX. Subsequently, cytotoxic and apoptotic effects on Ishikawa endometrial cancer cells were investigated within the scope of biological research. According to our research the compound has killed the cells beginning from 100 mM concentration. And also for 100, 200, 400, and 600 mM concentrations, the % cell viability was found 52 %, 26 %, 27 %, 24 %, respectively. Also cell death (%) was found as 48, 74, 73, 76, respectively. IC_{50} values was found as 135.032 mM for 24 h. After 48 hours we couldn't detect any cells in the wells. The % cell viability was found as 0.17, 0.09, 0.09, 0.08 which are nearest the blank well. As a result, the compound has killed 76 % of cancer cells over programmed cell death, not by necrosis.

Keywords: Boronic Acid: Thio-Imine: Ishikawa Endometrial Cancers
General area of research: Chemistry
ICFAS2018-ID: 1103

SYNTHESIS OF IRON COMPLEXES OF NEW QUINOLINE AND INDOLE THIOSEMICARBAZONE SYSTEMS AND INVESTIGATION OF ANTIOXIDANT ACTIVITIES.

Murat Bingül, Mehmet Boga, Salih Paşa

School of Pharmacy, Department of Pharmaceutical Chemistry, Dicle University, Diyarbakır, 21280, Turkey
murat.bingul@dicle.edu.tr
School of Pharmacy, Department of Pharmaceutical Technology, Dicle University, Diyarbakır, 21280, Turkey
mehmet.boga@dicle.edu.tr
Department of Science, Faculty of Education, Afyon Kocatepe University, Afyonkarahisar, 03200, Turkey
salihpasa@aku.edu.tr

Abstract:

For many years, thiosemicarbazones and their metal complexes have been the subject of most structural and medicinal studies and it was found that these compounds have shown a wide variety of biological activities, namely antiviral, antibacterial, antifungal antioxidant and anticancer [1]. The most important metal complexes derived from the thiosemicarbazone systems have been identified as iron metal complexes and these complexes have shown a high potential antioxidant activity [2]. Recently, an intense research has been subjected to design and synthesize for new iron chelators in the literature. The structural modifications on the ligand systems have revealed that the heterocyclic compounds condensed with the thiosemicarbazides are important molecules for the development of potent biologically active scaffolds.

Quinoline and indole moieties are pharmacologically valuable scaffolds that are prevalent in a variety of biologically active natural and synthetic compounds [3,4]. Throughout the 20th century, the chemistry of quinoline and indole compounds have been the subject of intense study and different classes of quinoline and indole systems showed interesting biological properties. The current study consists of the design and synthesis of novel iron complexes with the quinoline and indole thiosemicarbazone systems as well as their antioxidant potential. A range of different synthetic methodoliges have been used for the preparation of quinoline and indole-based compounds. The antioxidant profile of novel compounds has been identified by using ABTS, Cuprac and DPPH assays.

Key words: indole, quinoline, thiosemicarbazone, antioxidant, iron complex
General area of research: Chemistry
ICFAS2018-ID: 1105

DETERMINATION OF THE MOST LIKED AND DISLIKED SUBJECTS IN THE MATHEMATICS LESSON OF THE FOURTH GRADE STUDENTS BY COLOR SCALE

Filiz Yağcı, Rıdvan Ezentaş, Feyzullah Baser, Elif Akkuş

Uludağ University, Art and Science Faculty, Bursa 16059, Turkey
gfiliz@uludag.edu.tr
Uludağ University, Education Faculty, Bursa 16059, Turkey
rezentas@uludag.edu.tr
Uludağ University, Art and Science Faculty, Bursa 16059, Turkey
feyzullahbaser@outlook.com
Uludağ University, Art and Science Faculty, Bursa 16059, Turkey
e.akkus1907@gmail.com

Abstract:

A lot of research has been done by scientists and artists on the color phenomenon from Milano to 300 days ago. In Piaget's "Cognitive Development Theory" children go through four stages of cognitive development while actively trying to understand and make sense of the world. These; Sensory Motor (0-2 years), Pre-Process (2-6 years), Concrete Processes (6-11 Years) and Abstract Processes (11-16 Years). In this study, the most liked and disliked subjects in the mathematics lesson of the fourth grade students who are in the concrete processes are examined using the color scale.
The sample of the study consisted of 31 students who were educated in the fourth grade of a state primary school in Bursa. The students in the research sample are at the concrete process stage, the third of Piaget's cognitive developmental stages. Children in this situation can act on objects, and if they contain concrete examples, they can reasonably reason. The data collection tool of the survey is a questionnaire consisting of demographic and likert type questions. The questions on the questionnaire were prepared using the colors in the first color circle.
The data from the questionnaire were analyzed in the SPSS 23 program. As a result of this analysis, the preference rates of girls and boys according to colors are as follows. Girl students' sense of love based on colors; (6,3%), orange (6,3%), orange (6,3%), orange (6,3% , 3). The feeling of dislike of girl students depending on colors; black and orange (25%), white and green (16,7%), white (6,3%), red and purple (8,3%). Male students' sense of love based on colors; (6,1%), white (6,1%), black (15,2%), green (15,2% 3%) and orange (0%). The feeling of dislike of male students depending on colors; black (60%), orange, red, purple and yellow (10%).
As a result, it is seen that the most popular topic in the mathematics course of fourth grade students is the "angle". According to gender, 100% of the female students and 94.4% of the male students liked the angle. However, it is seen that the most unpopular subject is "the process of collecting and extracting from the mind with the folds of 100". According to gender, 85.7% of the female students and 62.5% of the male students did not like it.

Keywords: Color Scale, Sensation of Love, Language of Colors, Concrete Concepts
General area of research: Statistics
ICFAS2018-ID: 1107

AN APPLICATION OF BOOTSTRAP AND JACKKNIFE TECHNIQUES TO AUTOMOTIVE INDUSTRY

Meral Yay

Mimar Sinan Fine Arts University, Istanbul, , 34347, Turkey
meral.yay@msgsu.edu.tr

Abstract:

The aim of this study is to apply repeated sampling methods which are used frequently in recent years on the automotive industry. These methods are based on the distribution of B repeated samples, each of which is drawn with replacement from the observed data set. It is aimed to reduce the standard error of the engine power, weight and fuel consumption estimations with the help of the generated empirical distribution and to reach more reliable predictions. Bootstrap-t, percentage and bias corrected confidence intervals were obtained for 1.6 and 1.8 injected vehicles with B=1000 repeated samples and the results were evaluated statistically. The results were obtained using the R software program and the evaluation was done with confidence intervals and graphs.

Keywords: Bootstrap, confidence intervals, jackknife, resampling.
General area of research: Statistics
ICFAS2018-ID: 1110

CRYSTAL AND MOLECULAR STRUCTURE OF N-(4-ACETYLPHENYL)-N_-(4-FLUOROPHENYL)UREA

İsmail Çelik[1], Gamze Ordu[2], Hayreddin Gezegen[3], Mehmet Akkurt[4]

[1]Department of Physics, Faculty of Sciences, Cumhuriyet University 58140 Sivas Turkey
[2]Cumhuriyet University, Institute of Science, Department of Physics, 58140 Sivas,
[3]Department of Nutr. and Dietetics, Fac. of Health Scie, Cumhuriyet University, 58140 Sivas, Turkey,
[4]Department of Physics Faculty of Arts and Sciences Erciyes University 38039 Kayseri Turkey
icelik@cumhuriyet.edu.tr

Abstract:

In the title compound, C15H13FN2O2, the fluorophenyl and 4-acetylphenyl rings are twisted from each other by a dihedral angle of 11.6 (2)° . In the crystal, molecules are packed into layers parallel to (010). Each layer contains the molecules linked by a pair of strong N—H···O hydrogen bonds, with an R22 (14) ring motif, while strong C—H···F hydrogen bonds forming R42(26) ring motifs connect molecules into a two-dimensional network.
Acetophenones having different substituents in synthetic organic chemistry are used as an important building block (Bing-Wei, 2010). In particular, they are frequently used in conjunction with aldehydes in the synthesis of chalcone derivatives (Kocyigit et al., 2018; Karaman et al., 2010; Ceylan et al., 2011), which are used as starting materials in the preparation of useful and multifunctional heterocyclic and bioactive compounds (Güdere, Gümuş¸ et al., 2017; Gürdere, Kamo et al., 2017; Gezegen et al., 2013). In this article we report the crystal structure of 4-fluorophenylurea-substituted acetophenone, namely N-(4-acetylphenyl)-N0-(4-fluorophenyl)urea.
From the single crystals obtained from the organic compound, molecular and crystal structures were determined by x-ray single crystal diffraction. Molecular conformation, the presence of intramolecular hydrogen bonds, interaction types between crystal-forming molecules, hydrogen bonds, pi-bond interactions, van der Waals interactions have been tried to be elucidated. The crystal system, space group identification, number of molecules in the asymmetric unit, unit cell parameter values are determined. Spatial and thermal parameter values of the molecule were determined.
Kocyigit, U. M., Budak, Y., Gürdere, M. B., Ertürk, F., Yencilek, B., Taslimi, P., Gülçin, İ.& Ceylan, M. (2018). Arch. Physiol. Biochem. 124, 61–68.

Keywords: Crystal and molecular structure
General area of research: Physics
ICFAS2018-ID: 1116

Crystal and Molecular Structure of $C_{23}H_{17}ClN_2O_3$

İsmail Çelik[1], Hayreddin Gezegen[2] and Mehmet Akkurt[3]

[1]Department of Physics, Faculty of Sciences, Cumhuriyet University 58140 Sivas Turkey
[2]Department of Nutr. and Dietetics, Fac. of Health Sci., Cumhuriyet University, 58140 Sivas, Turkey,
[3]Department of Physics Faculty of Arts and Sciences Erciyes University 38039 Kayseri Turkey
icelik@cumhuriyet.edu.tr

Abstract:

In the title compound, intermolecular N—H···O hydrogen bonds produce $R_1^2(6)$ rings and generate infinite chains along the a-axis. The nine-membered 2,3-dihydro-1*H*-indene ring system which is essentially planar [r.m.s deviation = 0.004 Å], and is inclined at the angles of 81.12 (16)° and 7.56 (14)° with respect to the chlorophenyl ring and the benzene ring at the midpoint of the molecule, respectively. The molecular conformation is stabilized by an intramolecular O—H···O hydrogen bond, forming a *S*(6) ring motif. A weak π-π stacking interaction [centroid-centroid distance = 3.656 (2) Å] between the five and six membered rings of the 2,3-dihydro-1*H*-indene ring systems of the adjacent molecules is observed.
From the single crystals obtained from the organic compound, molecular and crystal structures were determined by x-ray single crystal diffraction. Molecular conformation, the presence of intramolecular hydrogen bonds, interaction types between crystal-forming molecules, hydrogen bonds, pi-bond interactions, van der Waals interactions have been tried to be elucidated. The crystal system, space group identification, number of molecules in the asymmetric unit, unit cell parameter values are determined. Spatial and thermal parameter values of the molecule were determined.
Crystala data: $C_{23}H_{17}ClN_2O_3$, M_r = 404.84, triclinic, *P*1, a = 4.6032 (4) Å, b = 6.9338 (8) Å, c = 15.4421 (15) Å, α = 89.811 (4) °, β =87.510(3) °, γ = 70.866 (3) °, V = 465.18 (8) Å^3, Z = 1, μ = 0.23 mm^{-1}. Data collection: Bruker APEXII CCD diffractometer, λ(MoK_α) = 0.71069 Å, T = 296(2) K. Refinement: R_1 = 0.041, wR_2 = 0.102, S = 1.11, 4386 reflections [I >2σ(I)], 276 parameters, $\Delta\rho_{max}$ =0.22 e.Å^3, $\Delta\rho_{min}$ = -0.19 e.Å^{-3}.

Keywords: Massive Scalar Field Theory, *n*-Scales, UV Cut-Off
General area of research: Mathematical Physics
ICFAS2018-ID: 1117

GALA LAKE NATIONAL PARK (EDIRNE / TURKEY) BIRD SPECIES

Mustafa Kaya

Trakya University
mustkaya22@hotmail.com

Abstract:

This study was performed between August 2015 and July 2016 in Gala Lake National Park located in Edirne province İpsala - Enez district borders. The results of 60 days of observations between August 2015 and July 2016 were evaluated and a total of 196 bird species were determined. Regional status of these species, in addition to their conservation and breeding status were given in a table. The problems related to the bird species determined and those of the study region and solution offers to these problems were discussed.

Key words: Birds, Gala Lake, Edirne
General area of research: Biology
ICFAS2018-ID: 1118

5th International Congress on Fundamental and Applied Sciences 2018 (ICFAS2018)
Proceeding Book

HOMOCLINIC AND HETEROCLINIC ORBITS FOR A LIÉNARD SYSTEM

Carmen Rocsoreanu, Mihaela Sterpu

University of Craiova, 13 A.I. Cuza, Craiova 200484, Romania
crocsoreanu@gmail.com
University of Craiova, 13 A.I. Cuza, Craiova 200484, Romania
msterpu@yahoo.com

Abstract:

A 2D dynamical system exibiting a double-zero bifurcation with symmetry of order two is considered. This bifurcation involves the presence in the parameter space of a curve corresponding either to double homoclinic, or to double heteroclinic bifurcations. Second order approximations of this curve and of the corresponding orbits were obtained by us using the regular perturbation method. These formula are applied for a Liénard system, which develops a double-zero bifurcation with symmetry of order two for some parameters values. The analitical results are very accurate and they are in good accordance with the numerical ones.

Keywords: Double-zero bifurcation, homoclinic orbit, heteroclinic orbit, Liénard system
General area of research: Mathematics
ICFAS2018-ID: 1122

SYNTHESIS, CHARACTERIZATION AND APPLICATION STUDIES OF FRAMEWORKS THAT INCLUDE IMINE AND ETHERIC BASED SECONDARY BUILDING UNITS

Ruhsar Ela İriş, İsmet Kaya

Çanakkale Onsekiz Mart University, Faculty of Sciences and Arts, Department of Chemistry, Polymer Synthesis and Analysis Lab, Çanakkale, Turkey
iris.r.ela@gmail.com
Çanakkale Onsekiz Mart University, Faculty of Sciences and Arts, Department of Chemistry, Polymer Synthesis and Analysis Lab, Çanakkale, Turkey
kayaismet@hotmail.com

Abstract:

Imine and etheric bond provides polymers various distinctive properties, such as pH sensitivity, elasticity, water solubility, reversibility and so forth. Several 2D and 3D porous polymeric substances which contain imine and etheric bond were synthesized through using multiple-functional binary building units. Following monomers were used for synthesis: 2,4,6-tris(4-hydroxybenzimino)-1,3,5-triazine, pentaerythritol, 1,5-dibromopentane, p-xylylene dibromide, and 9,10-dibromoantracene. Applicational advantages of imine bond and etheric bond tried to be predicted through performing following analysis. The structures of synthesized frameworks were determined by FT-IR, 1H-NMR, 13C-NMR and UV-Vis analysis methods. In addition, the surface morphologies were determined by scanning electron microscopy (SEM) images. The number average molecular weight, mass average molecular weight and polydispersity index were identified by Size Exclusion Chromatography (SEC). Optical properties of compounds were determined by UV-Vis and fluorescence spectroscopy measurements. Pore size and surface area measurements were determined by BET analysis. Thermal properties were determined by Thermogravimetric Analysis-Differential Thermal Analysis (TGA-DTA) and Differential Scanning Calorimetry (DSC) measurements. Also, solubilities of frameworks determined through solubility tests in various solvents.

Keywords: imine bond, etheric bond, porous materials, organic frameworks
General area of research: Polymer Chemistry
ICFAS2018-ID: 1133

THEORETICAL CHARACTERIZATION OF (1E, 1'E)-N, N'-(BUTANE-1,4-DIYL)BIS(1-(4-METHYLTHIOPHEN-2-YL)METHANIMINE) LIGAND BY DENSITY FUNCTIONAL THEORY

Gühergül Uluçam

Trakya University, Science Faculty, Department of Chemistry, Edirne, TURKEY
gulergul@trakya.edu.tr

Abstract:

The Schiff base ligands which have donor atoms such as N, S, O are widely used in industrial and medicinal research, especially due to their stable metallic complex building properties [1]. The molecular structure of the title ligand was investigated by the simulative calculations. The theoretical properties of Schiff base ligands were obtained using the basic base sets B3LYP / 6-311G ++ (2d, p) in Gaussian G09w packet program. The NMR and FT-IR spectra were calculated on the minimized molecular configuration. The Mulliken atomic charges, dipole moments, highest filled molecular orbital energy and the lowest empty molecular orbital energy of the ligand were theoretically determined.

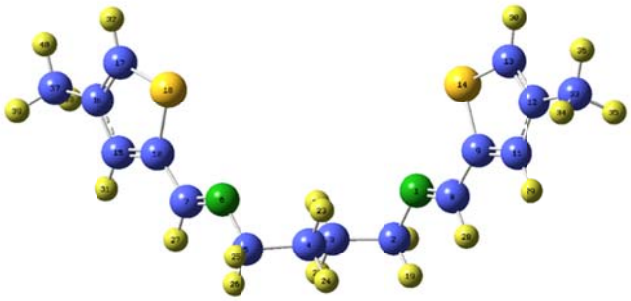


Figure 1 Schematic presentation of the title ligand

Keywords: Thiophen, Density Functional Theory, Schiff base
General area of research: Chemistry
ICFAS2018-ID: 1134

References

[1] Y. Hamada, The Development of Chelate Metal Complexes as an Organic Electroluminescent Material, IEEE Transactions On Electron Devices, Vol. 44, No. 8, (1997)

RESONANCE TUNNELING IN A MULTILAYERED SEMICONDUCTURE STRUCTURE

Sevket Erol Okan, Hülya Kes, Saban Aktas

Department of Physics, Trakya University, 22030, Edirne-Turkey
erolokan@trakya.edu.tr, hulyakesuyguner@trakya.edu.tr, sabana@trakya.edu.tr

Abstract:

The multiple quantum well structures may function as resonance tunneling structures. An outer quantum well in such structures could be an accelerating factor [1]. In addition, a laser field application to these structures provides full control on the performance of such devices [2]. We calculate the current-voltage characteristics of this structure with and without laser field.

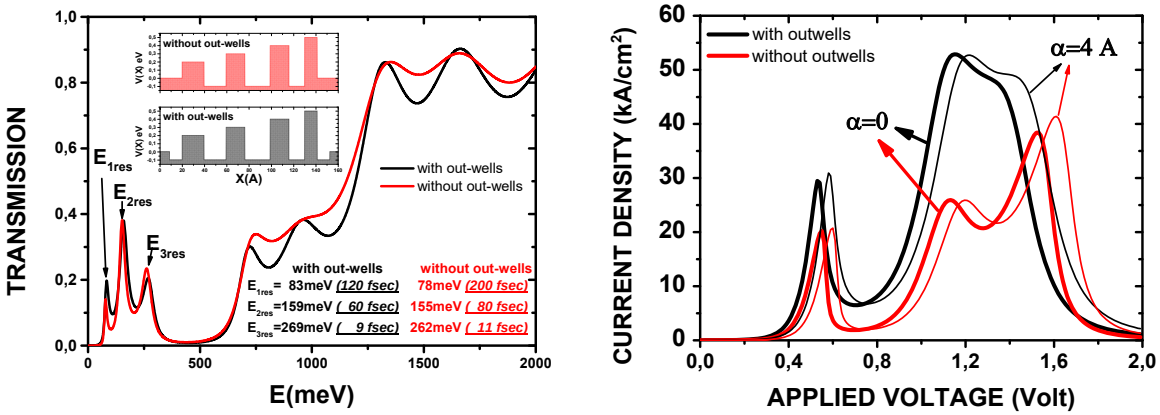


Figure 1. Transmission and I-V characteristics of the structure.

It is proved that the outer wells shortens the tunneling time of the electrons while the resonance pattern is not effected. The laser field application shifts the resonance currents, and compensates the geometrical parameter sensitivity of the structure.

Keywords: Multiple barrier-well structure, pre-well, resonant tunneling, tunneling time
General area of research: Physics
ICFAS2018-ID: 1135

References

[1] H. Hamaguchi, H. Yamamoto, N. Yamada, Elec. Comm. Jpn. 87 (2004) 1.
[2] S. Aktas, H. Kes, F. K. Boz, S. E. Okan, Superlattices and Microstructures 98 (2016) 220.-

HOW DOES A CURRENT PASSING THROUGH CONDUCTING CENTER OF A COAXIAL QUANTUM WIRE AFFECT THE ELECTRONIC PROPERTIES OF THE STRUCTURE?

Saban Aktas, Hülya Kes, Sevket Erol Okan

Department of Physics, Trakya University, 22030, Edirne-Turkey
sabana@trakya.edu.tr, hulyakesuyguner@trakya.edu.tr, erolokan@trakya.edu.tr

Abstract:

The coaxial quantum well wires have received attention due to their remarkable physical properties in comparison with those of the single quantum wires [1]. In general, the ground state energy depends the geometrical parameters of the structure such as the radius of the wires and the potentials constituted by the barriers. These parameters can be controlled by a self-induced azimuthal magnetic field from a conducting central wire as the current density in quantum wires can be measured experimentally [2-4].

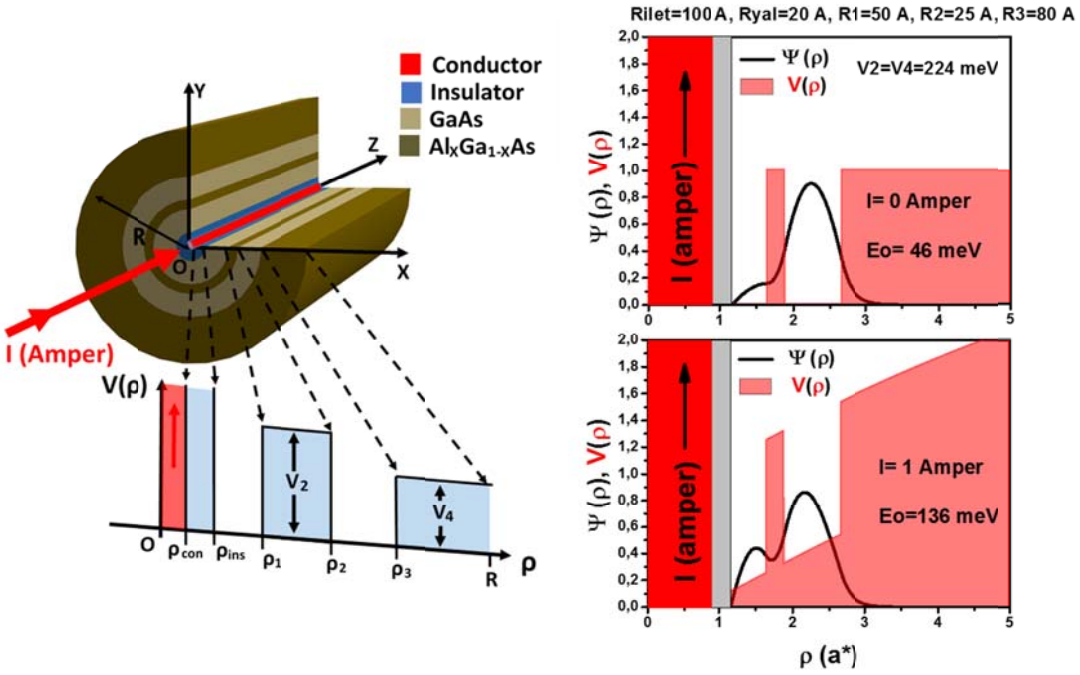


Figure 1. View of the coaxial quantum wire and its potential profiles as a current passing through from the central metallic wire.

The ground state energy and the potential profile response to the magnetic field generated by the conductive current passing through the center of the coaxial quantum wire were studied. It is established that the ground state energies are sensitive to the inner well width as well as the current.
The results might be eligible for the design of new nano-gadgets.

Keywords: Coaxial quantum wire, nano-device, ground state energy
General area of research: Physics

ICFAS2018-ID: 1136

References

[1] H. Kes, A. Bilekkaya, S. Aktas, S. E. Okan, Superlattice. Microst., 111 (2017), 966-975.
[2] M. Tian, J. Wang, W. Ning, T.E. Mallouk, M.H.W. Chan, Nano Lett. 15 (3) (2015) 1487e1492.
[3] S. Karim, K. Maaz, G. Ali, W. Ensinger, J. Phys. D: Appl. Phys. 2009, 42, 185403.
[4] M. Masale, Physica B 344 (2004) 284.

THE RESONANT PEAKS OF THE INTERSUBBAND OPTICAL ABSORPTION COEFFICIENTS IN THE TRIPLE RECTANGULAR QUANTUM WELL UNDER THE EXTERNAL FIELDS

Figen Karaca Boz[1], Bahadır Bekar[2], Saban Aktas[1], Sevket Erol Okan[1]

[1]Trakya University, The Faculty of Science, Department of Physics 22030, Edirne, Turkey
[2]Trakya University, Vocational of Kesan 22800, Edirne, Turkey
figenb@trakya.edu.tr; sabana@trakya.edu.tr; erolokan@trakya.edu.tr

Abstract:

The photodetectors are designed on the electro-optic modulation properties of the quantum well systems. Therefore, the changes of the energy levels of the double and triple quantum wells under the external fields becomes very important [1-2]. Some of investigations on optical properties of these systems are based on the calculation of the resonances of the intersubband optical absorption coefficients [3-6].

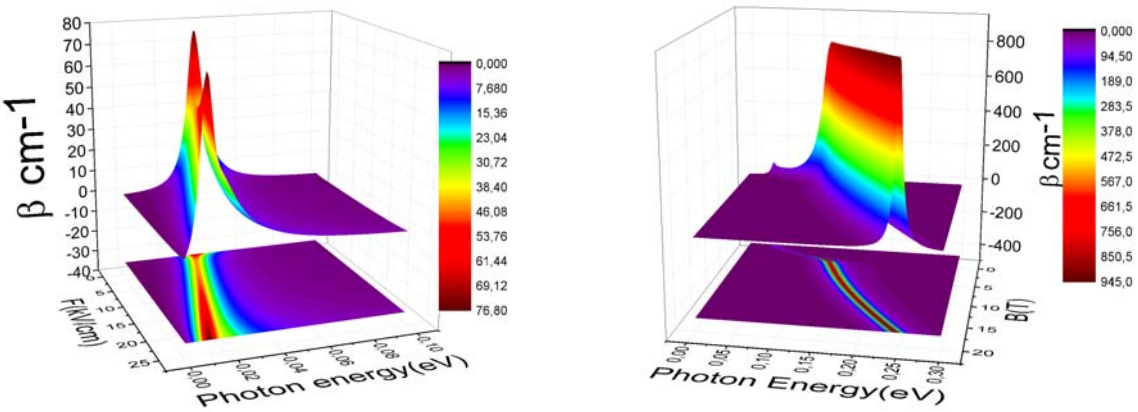


Figure 1. a) Optical absorption coefficient as a function of electric field and incident photon energy. b) Optical absorption coefficient as a function of magnetic field and incident photon energy.

The effect of the external fields on the energy levels and the resonances of the absorption coefficients in GaAs/Al(GaAs) triple rectangular quantum well have been investigated. The energy levels are calculated by adopting the effective mass approximation under the electric, magnetic and laser fields. The energy levels in the structure displayed interesting behaviors under external fields those were a red shift in the absorption coefficient positions were observed while the electric field increases and the blue shift is observed while the magnetic field increases as shown in Figs 1a and 1b. If the laser field is on, an initial blue shift was observed on the

absorption coefficient for small strengths of the field, and it was transferred into a red shift after a certain strength of the field. The results can be useful for the technological applications.

Keywords: Electric Field, Magnetic field, Laser Field, Absorption Coefficient, triple quantum well
General area of research: Physics
ICFAS2018-ID: 1137

References

[1] S.Aktas, A.Bilekkaya, F.K.Boz, S. E. Okan, "Electron transmission in symmetric and asymmetric double-barrier structures controlled by laser fields", Superlattıces and Microstructures, 85(2015), 266-273.
[2] F. K. Boz, S. Aktas, B. Bekar, S.E. Okan, "Laser field-driven potential profiles of double quantum wells", Physics Letters A, 376(4) (2012), 590-594.
[3] B. Chen, K-X. Guo, R-Z Wang, Z-H. Zhang, Z-L. Liu, "Linear and nonlinear intersubband optical absorption in double triangular quantum wells" Solid State Communications, 149(2009), 310-314
[4] Latge, M. Pacheco, Z. Barticevic."Intra-donor transitions in triple quantum-well structures under external fields" Semicond. Sci. Technol. 17(2002) 952-956.
[5] M. solaimani, I. Morteza, H. Arabshahi, S. M. Reza, " Effect of the magnetic field on optical properties of GaN/AlN multiple quantum wells"Journal of Luminescence 134(2013) 88-95.
[6] E. Ozturk, "Depending on the electric and magnetic field of the linear optical absorption and rectification coefficient in triple quantum well" Opt. Quant. Electron 49(2017) 270

EXCITON BINDING ENERGIES IN COAXIAL MULTI-LAYER QUANTUM WELL WIRES UNDER THE EXTERNAL ELECTRIC AND MAGNETIC FIELDS

Hülya Kes

Department of Physics, Trakya University, 22030, Edirne-Turkey
hulyakesuyguner@trakya.edu.tr

Abstract:

The binding energies of the heavy-hole and light-hole excitons were calculated in a coaxial multiple quantum well wire (MCQWW) made of GaAs/AlxGa1-xAs layers [1,2]. The external electric and magnetic field applications were considered in the calculations.

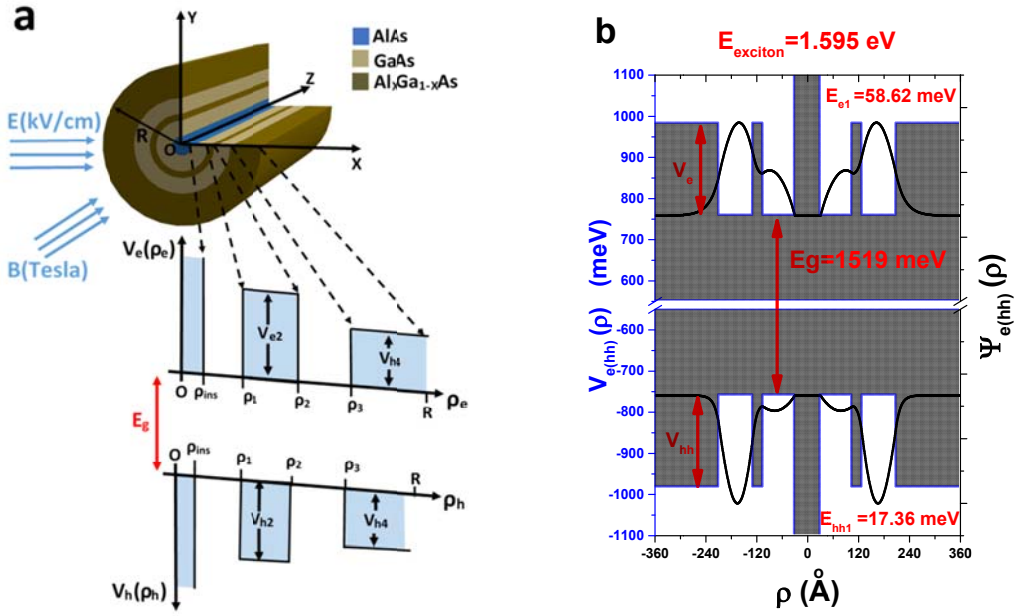


Figure 1. a) MCCQW and its potential profile, b) Potential profiles and probability distributions and energies of the electron and hole along ρ-direction.

The binding energies of heavy-hole and light-hole excitons in AlAs/GaAs/ Alx1Ga1-x1As/GaAs/Alx2Ga1-x2As cylindrical quantum well wires have been determined in terms of the quantum well width, the barrier heights and the external electric and magnetic field applications. Within the framework of the effective mass approximation, the binding energy of an exciton is calculated by using the combination of the fourth-order Runge-Kutta method and variational approaches [3].

Keywords: Nano-device, exciton binding energy, coaxial wire, electric and magnetic field application
General area of research: Physics
ICFAS2018-ID: 1138

References

[1] S. E. Okan, S. Aktas, H. Akbas, and M. Tomak, Phys. Status Solidi (b) 212, 263 (1999).
[2] J.G. Rojas-Briseño, Guillermo L. Miranda-Pedraza, J.C. Martínez-Orozco, Phys. Status Solidi B 254 (4) (2017) 1600461.
[3] H. Kes, A. Bilekkaya, S. Aktas, S. E. Okan, Superlattice. Microst., 111 (2017), 966-975.

A FIXED POINT THEOREM FOR MAPPINGS OF NADLER TYPE IN CONE b-METRIC SPACES OVER BANACH ALGEBRAS

Muttalip Özavşar

Yıldız Technical University, Department of Mathematics, Istanbul, 34210, Turkey
mozavsar@yildiz.edu.tr

Abstract:

By following the results obtained in [1-4], a fixed point theorem for Nadler mappings in the sense of Wardowski and some results are presented in the setting of cone b-metric spaces over Banach algebras.

Keywords: Banach Contraction Principle; Fixed Point; NadlerMappings; Cone Metric Spaces over Banach Algebras
General area of research: Mathematics
ICFAS2018-ID: 1140

References:

[1] D. Wardowski, *On set-valued contractions of Nadler type in cone metric spaces*, Appl. Math. Lett., (24)(2011), 275-278.
[2] S. Xu, S. Radenovic, *Fixed point theorems of generalized Lipschitz mappings on cone metric spaces over Banach algebras without assumption of normality*, Fixed Point Theory Appl., (2014), 12 pages.
[3] H. Huang, S. Radenovic, *Common fixed point theorems of generalized Lipschitz mappings in cone b-metric spaces over Banach algebras and applications*, J. Non. Sci. Appl., (8)(2015), 787--799.
[4] M.Özavşar, *Nadler Mappings in Cone b-Metric Spaces over Banach Algebras,* Ren.Sem.Mat.Uni.Pad., 2018 (Accepted)

SIZE EFFECTS ON THE THERMAL BEHAVIOR OF METALLIC NANOPARTICLES

Sedat Sengul

Dept. of Physics, Faculty of Science, Trakya University, Edirne, 22030, Turkey
sedatsengul@trakya.edu.tr

Abstract:

Nanoparticles have unique physical properties which may be radically different from their bulk counterparts. In this work, it is reported thermal properties of metallic nanoparticles according to their sizes. The melting mechanism was also analyzed by structural quantities. Using well-known EAM type potential, classical molecular dynamics simulations, which are effective tools to study the time evolution of the system, were performed to study the effect of nanoparticle size on the melting temperatures of nanoparticles. During the melting process, the temperature dependence of the pair distribution functions was calculated. The simulated melting points of metallic nanoparticles are much lower than that of bulk system. As the diameter of nanoparticle drops, the melting point also descends.

Keywords: Classical molecular dynamics simulations; Melting of nanoparticle; Pair distribution functions; Type your keywords here, separated by colons
General area of research: Physics
ICFAS2018-ID: 1141

THE MELTING MECHANISM IN LEAD NANOPARTICLES

Unal Domekeli

Dept. of Physics, Faculty of Science, Trakya University, Edirne, 22030, Turkey
unaldomekeli@trakya.edu.tr

Abstract:

In this work, we have investigated the size effect on the thermal behavior of lead nanoparticles by using both atomic simulation method and theoretical thermodynamics model. Six nanoparticles were studied in different sizes to observe the effect of nanoparticle size on thermal properties such as melting point, the heat of fusion and entropy of fusion. The melting points of nanoparticles were estimated by the following changes in Lindeman index and in energetic quantities such as total energy and heat capacity. The melting points of nanoparticles obtained from both the atomic simulation method and the theoretical thermodynamic model are lower than the bulk. For lead nanoparticles, the melting temperatures obtained from both methods are in good agreement with the experimental results. It has been observed that the thermal properties of the nanoparticle change as the particle size changes. In addition, the melting mechanism of lead nanoparticles has been analyzed in detail in this study. We observed that the melting occurs in two stages in lead nanoparticles. Firstly, a liquid-like shell is formed in the outer regions of nanoparticle by increasing temperature. The thickness of the liquid-like shell increases with increasing temperature until the shell reaches a critical thickness. Then, the entire nanoparticle including core related solid-like regions melts at once.

Keywords: Lead nanoparticle; Melting process; Pair distribution function; Molecular dynamics simulations
The general area of research: Physics
ICFAS2018-ID: 1142

THE EFFECTS OF COOLING RATE ON THE ATOMIC STRUCTURE DURING THE RAPID SOLIDIFICATION OF Al-BASED BINARY ALLOY BY MOLECULAR DYNAMICS SIMULATIONS

Murat Celtek

Trakya University, Faculty of Education, Edirne, 22030, Turkey
mceltek@trakya.edu.tr

Abstract:

In this study, the atomic structure and the glass formation process of Al-based binary alloy have been investigated by molecular dynamics simulation based on the embedded atom method using different cooling rates. The structural development and phase transformation in the system were analyzed based on the variations of the pair distribution function and Honeycutt-Andersen bond-type index method. The glass formation in Al-based binary alloy was achieved by cooling from the liquid state. It has been observed that the glass transition temperature is systematically decreased with decreasing cooling rate, and the system has crystalline-like order when the cooling period is long enough to relax atoms in the alloy. The results for the pair distribution functions derived from molecular dynamics simulations at different temperatures agreed well with the experimental and ab initio molecular dynamics results in the literature.

Keywords: Al-based Alloy; Molecular Dynamic Simulations; Glass Transition Temperature; Phase Transformation; Honeycutt-Andersen Index
General area of research: Physics
ICFAS2018-ID: 1143

THERMOPHYSICAL PROPERTIES OF BERYLLIUM

Cem Canan

Edirne Vocational College of Technical Science, Trakya University, Turkey
cemcanan@trakya.edu.tr

Abstract:

In this work, thermophysical properties of Beryllium (Be) were investigated by molecular dynamics simulation based on the embedded atom method (EAM) potential with the form of a Morse potential and a Johnson embedding function. Lattice parameters and heat capacities are calculated from room temperature to the melting point. Radial distribution function is used to measure the nearest neighbor distances. Bulk properties such as cohesive energy, elastic constants, bulk and shear moduli are compared with literature.

Keywords: Classical molecular dynamics simulations; thermophysical properties; Radial distribution functions;
General area of research: Physics
ICFAS2018-ID: 1144

USEFULNESS OF IMAGE PROCESSING IN PARACLINICAL ASSESSMENTS OF DENTAL MEDECINE

Antohe Magda-Ecaterina [1],Iordache Cristina[2], Macovei Georgiana[3], Ancuța Codrina[4],Dascalu Cristina Gena[5]

[1]Grigore T. Popa University of Medicine and Pharmacy, Faculty of Dental Medicine, 16 University Str., 700115, Iasi, Romania ,*magda.antohe@yahoo.com*
[2]Grigore T. Popa University of Medicine and Pharmacy, Faculty of Dental Medicine, 16 University Str., 700115, Iasi, Romania , *ccmiiordache@yahoo.com*
[3]Grigore T. Popa University of Medicine and Pharmacy, Faculty of Dental Medicine, 16 University Str., 700115, Iasi, Romania , *dr_geo_m@yahoo.com*
[4]Grigore T. Popa University of Medicine and Pharmacy, Faculty of Medicine, 16 University Str., 700115, Iasi, Romania , *codrina_ancuta@yahoo.com*
[5]Grigore T. Popa University of Medicine and Pharmacy, Faculty of Medicine, 16 University Str., 700115, Iasi, Romania, *cdascalu_info@yahoo.com*

Abstract:

Introduction

Digital image processing can be defined in a broad sense as the technology of using computerized algorithms to transform images stored electronically to highlight or blur some of their. The application of certain digital processing techniques offers the possibility of extra accuracy in the interpretation of paraclinical examinations used in dental medecine with profound implications in the diagnosis as well as in the hierarchy of the treatment plan.

The aim of this study is to identify the type of imaging processing for the identification of pathological elements from orthopantomographies and articular tomographies.

Material and method

A number of 20 orthopantomographies and 15 temporo-mandibular joint CTs have undergone through various image enhancement techniques.These processing techniques have focused on the accuracy of diffuse or encapsulated osteotomic processes, as well as the accurate identification of cavity reports sinus or mandibular canal, particularly important aspects of the variation of the imaging palette through additional elective data at a later stage, data necessary for choosing the best therapeutic option in the long run.

Results and discussions

Of the most useful imaging processing in the optimization of the orthopantomographic image accuracy the point-to-point transformations are to be noted.We used the equation, g (x, y) = T [f

(x, y)], in which the vicinity of a point coincides with the point itself, and T is usually a gradient transformation function.Equally, in the Frequency Techniques area, we used imaging of orthopantomographies and Fourier Transformation Joints.This technique has proven to be particularly useful for the analysis of articular tomographs, making it easy to detect contours of the glenoid cavity or articular tuber, which is the basis for specific analyzes that are absolutely necessary for oral reabsorption.

Conclusions Applying these imaging methods to dental practice is particularly important, providing an accurate addition to the assessment of orthopantomography and temporomandibular joint tomography, common paraclinical examinations, aspects underpinning the formulation of a precise diagnoses, and the development of a therapeutic plan choice.

Key words: imaging processing, orthopantomography, TMJ tomography, image enhancement , oral pathology
General area of research: Multidisciplinary researchers
ICFAS2018-ID: 1147

SHAPE – MATCHING TECHNIQUES INVOLVED IN DENTO-FACIAL AESTHETICS

Cristina Gena Dascalu, Gabriel Dimitriu, Magda Ecaterina Antohe

Medical Informatics and Biostatistics Dept., "Grigore T. Popa" University of Medicine and Pharmacy, Str. Universitatii no. 16, 700115, Iasi, ROMANIA , *cdascalu_info@yahoo.com*
Medical Informatics and Biostatistics Dept., "Grigore T. Popa" University of Medicine and Pharmacy, Str. Universitatii no. 16, 700115, Iasi, ROMANIA, *dimitriu.gabriel@gmail.com*
Implantology, Removable Prosthetics, Technology of dental prostheses Dept., "Grigore T. Popa" University of Medicine and Pharmacy, Str. Universitatii no. 16, 700115, Iasi, ROMANIA
magda.antohe@yahoo.com

Abstract:

The aesthetic dentistry has a significant role in choosing the optimal restorative solutions, agreed by the physician and the patient as well. A well-designed dental prosthesis must fit harmoniously with the patient's general aspect, and this can be achieved by following certain exact aesthetic rules, often based on mathematical analyses. Recent studies showed that, for a normal human being, a certain match can be found between the shape of his face and the shapes of his central superior incisives, as well as a systematic similarity between the plane surface of the face and the plane surface of the central superior incisives. Our approach aims to develop a shape matching procedure applied to these plane surfaces, which can help the dental physician to design the dental prosthesis if necessary and to evaluate the treatment's result. To do this, we developed in MATLAB a correspondence algorithm using the Ant Colony Optimization (ACO) framework. Given two point sets I and J, the shape correspondence problem can be stated as finding a meaningful mapping from points of I to points of J which minimizes a given objective function; the analyzed points are included in a graph structure, with vertices composed by the points sets and the edges which fully connect them. The distances between points are normalized geodesic distances. When traversing from a vertex $i \in I$ to a vertex in J, the edge probability is defined as the probability p^k_{ij} of an ant k choosing the edge that connects to vertex $j \in J$. The solutions are evaluated through their cost, expressed using a Quadratic Assigment Problem (QAP). The shapes to match are detected starting from the patient's facial and oral photos and processing them in Corel PhotoPaint; the number of points of each shape is known (and varies between 20 and 50), as well as their surfaces and perimeters. The ACO approach allowed us to calculate a matching degree between shapes, expressed in percentages, necessary in the dental prosthesis design. We perform the analysis on 10 patients with different face contours and we found similarities bigger than 60% in all the investigated cases. This analysis validates the empirical hypothesis about the match between the human face shape and the shape of the central superior incisives and is useful in dental prosthetics to choose the optimal treatment plan and the optimal shape of the prosthetic restoration in full agreement with the morphological dental-facial aspects.

Keywords: shape - matching, ACO algorithm, QAP, dental aesthetics
General area of research: Computer Science
ICFAS2018-ID: 1151

HESSENBERG ELM AUTOENCODER KERNEL FOR DEEP LEARNING

Gokhan Altan, **Yakup Kutlu**, Apdullah Yayık

Iskenderun Technical University, Computer Engineering Dept., Iskenderun, 31200, Hatay, Turkey
gokhan_altan@hotmail.com
Iskenderun Technical University, Computer Engineering Dept., Iskenderun, 31200, Hatay, Turkey
yakup.kutlu@iste.edu.tr
Military Academy, National Defense University, 06000, Ankara, Turkey
ayayik@kho.edu.tr

Abstract:

Deep Learning (DL) consists of both feature learning and classification stages for more detailed analysis with training time problem [1]. To overcome the disadvantages of DL, the fast Extreme Learning machines (ELM) which is based on singular value decomposition (SVD) technique was integrated as ELM Autoencoder (ELM-AE) to the Deep ELM by Kasun et al [2]. In this study, we aimed to propose the Hessenberg decomposition based ELM-AE (HessELM-AE) kernel as an alternative to the SVD for enhancing the performance of the model for Deep ELM models using simple matrix inversing capability.
Hilbert-Huang Transform was applied to the lung sounds from RespiratoryDatabase@TR [3] and the statistical features were calculated from the different modulations of the signal. The statistical features were fed into the proposed Deep ELM with the HessELM-AE was applied with 2 hidden layers (340,580 neurons) to classify the lung sounds from Chronic Obstructive Pulmonary Disease (COPD) and healthy subjects. The sequential forward feature selection algorithm with 6-fold cross-validation is performed on the proposed Deep ELM classifier model and has an accuracy rate of higher than 90% whereas the Deep ELM with traditional ELM-AE kernel has reached an accuracy rate of about 80%. This study was supported under the TUBITAK project (Project No: 116E190).

Keywords: Deep Learning, RespiratoryDatabase@TR, COPD, Lung sounds, Deep ELM, Hessenberg
General area of research: Computer Engineering
ICFAS2018-ID: 1153

References

[1] Altan G., Allahverdi N., Kutlu Y., Diagnosis of Coronary Artery Disease Using Deep Belief Networks, European Journal of Engineering and Natural Sciences, 2017, Vol:2 Issue(1),ISSN:2458-8156, p.29-36
[2] Kasun L.L.C., Zhou H., Huang G.-B., and Vong C.M., "Representational learning with extreme learning machine for big data," IEEE Intell. Syst., vol. 28, no. 6, pp. 31–34, Nov. 2013.
[3] Altan G., Kutlu Y., Garbi Y., Pekmezci A.O., Nural S., Multimedia Respiratory Database (RespiratoryDatabase@TR): Auscultation Sounds and Chest X-rays, Natural and Engineering Sciences, 2017, ISSN:2458-8989, Vol.2, Issue:3, pp.59–72, DOI: 10.28978/nesciences.349282

LOW RANK APPROXIMATE SOLUTIONS TO LARGE-SCALEDIFFERENTIAL SYMMETRIC STEIN EQUATIONS

Muhammet Kurulay, Yaprak Dericioglu

Department of Mathematical Engineering, Yildiz Technical University
mkurulay@yildiz.edu.tr
Department of Mathematics, Yildiz Technical University, Istanbul, Turkey
guldogan@yildiz.edu.tr

Abstract:

The aim of this work is to present a new method for solving symmetric Stein differential equations. These equations have many applications in control theory, model reductions. Our method is based on Krylov subspace where the initial and large problem is projected onto an extended block Krylov subspace. Then we use integration methods such as BDF or Rosenbrock solvers. We give some theoretical results and numerical experiments to show the effectiveness of our method.

Keywords: Extended block Krylov; Differential Symmetric Stein equations, Bdf Method
General area of research: Mathematics
ICFAS2018-ID: 1154

PHYSICAL PROPERTIES OF NiO:Cu THIN FILMS DEPOSITED ON GLASS SUBSTRATE BY SPRAY PNEUMATIC TECHNIQUE

Okba Belahssen, Mebrouk Ghougali, Abdelouhed Chala

Physic Laboratory of Thin Films and Applications (LPCMA), University of Biskra, Algeria
belahssenokba@gmail.com
Physic Laboratory of Thin Films and Applications (LPCMA), University of Biskra, Algeria
gh_mebrouk@yahoo.fr
Physic Laboratory of Thin Films and Applications (LPCMA), University of Biskra, Algeria
ab.chala@gmail.com

Abstract:

Nickel oxide copper doped was deposited on highly cleaned glass substrates using spray pneumatic technique. The effect of copper doped on structural, optical and electrical properties has been studied. The XRD lines of the deposited NiO:Cu were enhanced with increasing precursor molarity due to the improvement of the films crystallinity. It was shown that the average of the crystalline size of the deposited thin films was calculated using Debye–Scherer formula and found in the range between 9.63 and 11.68 nm. The optical properties have been discussed in this work. The absorbance (A), the transmittance (T) and the reflectance (R) were measured and calculated. Band gap energy is considered one of the most important optical parameter, therefore measured and found ranging between 3.23 and 3.56 eV. The NiO:Cu thin film reduces the light reflection for visible range light. The increase of the electrical conductivity to maximum value of 1.9102 $(\Omega\ \mathrm{cm})^{-1}$ can be explained by the increase in carrier concentration of the films. A good electrical conductivity of the NiO:Cu thin film is obtained due to the electrically low sheet resistance. NiO:Cu can be applied in different electronic and optoelectronic applications due to its band gap, high transparency and good electrical conductivity.

Keywords: Nickel oxide, thin films, XRD, band gap energy, conductivity
General area of research: Physics
ICFAS2018-ID: 1155

ASSESMENT OF ENVIROMENTAL FACTORS AFFECTING HEALTHY DEVELOPMENT OF THE FETUS

Mehmet Seven[1], Selcuk Sozer Tokdemir[1], Aysel Kalaycı Yiğin[1].

[1]University of Istanbul, Cerrahpaşa Medical Faculty, Deparment of Medical Genetics. Istanbul, Turkey
mimseven@istanbul.edu.tr

Abstract:

During pregnancy, many factors may affect the healthy development of the embryo/fetus, and the most important and frequently encountered reasons are the genetic and environmental factors. The pregnant women who are exposed to environmental factors, such as radiation and hyperthermia, may have affected embryo/fetus leading to miscarriage, intrauterine death and structural and functional disorders. The most important feature of the diseases/anomalies caused by environmental factors is that they cannot be passed on to the next generation through inheritance and can be prevented. Contrary, genetic diseases can be transmitted to future generations through inheritance and are often can be prevented.

In this study, about 22.000 pregnant women who were applied to Genetics and Teratology Outpatient Clinic of Medical Genetics Department of Cerrahpasa Medical Faculty, Istanbul University for counseling due to the radiation exposure were retrospectively evaluated.

The evaluation criteria's for the study include the followings: The radiation exposed pregnant women's primary physician suggestions, decision about the continuation of the pregnancy before counseling, the decision about the continuation of the pregnancy after counseling and physical evaluation of the babies who were delivered with the effects of radiation. The absorbed radiation dose of the fetuses was measured by the physicists.

It was determined that the pregnant women, directed to our center for the counseling from varying centers such as; 47% from Private Hospitals, 21% from State Hospitals, 18% from University Hospitals and 14% from Private Practice. It was revealed that 98% of pregnant women were exposed at least one environmental factor during their pregnancy and 95% of them were exposed to radiation for the clinical examination for the non-pregnancy related health problems without awareness of their pregnancy. The most observed reason for the radiation exposure of the pregnant women was due to the chest radiograph (31%). It was determined that 79% of the pregnant women who were directed from private clinics, 58% of the pregnant women who were directed from Private Hospitals, 55% of the pregnant women who were directed from State Hospitals and 27% of the pregnant women who were directed from University Hospitals, were recommended to terminate their pregnancies.

During the "Counseling Service" provided to the pregnant women who were in their first month of pregnancy, were informed about the "all or none law" for pregnancy and the exposure to the environmental factors was not being expected to cause any fetus anomalies. The pregnant women who were applied later than the first month of pregnancy were informed about the possibility of detecting fetus anomalies during this period, but, since the absorbed radiation dose being under the threshold level, no increased risk for the congenital anomalies was expected.

The pregnant women who are exposed to various environmental factors during their pregnancy experience high stress due to the idea of "my baby are going to be disabled." Even they have uncertainty and dilemma of termination of the pregnancy and having a disabled child.

During this period, there is an urgent need for an efficient and necessary "Counseling Service" for the pregnant women that eliminates concerns and prevents unnecessary pregnancy losses. This service is provided by our center to the pregnant women, and the success of this service has been demonstrated with satisfaction surveys after counseling.

Keywords: Pregnancy, Radiation, Environmental Factors, Congenital Anomalies, Counseling Service.
General area of research: Health
ICFAS2018-ID: 1162

EXTENDED TRIAL EQUATION METHOD TO CAMASSA-HOLM EQUATION

Mehmet Fatih Karaaslan, Muhammet Kurulay

Yildiz Technical University, Department of Statistics, Istanbul, 34220, Turkey
mfatih@yildiz.edu.tr
Yildiz Technical University, Department of Mathematical Engineering, Istanbul, 34210, Turkey
mkurulay@yildiz.edu.tr

Abstract:

In this work, we briefly introduce the extended trial equation method for a nonlinear partial differential equation in general form. Then, the exact traveling wave solutions are obtained for Camassa-Holm equation using this method. As a result, the solutions are successfully constructed such as soliton solutions, elliptic integral function solutions, Jacobi elliptic function solutions. The algorithm that gives the solution of the equation is written in Matlab2014a.

Keywords: Extended trial equation method: Camassa-Holm equation: soliton solution
General area of research: Mathematics
ICFAS2018-ID: 1163

A NEW PERSPECTIVE FOR THE NUMERICAL SOLUTIONS OF THE CMKDV EQUATION VIA MODIFIED CUBIC B-SPLINE DIFFERENTIAL QUADRATURE METHOD

Ali Başhan, N. Murat Yağmurlu, Yusuf Uçar, Alaattin Esen

Bulent Ecevit University, Faculty of Science and Art, Zonguldak, 67100, Turkey
alibashan@gmail.com
Inonu University, Faculty of Science and Art, Malatya, 44200, Turkey
murat.yagmurlu@inonu.edu.tr
Inonu University, Faculty of Science and Art, Malatya, 44200, Turkey
yusuf.ucar@inonu.edu.tr
Inonu University, Faculty of Science and Art, Malatya, 44200, Turkey
alaattin.esen@inonu.edu.tr

Abstract:

In the present paper, a novel perspective fundamentally focused on the differential quadrature method using modified cubic B-spline basis functions are going to be applied for obtaining the numerical solutions of the complex modified Korteweg-deVries equation (cmKdV). In order to test the effectiveness and efficiency of the present approach, three test problems, that is single solitary wave, interaction of two solitary waves and interaction of three solitary waves will be handled. Furthermore, the maximum error norm L∞ will be calculated for single solitary wave solutions to measure the efficiency and the accuracy of the present approach. Meanwhile, the three lowest conservation quantities will be calculated and also used to test the efficiency of the method. In addition to these test tools, relative changes of the invariants will be calculated and presented. In the end of these processes, those newly obtained numerical results will be compared with those of some of the published articles. As a conclusion, it can be said that the present approach is effective and efficient one for solving the cmKdV equation and can also be used for numerical solutions of other problems.

Keywords: Partial differential equations, differential quadrature method, cmKdV equation, solitary waves, modified cubic B-splines.
General area of research: Mathematics
ICFAS2018-ID: 1164

SOLVING CAMASSA-HOLM EQUATION BY JACOBI ELLIPTIC FUNCTION METHOD

Hami Gündoğdu, Ömer Faruk Gözükızıl

Sakarya University, Department of Mathematics, Sakarya 54100, TURKEY
hamigundogdu@sakarya.edu.tr
Sakarya University, Department of Mathematics, Sakarya 54100, TURKEY
farukg@sakarya.edu.tr

Abstract:

In this study, the simplified modified form of Camassa-Holm equation is considered. The jacobi elliptic function method is applied to it. Then, we introduce new solutions to this equation in the form of jacobi elliptic functions in addition to hyperbolic and trigonometric solutions.

Keywords: Camassa-Holm equation (C-H), the sn-ns method, elliptic function solution, hyperbolic solutions, trigonometric solution.
General area of research: Mathematics
ICFAS2018-ID: 1165

APPLICATION OF LAPLACE DECOMPOSTION METHOD TO GARDNER EQUATION

Hami Gündoğdu, Ömer Faruk Gözükızıl

Sakarya University, Department of Mathematics, Sakarya 54100, TURKEY
hamigundogdu@sakarya.edu.tr
Sakarya University, Department of Mathematics, Sakarya 54100, TURKEY
farukg@sakarya.edu.tr

Abstract:

In this paper, we are interested in obtaining the approximate analytical solutions of nonlinear partial differential equations. In this regard, the Laplace decomposition method, the combined form of the Laplace transform and the Adomian decomposition method is utilized. Nonlinear Gardner equation, also named as combined Kdv-mKdv equation is studied. The method is applied to it with its initial value. Then, the solution satisfying the given initial condition is gained.

Keywords: Laplace decomposition method, the Adomian decomposition method, the Adomian polynomials, Gardner equation.
General area of research: Mathematics
ICFAS2018-ID: 1169

SECURITY ISSUES AND THE IMPROPER USE OF POINTERS

Ferda Omeri, Mirsat Yesiltepe, Muhammet ,Kurulay

Yildiz Technical University, Department of Mathematical Engineering, 34220 Esenler - İstanbul, Turkey
ferda.o@outlook.com
Yildiz Technical University, Department of Mathematical Engineering, 34220 Esenler - İstanbul, Turkey
mirsaty@yildiz.edu.tr
Yildiz Technical University, Department of Mathematical Engineering, 34220 Esenler - İstanbul, Turkey
mkurulay@yildiz.edu.tr

Abstract:

Writing secure applications in C programming language can be difficult because of several inherent aspects of the language. In addition, the improper use of pointers is often at the root of many security problems.
Understanding pointers and the proper ways to use them is an important tool for developing secure and reliable applications. In this paper, it will identify additional improper usages of pointers.

Keywords: Pointer, security, error
General area of research: Computer Science
ICFAS2018-ID: 1170

DOYRAN LAKE AND ITS SURROUNDINGS (EDIRNE / TURKEY) BIRD SPECIES

Sedef Ismetoglu, Osman Özmen Yeltekin, Mustafa Kaya

Trakya University, Department of Biology Edirne, Turkey
sedef-ismetoglu@hotmail.com

Abstract:

This study was performed between November 2017 and May 2018 in Doyran Lake and its surroundings in Edirne province. The results of 18 days of observations between November 2017 and May 2018 were evaluated and a total of 74 bird species were determined. 40 species of Indigenous, 13 species of Winter Immigrants, 21 species of Summer Immigrants. Regional status of these species, in addition to their conservation and breeding status were given in a table. The problems related to the bird species determined and those of the study region and solution offers to these problems were discussed.

Keywords: Birds, Doyran Lake, Edirne
General area of research: Biology
ICFAS2018-ID: 1171

POLYCYCLIC CODES OVER THE RING $F_q + uF_q$

Mehmet Özen, Halit İnce

Sakarya University, Sakarya, Turkey
ozen@sakarya.edu.tr
Sakarya University, Sakarya, Turkey
ince@sakarya.edu.tr

Abstract:

Polycyclic codes are generalization of cyclic codes. In this work, we investigate the structure of polycyclic codes from a linear algebraic point of view over the ring $F_q + uF_q$ where $u^2 = 0, v^2 = 0$. Using the theoretical results we derive, we obtain some good code parameters over the field F_q which are presented at the end of the paper.

Keywords: Polycyclic Codes, Cyclic Codes, Invariant Submodule
General area of research: Mathematics
ICFAS2018-ID: 1173

SYNTHESIS OF NEW DIMETHOXYINDOLE THIOSEMICARBAZONE SYSTEMS AND INVESTIGATION OF THEIR ANTIOXIDANT ACTIVITIES.

Murat Bingül, Salih Paşa Mehmet Boga,

School of Pharmacy, Department of Pharmaceutical Chemistry, Dicle University, Diyarbakır, 21280, Turkey
murat.bingul@dicle.edu.tr
Department of Science, Faculty of Education, Afyon Kocatepe University, Afyonkarahisar, 03200, Turkey
salihpasa@aku.edu.tr
School of Pharmacy, Department of Pharmaceutical Technology, Dicle University, Diyarbakır, 21280, Turkey
mehmet.boga@dicle.edu.tr

Abstract:

Biochemical processes in living systems are generated by the reactive oxygen species including reactive hydroxyl radical, superoxide anion radical hydrogen peroxide and nitric oxide. Living organisms have built endegounous defence enzymatic systems to protect the cellular organelles by scavenging the exceeded oxidant species. Under some circumstances, the scavenge ability of endogenous antioxidant has been decreased to result the imbalance oxidative stress. Therefore desing and synthesis of new chemicals hold promising potentials in the development of nutritional supplements for the application as antioxıdant agents.

Indole heterocyclic systems are biologically valuable scaffolds that occur in many natural alkaloids and there has been a significant recent interest in heterocyclic aromatic systems derived from dimethoxyindoles as well as dimethoxyindole containing heterocyclic compounds due to their possible biological and pharmacological activities. In our work we have utilised the Hemetsberger indole synthesis method to produce indole-2-carboxylate derivatives and Vilsmeier formylation reaction was carried out to activate the 7 position with the formyl substitution. The activated indoles at 2 and 7 positions have been the basis of the synthetic targets and a series of reaction with the different thiosemicarbazide compounds yielded newly synthesised indole thiosemicarbazone systems. The antioxidant profile of novel compounds has been identified by using ABTS, Cuprac and DPPH assays.

Key words: dimethoxyindole, thiosemicarbazone, antioxidant, Hemetsberger, Vilsmeier Reaction
General area of research: Chemistry
ICFAS2018-ID: 1174

SINGULAR CURVES AND THEIR APPLICATIONS IN CRYPTOGRAPHY

Enver Özdemir

Istanbul Technical University, Informatics Institute
ozdemiren@itu.edu.tr

Abstract:

In this talk, I am going to present a method for computing in the Jacobian group of a nodal curve. Nodal curves in computational sense are similar to hyperelliptic curves. The Jacobian groups of these curves have been employed for various applications in computational number theory and cryptography.

Keywords: Singular Curves, Cryptography
General area of research: Mathematics
ICFAS2018-ID: 1176

EQUILIBRIUM POINTS BETWEEN THE CROWD AND THE REQUESTER IN SOFTWARE DEVELOPMENT

Gülfem Işıklar Alptekin

Galatasaray University, Çırağan Cad. No:36, Ortaköy 34357 İstanbul, Turkey,
gisiklar@gsu.edu.tr

Abstract:

Crowdsourcing is an emerging phenomena based on outsourcing the work to undefined large network of individuals by means of open call requesting for participation. It has started to gain much more attention in software engineering research areas, from coding to development by means of special platforms and applications. It is seen as a good alternative for academia and industry as a means of software development approach. Crowdsourcing is believed to enhance efficiency of the projects and reduce their development times and costs. Besides, it is possible to find a large number of people/community who are willing to work for crowdsourced projects at any time. Flexible workforce, i.e. the crowd, is a chance for using specialist freelancers. In crowdsourcing, multiple developers independently work to produce solutions; thus, it is possible to produce higher quality solutions by developers. Difficult tasks for computers are achieved successfully by means of human intelligence. On the other hand, there are some drawbacks in crowdsourcing approach. Collaboration between a large group of workers leads to management problems. This problem causes waste of time due to the fact that multiple workers create similar designs for the same works. Besides, some complex software projects require dependencies between tasks.

This paper focuses on the crowdsourcing concept and research in software engineering from different aspects. The main objective is to determine the equilibrium points, where both the crowdsourcing requestor and the crowd desire come together onto a crowdsourcing platform. For this, both sides need to satisfy from their received profits; either from the gained prize or received software product. In this paper, we first introduce crowdsourcing concepts in software engineering and then concentrate on these common equilibrium points and the ways to determine them.

Keywords: Software development; crowdsourcing; software engineering
General area of research: Software Engineering
ICFAS2018-ID: 1177

INDUSTRY 4.0 PRODUCT DESIGN FRAMEWORK: AN APPLICATION IN HEALTHCARE INDUSTRY

Ece Uçar, **S. Emre Alptekin**

Galatasaray University, Department of Industrial Engineering, Çırağan Cad. No.36, İstanbul, Turkey
eceucar96@hotmail.com
Galatasaray University, Department of Industrial Engineering, Çırağan Cad. No.36, İstanbul, Turkey
ealptekin@gsu.edu.tr

Abstract:

The concept of "Industry 4.0", also known as the fourth industrial revolution, envisages the digitization of production / service systems in parallel with developments in information and communication technologies. This transformation results in the efficient integration of different systems into an integrated one. Industry 4.0 involves the use of linked objects especially in the field of production. It aims to establish new models ranging from business development to human resources.
The concept of the Internet of Things ("Internet of Things") defines the platform and its components for this interaction. On top of this proposed structure, suitable software and hardware platforms are introduced. These additions enable to collect real-time data and especially collecting data through sensors. The collected data are used as inputs to data mining applications to increase process efficiency and hence providing decision support to management.
In industry 4.0, the main goal is to use every available data from different sub-systems to improve productivity. This approach provides the basis for the concept of smart factories. The obtained data are automatically analyzed and transformed into efficient business models. It is essential to design all processes from warehouse management to pricing based on this new point of view and to develop appropriate business models for each of them.
In this work, we will study the design of the subsystems within the scope of Industry 4.0, determine business models of these subsystems, and obtain efficiency enhancing solutions with appropriate decision support systems. The focus will be on the improvement of product design based on resource utilization and customer satisfaction.
We choose the healthcare industry as the application area. Recent advances in data collection and digitization of patient data enabled making informed decisions regarding treatment options, especially for chronic disease patients. The aim of this study is to propose a product design framework that would consider consumer expectations/requirements and develop a healthcare product. The decision support framework is based on the popular product design tool, quality function deployment (QFD). Analytic network process is also used as part of the QFD methodology to evaluate customer needs and corresponding product technical attributes.

Keywords: Industry 4.0, Internet of Things, Healthcare Industry, Product Design, Quality Function Deployment
General area of research: Decision Support Systems
ICFAS2018-ID: 1178

φ - LIFTED POLYNOMIALS

Elif Segah Öztaş

Karamanoglu Mehmetbey University, Turkey
elifsegahoztas@gmail.com

Abstract:

In this study, φ-lifted polynomial are defined to obtain reversible codes over finite rings. φ-lifted polynomial are not a self-reciprocal or self-revers polynomials but they can generate reversible codes. Moreover, they have some application to generate reversible DNA codes over rings.

Keywords lifted polynomials, reversible codes
General area of research: Mathematics
ICFAS2018-ID: 1179

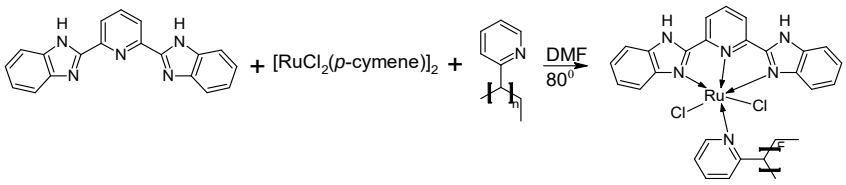
SYNTHESIS OF POLY(2-VINYL PYRIDINE)-RUTENIUM COMPLEX MATERIAL INTENDED FOR HYDROGEN ENERGY APPLICATIONS

Ihsan Basaran, Elif K. Yeldir, Ayhan Oral, Osman Dayan

Canakkale Onsekiz Mart University, Science and Technology Research and Application Center, Canakkale 17100, Turkey. *ihsanbasaran.tr@gmail.com*
Canakkale Onsekiz Mart University, Faculty of Literature and Science, Department of Chemistry, Canakkale 17100, Turkey. *karacan_elif@yahoo.com*
Canakkale Onsekiz Mart University, Science and Technology Research and Application Center, Canakkale 17100, Turkey. *ayhanoral@comu.edu.tr*
Canakkale Onsekiz Mart University, Faculty of Literature and Science, Department of Chemistry, Canakkale 17100, Turkey, *osmandayan@hotmail.com*

Abstract:

Recently, there has been growing concern about environmental pollution caused by the use of fossil fuels as energy sources. Moreover the sources of the fossil fuels are expected to last in decades or a century. Thus alternative energy production methods and sources became necessary. Generally ruthenium and its complexes are used to catalyze such as the water splitting[1,2], hydrogen production reactions etc[3]. In this study a new polymeric material with metal complex were synthesized with poly(2-vinylpyridine) (PVP) and ruthenium. First the PVP was synthesized by photopolymerization and then Ru-PVP complex prepared with the reaction showed in scheme below.



Scheme. Preparation of Ru-PVP complex

Chemical structure of the produced material were confirmed via HNMR and FT-IR analysis. Thermal characterization of the metal polymer complex were characterized by TGA. Further characterization was made by SEM- EDX.

Keywords: Hydrogen energy, photopolymerization, metal polymer complex, ruthenium
General area of research: Chemistry
ICFAS2018-ID: 1183

References:

1. Wang, N.; Zheng, H.; Zhang, W.; Cao, R. Chinese J Catal 2018, 39, 228–244.
2. Kaufhold, S.; Petermann, L.; Staehle, R.; Rau, S. Coord Chem Rev 2015, 304–305, 73–87.
3. Crisafulli, C.; Scir, S.; Salanitri, M.; Zito, R.; Calamia, S. Int J Hydrogen Energy 2011, 36, 3817–3826.

5th International Congress on Fundamental and Applied Sciences 2018 (ICFAS2018)
Proceeding Book

LOW RANK APPROXIMATONS FOR FRACTIONAL DIFFERENTIAL EQUATIONS

Yaprak Dericioğlu

Department of Mathematics, Yildiz Technical University, 34220 Istanbul, Turkey.
guldogan@yildiz.edu.tr

Abstract:

In the present paper, we consider fractional time differential equations. Discretizations of fractional differential equations lead to large-scale linear systems or matrix equations, especially whenever more than one space dimension is considered. The discretization of fractional differential equations typically involves dense matrices. We project the initial problem onto an extended block Krylov subspace and get a low-dimentional differential matrix equation. The latter matrix problem is then solved by the integration methods like Backward Differentiation Formula (BDF) or Rosenbrock. We give some theoretical results and present some numerical experiments.

Keywords: Extended block Krylov; Low rank approximation; Fractional differential equations
General area of research: Mathematics
ICFAS2018-ID: 1186

NUMERICAL SOLUTION OF HYPERBOLIC EQUATIONS WITH NONLOCAL BVPs

Ozgur Yildirim, **Meltem Uzun**

Department of Mathematics,Yildiz Technical University, İstanbul 34220, Turkey
ozgury@yildiz.edu.tr
Department of Mathematics,Yildiz Technical University, İstanbul 34220, Turkey
meltemu@yildiz.edu.tr

Abstract:

The aim of this study is to present third and fourth order of accuracy stable difference schemes for the approximate solutions of hyperbolic multipoint nonlocal boundary value problem (NBVP) in a Hilbert space H with self-adjoint positive definite operator A.

Keywords: Abstract hyperbolic equations, stability, difference equations
General area of research: Mathematics
ICFAS2018-ID: 1187

PERTURBATED DYNAMICAL SYSTEMS IN FINANCIAL MATHEMATICS AND ARTS

Roksana Brodnicka, Henryk Gacki

Institute of Mathematics, University of Silesia in Katowice, POLAND
rbrodnicka@o2.pl, Henryk.Gacki@us.edu.pl

Abstract:

The main purpose of our work is to get the answer to the question:
Why the distribution of the income in the population with low earnings is logarithmic-normal? To present this fact we will use the model of dynamical systems with multiplicative perturbations related to theory of Markov operators in combination with central limit theorem of Lapunov-type.
We consider a dynamical systems with multiplicative perturbations. Suppose that we have n impulses 1, ..., n acting in the order of their indices. These we consider as independent random variables. Denote by Xn the income made by those impulses. Let us consider a model where the income's growth made by the (v + 1)-th impuls is proportional to the strength of this impulse with index v+1 and to some function f(Xv) presenting the growth of the income before the (v + 1)-th
impulse.
To sum up, we will obtain that X, which shows the size of the income of the people who have low earnings, has has the logarithmico-normal distribution.
The answer for the main question of this work may be given in different ways. The choice of exactly this method - perturbated dynamical systems - was made on purpose, not only because it was the first one but also due to the fact that using this method financial mathematics got closer to arts. Perturbated dynamical systems have a very wide branch of usage. One of them is financial mathematics, on the other hand, by making a small change in the assumption, we obtain the application in arts.

Keywords: Perturbated dynamical systems, financial mathematics
General area of research: Mathematics
ICFAS2018-ID: 1188

DEVELOPMENT OF A PERSONNEL INFORMATION SYSTEM FOR UNIVERSITIES

Musa Turkan, Burakhan Çubukçu, Emre Dandıl, Uğur Yüzgeç

Institute of Science, Electronics and Computer Engineering, Bilecik Şeyh Edebali University
Bilecik, TURKEY
musa.turkan@bilecik.edu.tr
Institute of Science, Electronics and Computer Engineering, Bilecik Şeyh Edebali University
Bilecik, TURKEY
burakhan.cubukcu@bilecik.edu.tr
Department of Computer Engineering, Bilecik Şeyh Edebali University
Bilecik, TURKEY
emre.dandil@bilecik.edu.tr
Department of Computer Engineering, Bilecik Şeyh Edebali University
Bilecik, TURKEY
ugur.yuzgec@bilecik.edu.tr

Abstract:

With advancing technology, the importance of the world of data has increased. In addition, another important issue for database management systems is to record the data correctly. Moreover, it is worthwhile to update and monitor it effectively and regularly after the data is recorded. Data management system consists of such as data security, data sharing, data destruction, and data architecture. In this study, a web-based application was developed to collect and display information about personnel working at Bilecik Seyh Edebali University. In this application, it was to develop used visual studio environment comprising .Net, C#, JavaScript programming language and Model-View-Controller (MVC) architecture. The main goal of the system is to give information on a web platform about the number of academic and administrative personnel, the number of student, academic works. The proposed system is integrated with some modules in order to provide correctly data in Higher Education Council Information System (YOKSIS)such as YÖK graduate query, staff information system and student information system. One of the benefits provided by this system is to collect on-site a single framework the distributed data in the different units. Besides, the statistics required by university are provided on the web application. In future works, it is aimed to be used calculations for academic promotion to provide more statistical data.

Keywords: Web Application, Decision Support Systems, Automation, JavaScript.
General area of research: Engineering
ICFAS2018-ID: 1191

ADDITIONAL COURSE FEE MANAGEMENT (AdCoFeeM) SYSTEM FOR ACADEMICIANS

Burakhan Çubukçu, **Musa Turkan**, Uğur Yüzgeç, Emre Dandıl

Institute of Science, Electronics and Computer Engineering, Bilecik Şeyh Edebali University
Bilecik, TURKEY
burakhan.cubukcu@bilecik.edu.tr
Institute of Science, Electronics and Computer Engineering, Bilecik Şeyh Edebali University
Bilecik, TURKEY
musa.turkan@bilecik.edu.tr
Department of Computer Engineering, Bilecik Şeyh Edebali University
Bilecik, TURKEY
ugur.yuzgec@bilecik.edu.tr
Department of Computer Engineering, Bilecik Şeyh Edebali University
Bilecik, TURKEY
emre.dandil@bilecik.edu.tr

Abstract:

There are about 160000 academicians at different levels at universities in Turkey. In accordance with the Turkish laws, academicians are paid additional course fee every month. Manual calculations required for payment cause a serious loss of work power. Along with the developing technology, the automations reduces both the loss of work power and the possibility of errors in calculations. In this study, an **A**dditional **C**ourse Fee **Management** System (AdCoFeeM) was developed for Bilecik Seyh Edebali University. AdCoFeeM system was developed in two different applications in Visual Studio environment using C #, JavaScript, .Net languages, one for web application and the other for console application. The web application allows the academics to review and approve their monthly additional course calculation results. It also allows administrators to perform calculation checks and obtain the necessary documents. The console application realizes calculations taking into account the constraints arising from Higher Education law and university regulations. This system was developed to integrate with the student information system and staff information system in order to operate fully automatic. In the system, all of the course data is taken from the student information system and all of the personnel data is taken from the staff information system. AdCoFeeM system is started to be used at Bilecik Seyh Edebali University.It has been observed that this proposed system works successfully. In future works, it is aimed that AdCoFeeM system can present more documents and turn it into web application completely.

Keywords: Web Application, Additional Course Calculation, Automation, JavaScript.
General area of research: Engineering
ICFAS2018-ID: 1192

GRAPHS ASSOCIATED TO COMMUTATIVE RINGS

Ayman Badawi

American University of Sharjah, Department of Mathematics & Statistics
abadawi@aus.edu

Abstract:

Let R be a commutative ring with $1 \neq 0$, add let $Z(R)$ be its set of zero-divisors. Over the past several years, there has been considerable attention in the literature to associating graphs with commutative rings (and other algebraic structures) and studying the interplay between ring-theoretic and graph-theoretic properties. In this general talk, we will explore (by examples) some basic properties of of the classical zero-divisor graph in the sense of Anderson-levingston-Beck. Recall that the **zero-divisor graph** of R is the (undirected) graph with vertices $Z(R)^* = Z(R) \setminus \{0\}$, and two distinct vertices x and y are adjacent if and only if $xy = 0$. If time allows, we will touch briefly on the two graphs: **(1) The annihilator graph of** R. The annihilator graph of R is the (undirected) graph $AG(R)$ with vertices $Z(R)^* = Z(R) \setminus \{0\}$, and two distinct vertices x and y are adjacent if and only if $ann_R(xy) \neq ann_R(x) \cup ann_R(y)$, where if $a \in Z(R)$, then $ann_R(a) = \{d \in R \mid da = 0\}$. **(2) The total graph of** R**.** The total graph of R is the (undirected) graph $TG(R)$ with all elements of R as vertices, and for distinct $x, y \in R$, the vertices x and y are adjacent if and only if $x + y \in Z(R)$.

Keywords: Graphs
General area of research: Mathematics
ICFAS2018-ID: 1193

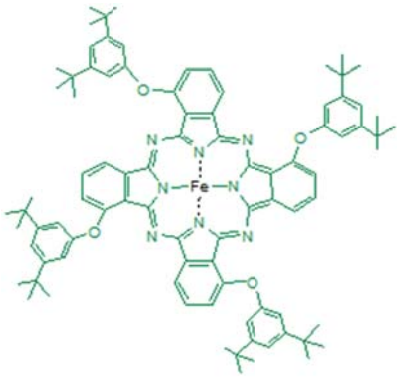
SYNTHESIS of *t-butyl*-SUBSTITUTED IRON(II) PHTHALOCYANINE

Mevlude Canlica

Yıldız Technical University, Science and Art Faculty, Chemistry Department, Davutpasa Campus, 34220 Esenler, Istanbul, Turkey
mcanlica@yahoo.com

Abstract:

This study reports on synthesis and photodegredation properties of Iron(II)phthalocyanine tetrasubstituted with di-*tert*-butyl groups at the end of non-peripheral Pc substituents. The Fe(II)Pc was characterized using elemental analysis, FT-IR, mass spectrum, electronic spectroscopy. The photodegradation quantum yield of the complex was found $1{,}51 \times 10^{-5}$ in DMSO.



Acknowledgements
This work was supported by Tubitak-BİDEB-2219 International Postdoctoral Research Scholarship Programme, Applying Number: 1059B191401081 in Turkey. The author is thankful to the Yildiz Technical University in Turkiye, the University of Illinois at Urbana-Champaign in USA as well as Rhodes University in Grahamstone, South Africa. I would also thank Prof. Kenneth S. Suslick for providing me the lab when synthesizing the compounds utilized in the study. The author is also thankful to Prof. Tebello Nyokong for providing me the grant and the facilities in the lab during the photochemical measurements.

Keywords: Fe(II)Phthalocyanine: photodegredation quantum yield: electronic spectra
General area of research: Chemistry
ICFAS2018-ID: 1194

RICCI SOLITONS ON NEARLY KENMOTSU MANIFOLDS

Gülhan Ayar, Mustafa Yıldırım, Nesip Aktan

Mathematics, Karamanoğlu Mehmetbey University, Karaman 70100, Turkey
gulhanayar@gmail.com
Mathematics, Address, Aksaray University, Aksaray 68100,Turkey
mustafayldrm24@gmail.com
Mathematics, Address, Necmettin Erbakan University, Konya 42090, Turkey
nesipaktan@gmail.com

Abstract:

In this study Ricci solitons and gradient Ricci solitons in a nearly Kenmotsu manifold are investigated. After giving preliminaries and some definitions we have proved that in a nearly Kenmotsu manifold if the metric admits a Ricci soliton then the manifold is an η-Einstein manifold. In addition to these, we have showed that if a nearly Kenmotsu manifold admits a compact Ricci soliton, then the manifold is Einstein. Finally we have proved that if an η-Einstein nearly Kenmotsu manifold admits a gradient Ricci soliton, then the manifold reduces to an Einstein manifold under certain condition.

Keywords: Ricci solitons, Nearly Kenmotsu Manifolds
General area of research: Mathematics
ICFAS2018-ID: 1195

SOME RESULTS ON (k,l)-ALMOST CONTRACTIONS IN CONE METRIC SPACES OVER BANACH ALGEBRAS

Muttalip Özavşar, Hatiçe Çay

Yıldız Technical University, Department of Mathematics, Istanbul, 34210, Turkey
mozavsar@yildiz.edu.tr
İstanbul Medipol Üniversitesi, İstanbul,Turkey
hcay@medipol.edu.tr

Abstract:

In this presentation, some fixed point results on (k,l)-almost contractions are introduced by using the setting of (k,l)-almost contractions defined in [1-3].

Keywords: Banach Contraction Principle; Fixed Point; (k,l)-almost contraction; Cone Metric Spaces over Banach Algebras
General area of research: Mathematics, Fixed Point Theory
ICFAS2018-ID: 1196

References:

[1] V. Berinde, Approximating fixed points of weak contractions using the Picard iterations. Nonlinear Anal. Forum. 2004(9): 43-53.

[2] S. Xu and S. Radenovic, Fixed point theorems of generalized Lipschitz mappings on cone metric spaces over Banach algebras without assumption of normality. Fix. P. Theory Appl. 2014, 12 pages.

[3] M.Özavşar, Fixed Point Theorems for (k,l)-almost contractions in Cone Metric Spaces over Banach algebras, Math.Adv.Pure and Appl. Sci. 2018(1): 46-51 .

INVESTIGATING THE SELF-EFFICACY VIA PARALLEL MULTIPLE MEDIATION MODELS

Meral Yay

Mimar Sinan Fine Arts University, Istanbul, , 34347, Turkey
meral.yay@msgsu.edu.tr

Abstract:

The purpose of the mediation analysis is to investigate the relationship between an independent and dependent variables. Analysis searches to go beyond the question of whether an independent variable causes a change in a dependent variable and the question of whether or not mediator is present. If there is the role of the third variable in the relationship between two variables, there is a mediator in the model. The model takes the name of the simple mediation model when there is only one mediator that describes the relationship between the variables. If there is more than one mediator variable describing the relationship between the variables, a multiple mediation model is used to explain the relationship between the variables. In this study it was aimed to examine the factors affecting the self-efficacy via parallel multiple mediation model and to explain the statistical relationship between the variables.

Keywords: Multiple mediation, self-efficacy, mediator
General area of research: Statistics
ICFAS2018-ID: 1098

NON-COVALENT INTERACTIONS IN ORTHORHOMBIC KCAF3

Mutlu Colakogullari

Department of Physics, Faculty of Sciences, Trakya University, 22030 Edirne-TURKIYE
mutlucolakogullari@trakya.edu.tr

Abstract:

Non-Covalent interactions (NCI) method associated with reduced density gradient (RDG) which is basically an analysis of quantum mechanically atomic and molecular interactions has been developed to make an investigation in periodic solids for hydrogen bonding and non-local van der Waals interactions as well as non-covalent interactions. NCI in a solid crystal can be easily visualized with 3D color-mapped demonstration of attractive and repulsive interactions by helping the zero values of RDG which are so-called as bond/ring critical points depend on the self-consistent electron density multiplied by sign of second eigenvalue of Hessian matrix. In this study, the theory has been applied to functional semiconductor Potassium Fluoroperovskite KCaF3 with orthorhombic lattice structure under density functional theory (DFT) plus plane wave basis set and ultrasoft pseudopotential. The investigation results for the strong and weak electron pairing among Ca-F1 and Ca-F2 bonds of CaF6 polyhedra reveal that why the crystal exist in lower symmetric orthorhombic structure rather than aristo type cubic one.

Keywords: Non-Covalent Interactions; Denstiy Functional Theory; Potassium Fluoroperovskite
General area of research: Physics
ICFAS2018-ID: 1199

ELECTRONIC PROPERTIES OF TRANSITION METAL DOPED SEMICONDUCTOR NANOWIRES

Sena Güler Özkapi[1], Barış Özkapi[2], Seyfettin Dalgiç[3]

1, Vocational School of Technical Sciences, Trakya University, Edirne, 22000, Turkey
senaguler@trakya.edu.tr
2, Vocational School of Technical Sciences, Trakya University, Edirne, 22000, Turkey
barisozkapi@trakya.edu.tr
3, Department of Physics, Trakya University, Edirne, 22000 Turkey
dseyfe@co.uk

Abstract:

In this study, structural and electronic properties of bulk structure of BN semiconductor in zinc blende and nanowires in the [001] direction have been examined by using Plane Wave Self Consistent Field (PWSCF) based on Density Functional Theory. In order to enrich the potential of doped semiconductor nanowires in electronic and spintronic devices, we implement a theoretical study of transition metal doped BN nanowires. The electronic properties of BN semiconductor nanowires with 0.92 nm diameter have been investigated by substituting separately with Cr and Mn atoms instead of a single boron atom. By substitution of Cr and Mn, the band structures and density of states (DOS) of nanowires are calculated and shown comparatively.

Keywords: Electronic structure, Transition metal, BN nanowire.
General area of research: Physics
ICFAS2018-ID: 1201

THE ELECTROSTATIC POTENTIALS OF GAN/ALN HETEROSTRUCTURES: BULK AND NANOWIRE

Barış Özkapi[1], Sena Güler Özkapi[2]

1, Vocational School of Technical Sciences, Edirne, 22000, Turkey
barisozkapi@trakya.edu.tr
2, Vocational School of Technical Sciences, Edirne, 22000, Turkey
senaguler@trakya.edu.tr

Abstract:

In this work, we have performed first principles calculations to study the structural and electronic properties of zinc-blende GaN/AlN superlattice heterostructures. The lattice constants, total energies and averaged electrostatic potentials of GaN/AlN (001) bulk and axial GaN/AlN nanowire heterostructures have been investigated by using first principles method based on density functional theory. The nanowire heterostructures have been constructed along the [001] direction. In addition, the effects of the AlN and GaN layer numbers have been considered on the atomic structure and electrostatic potential forms in the interface region. The results are given comparatively for both nanowire and bulk heterostructures.

Keywords: III-Nitrides, nanowire heterostructures, electrostatic potentials, GaN/AlN
General area of research: Physics
ICFAS2018-ID: 1202

5th International Congress on Fundamental and Applied Sciences 2018 (ICFAS2018) Proceeding Book