SELCUK UNIVERSITY
FACULTY OF TECHNOLOGY

ICENTE'22

INTERNATIONAL CONFERENCE ON ENGINEERING TECHNOLOGIES

November 17-19, 2022

Konya/TURKEY

ABSTRACTS BOOK

Editor
Prof. Dr Sakir TASDEMIR

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International Conference on Engineering Technologies

6th International Conference, ICENTE
Konya, Turkey, November 17-19, 2022

Abstracts

Editor
Sakir TASDEMIR

International Conference on Engineering Technologies, **ICENTE'22**
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Şakir TAŞDEMİR

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Konya Kasım 2022

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PREFACE

International Conference on Engineering Technologies (ICENTE'22) was organized in Konya, Turkey on 17-19 November 2022.

The main objective of ICENTE'22 is to present the latest research and results of scientists related to Biomedical, Computer, Electrics & Electronics, Mechanical, Mechatronics, Metallurgy & Materials and Civil Engineering fields. This conference provides opportunities for the delegates from different areas in order to exchange new ideas and application experiences, to establish business or research relations and to find global partners for future collaborations.

All paper submissions have been double blind and peer reviewed and evaluated based on originality, technical and/or research content/depth, correctness, relevance to conference, contributions, and readability. Selected papers presented in the conference that match with the topics of the journals will be published in the following journals:

- Artificial Intelligence Studies (AIS)
- Gazi Journal of Engineering Sciences (GJES)
- International Journal of Applied Mathematics, Electronics and Computers (IJAMEC)
- International Journal of Automotive Engineering and Technologies (IJAET)
- International Journal of Energy Applications and Technology (IJEAT)
- MANAS Journal of Engineering (MJEN)
- New Trends in Computer Sciences
- Open Journal of Nano (OJN)
- Selcuk University Journal of Engineering Sciences (SUJES)
- Intelligent Methods In Engineering Sciences (IMIENS)

At this conference, there are 260 paper submissions. Each paper proposal was evaluated by two reviewers. and finally, 215 papers were presented at the conference from 9 different countries (Turkey, Ukraine, Iraq, Macedonia, Algeria, Georgia, Tunisia, Romania, Albania) with 151 local and foreign universities and organizations participating,

In particular, we would like to thank Prof. Dr. Metin AKSOY, Rector of Selcuk University, conference scientific committee, session chairs, invited speakers, referees, technical team, participants, and all our colleagues who have contributed. They have made a crucial contribution to the success of this conference. Our thanks also go to our colleagues in our conference office.

Prof. Dr. Sakir TASDEMIR
Editor

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EXPANSION OF FUZZY SET THEORY WITH NEW EXTENSIONS

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ABSTRACT

Multivalued logic has found its ultimate destination with Zadeh's continuous fuzzy logic (Zadeh, 1965). Ordinary fuzzy sets (OFS) introduced by Zadeh (1965) are represented with singletons with some elements and their degrees of membership to the set. The non-membership of this element is the complement of the membership degree to 1. This complementary feature of ordinary fuzzy sets was criticized by various researchers. According to these researchers, the membership degree of an element should be also fuzzy and there should be no necessity for the complementary feature in OFS. Thus, by adding the fuzziness to membership degrees and/or by removing the complementary feature, OFS have been extended to several new extensions that describe membership functions with more details. Type-2 fuzzy sets and interval-valued fuzzy sets were developed, which let membership functions also be fuzzy. (Zadeh, 1975). Later, Atanassov (1986) introduced intuitionistic fuzzy sets (IFSs) including x values with degrees of membership and non-membership whose sum can be at most equal to 1. The complement of the membership and non-membership degrees to one is the hesitancy or indeterminacy degree of the decision maker. Torra (2010) introduced hesitant fuzzy sets (HFSs) to deal with a set of potential membership values of an element in a fuzzy set. Atanassov (1999) introduced intuitionistic type-2 fuzzy sets (IFS2) in his book, which let squared sum of membership and non-membership degrees be at most equal to one. Later, Yager (2013) called IFS2 as Pythagorean fuzzy sets (PFSs). Yager (2017) also introduced q-rung orthopair fuzzy sets (Q-ROFSs) as a generalization of IFSs, which the sum of qth powers of membership and non-membership equals at most one. Smarandache (1998) introduced neutrosophic sets whose degrees of truthiness, indeterminacy, and falsity for each element in the universe can be equal to at most one and their sum can be at most 3. Coung (2017) introduced picture fuzzy sets with three parameters which are called yes, no, and abstain and their complement to one as refusal degree. Kahraman and Kutlu Gündoğdu (2018) and Kutlu Gündoğdu and Kahraman (2019) introduced spherical fuzzy sets which the squared sum of the same parameters as picture fuzzy sets can be at most equal to one. The aim of all these extensions is to explain the membership of an element to a fuzzy set with more parameters and more details.

KEYWORDS – Fuzzy Set, Multivalued logic, Type-2 fuzzy.

FEDERATED COMPUTING OF VECTOR-MATRIX TRANSACTIONS IN CYBER-SOCIAL SYSTEMS

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ABSTRACT

The main idea is to create logic-vector computing that uses only read-write transactions on address memory. The strategic goal is to create a deterministic vector-quantum computing that uses photons for read-write transactions on stable subatomic memory elements. The main task is to implement a new vector logic-vector computing in the technology of classification and identification of big data based on similarity-difference. Vector computing is a computational process of analyzing big data like addresses based on read-write transactions over bits of binary vectors of functionality. In order to analyze big data, a matrix of deductive vectors is synthesized, which is characterized by the following properties: compactness, parallel processing of input data based on one read–write transaction on matrix memory, exclusion of traditional logic from data analysis procedures, full automation of the process of its synthesis, orientation towards a technological solution many computing tasks. A new structure of a scalable sequencer for vector data processing as addresses is proposed, which is characterized by ease of implementation on matrix memory, excludes any traditional logic, and uses data read-write transactions in memory to generate the analysis result. A new vector-matrix technology for parallel processing of large data as addresses has been developed, which is characterized by the use of read-write transactions on matrix memory without the use of processor logic. A Conventional Memory Computing architecture with global feedback and an algorithm for matrix parallel processing of large data as addresses are proposed.

KEYWORDS – Vector-Matrix Transactions, cyber-social systems.

ECG ARTIFACTS REMOVING USING ZERO PHASE FILTERING

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ABSTRACT

In addition to cerebral activities in the brain, electrical activities originating from places outside the brain are also recorded with Electroencephalogram (EEG). Since the waveforms of these signals, called artifact, are measured like real brain waves, removing these artifacts from EEG signals is extremely important for diagnosis and treatment. Therefore, in this study, Zero Phase Filtering method is proposed to remove Electrocardiogram (ECG) artifact from EEG recordings. The performance of this method was tested using the Boston's Beth Israel Hospital Sleep Laboratory (MIT-BIH) Polysomnographic EEG dataset. The results obtained using various statistical performance measurement methods showed that the Zero Phase Filtering method is an effective method for removing ECG artifacts in the EEG signal. With this proposed method, almost all cerebral activity was preserved, while ECG artifacts were successfully removed.

KEYWORDS - Artifact, brain, electroencephalogram, electrocardiogram, zero phase filtering.

EXTRACTION OF HYDROXYAPATITE FROM TILAPIA FISH BONE USING CALCINATION METHOD

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ABSTRACT

Hydroxyapatite (HAp) has been used as coating material in biomedical applications. The main reason for this is that the structure of HAp has a bone-like structure. HAp can be synthesised chemically or can be extracted from natural resources. This study natural Hydroxyapatite is obtained from Tilapia Fish bone using calcinaton method. The fish bones are deproteinized and washed throughly to balance pH, dried and prepared for calcination. After the calcination, obtained HAp powders were characterised by using X-ray diffraction analysis (XRD), field emission scanning electron microscopy analysis (FE-SEM-EDX), ICP-OES and fourier-transform infrared spectroscopy (FTIR). As a result of the obtained hydroxyapatite that is extracted from fish bone can be a promising natural option for biomedical uses.

KEYWORDS - Hydroxyapatite, Biomaterials, Nano size, FTIR, FE-SEM, XRD

3D NEUROMUSCULAR MODELLING OF A TRANSFEMORAL AMPUTEE WALKING

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ABSTRACT

In this study, to determine the quality of the transfemoral prosthesis, a suitable model was developed using finite element (FE) to evaluate the functions of the socket, knee joint, and feet. The current 3D neuromuscular model of a healthy individual has been adapted to represent a transfemoral amputee with a 3R60. A walking simulation at average speeds of 0.9 m/s and 1.2 m/s was applied to the model via the MATLAB program. The model's performance was evaluated by comparing the gait differences between healthy and amputee models with the findings in the literature. In addition, a case study on fall prevention was conducted using a control moment gyroscope embedded in the prosthetic leg. The simulated amputee gait was compatible with the literature, especially at a speed of 1.2 m/s. However, the oscillation of the model in the coronal plane is 0.9 m/s; This shows that it is difficult to maintain the balance.

KEYWORDS - Control moment gyroscope, fall prevention, gait simulation, neuromuscular model, transfemoral amputee.

FEATURE SELECTION BASED ON GABOR FILTER AND BSO FOR DETECTING PARKINSON S DISEASE

POUYA BOLOURCHI[1] , MOHAMMADREZA GHOLAMI[2]

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ABSTRACT

Parkinson's disease (PD) is the second most predominant neurological disorder, which clinically involves a movement disorder consisting of bradykinesia, resting tremor, and rigidity. The high death rate from PD attracts the attention of several neuroscience communities and researchers in this field. Early diagnosis of Parkinson's disease is vital for effective treatment. In this regard, computer-based tools are applied widely in diagnosing diseases in medical applications. Machine learning techniques are powerful computer-based tools used in many studies due to their ability to predict PD with a high probability. ML can provide optimal performance by utilizing mathematical models and optimization techniques. This paper presents a model to distinguish PD from healthy control (HC) subjects using the Gabor filter (GF) and brainstorm optimization (BSO) as feature extraction and selection stages, respectively. A standard support vector machine (SVM) with a 10-fold cross-validation technique is used for classification. The proposed model is applied to the PD dataset with the structural magnetic resonance imaging (sMRI) modal as the most relevant neuroimaging modality in PD studies. The achieved results validate the high efficiency of the proposed method compared to other state-of-the-art methods.

KEYWORDS - Parkinson's disease, Gabor filter, brainstorm optimization, structural magnetic resonance imaging, support vector machine

STUDY OF THE FORMATION MECHANISM OF DPPC LIPOSOMES AND CALCIUM ION COMPLEXES

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ABSTRACT

The study of the possible interaction between calcium ions and lipids is of great importance for the studies of complexes of calcium drug-carrying nanoparticles. We prepared calcium-containing complex liposomes from DPPC lipids and studied their thermodynamic properties. In calorimetric studies, we determined that the phase transition temperature of these complexes is close to 420 C. It was shown that both hydrophobic and hydrophilic connections take part in the formation of calcium nanoparticles. We were interested in hydrophilic bonds represented by hydrogen bonds. We have shown that these hydrogen bonds are formed between the phospholipid heads, and the main contributor is the oxygen atoms in the phosphoric acid residues. In addition, based on the amount of heat absorbed during the breaking of hydrogen bonds formed between calcium-containing nanoparticle complexes, it can be concluded that the hydrogen atoms in the head of DPPC lipids form hydrogen bonds between P=O and P-O groups of phosphate. The energy of heat absorption measured by the calorimeter is of the order obtained by breaking the hydrogen bonds we have specified. Thus, we conclude that our approach to the model of liposome formation from lipids is correct. As for calcium atoms - due to the fact that it is present in the form of positive ions in the liposome, they will connect only with negatively charged phosphorus ions. Acknowledgement:The research is funded by the Shota Rustaveli National Science Foundation of Georgia within the framework of the fundamental grant

KEYWORDS - DPPC- Dipalmitoylphosphatidylcholine, Liposomes, Calcium, Complex nanoparticles

THE EFFECT OF PULSE WIDTH AND FREQUENCY IN A MULTISCALE COMPUTATIONAL MODEL OF A SINGLE CELL

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ABSTRACT

In the last decade, electrical stimulation has been frequently used clinically with significant progress to treat certain neurological and psychiatric disorders like Parkinson's disease, sensory restoration for patients suffering from loss of vision, hearing, and touch, resulting in improved quality of life. Most of the research covers neuron's responses to electrical stimulation. However, computational modeling with mathematical theory is a promising complementary approach to experimental studies. This work aims to show the effect of several electrical stimulation parameters such as pulse width and frequency on stimulation threshold. It includes a multi-scale approach that combines a 3-dimensional finite element head model for brain stimulation with a multi-compartmental pyramidal neuron with 3-dimensional morphology. An ideal point source was used for extracellular stimulation. NEURON v8.0 was used for building a computational neuron model. Electrical current threshold was analyzed while other parameters were constant. Frequency was 20 Hz and pulse width is 1 ms. Threshold was sought between 1-500 μA. Pulse width varied between 0.1 and 2.5 ms, while frequency ranges between 1 and 100. The increasing pulse width resulted in a significant decrease in the stimulation threshold to some extent. These results are consistent with the well-known experimental studies. Increasing frequency after a certain value decreased the threshold, which was related to the neuron's characteristics. It was concluded that realistic multi-scale computational models can be used to investigate parameter space in advance, providing valuable approximations before experimental works.

KEYWORDS - computational, modeling,brain,electrical,stimulation

THE IMPACT OF RESEARCH AND CITATIONS ON WORLD RANKINGS OF COUNTRIES WITH THE BEST UNIVERSITIES

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ABSTRACT

The ranking of world universities is based on several attributes that also consider research and citations, where their impact on the country's global positioning as having the best universities could change its current position. These attributes must be measured for this effect to look reasonable. The Times Higher Education World University Rankings (THE) provides a data set that ranks various universities around the world based on total common attributes, among others including research and citations. But this positioning can be discerned using a specific statistical approach, such as considering only research and citations, by giving such universities a different ranking position that is different from what is known. This approach has also affected the ranking of countries with the best universities. The statistical relationship of research and citations, as well as the global ranking positions of the best universities and their respective countries are shown in this study by processing THE's dataset using SPSS program. Understanding the importance of research and citations to science and society, results of these contrasting positioning approaches can have a profound impact on how university rankings are conducted, and depending on how these occur, the study shows the changed global positioning of countries with the best universities.

KEYWORDS - Research, Citations, World Ranking Universities, Best Universities

ROAD PROBLEM DIAGNOSIS WITH MULTI AGENT SYSTEMS IN TRAFFIC

MERT DEMIR[1]

[1] Izmir Kavram Vocational School, Turkey

ABSTRACT

Today, traffic problems are important factors that cause loss of life and property. The fact that the drivers are not instantly unaware of the changing road and traffic conditions prevents taking early measures and triggers traffic problems. As an alternative to the deficiencies in the existing traffic cameras and observation systems, a model has been developed that includes each vehicle on the road to be a unit of measurement. The model created is the adaptation of multi-agent systems to the traffic environment. In this way, possible highway problems and worn-out roads are facilitated. In the study, the application of a low-budget vehicle network module to evaluate and share the road and traffic conditions between vehicles and to take early measures against possible problems is explained. Early prevention method is presented by using multi-factor structures to monitor vehicle flow, detect road problems and take early precautions. By making the prototype of the proposed system, a road hazard detection model was developed, and suggestions for studies, experiments and early warning system to prevent possible traffic accidents were presented.

KEYWORDS - Multi agent systems, Signal processing, Traffic control, Transportation security, Internet of Things

REAL TIME FAST SELECTING SYSTEM WITH OBJECT RECOGNITION AND TSP ALGORITHMS

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ABSTRACT

The stage before the conversion of agricultural products into post-harvest consumer products is the process of separating the raw products into appropriate classes. Today, this difficult manual seperating process is a process in which a large number of workers work at an intense pace on the product line and the workforce is intensively spent. Disruptions in seperating as a result of carelessness cause product loss, loss of time and cost increases. In this study, as an alternative to manual seperating processes, a real-time seperating system, which detects the products in the factory band with object recognition methods and enables fast positioning of the seperating tool on the products, works simultaneously with object recognition and traveling salesman problem algorithms has been created. In this way, a low-budget seperating system is recommended for large sorting processes with a time- and cost-effective sorting model. In the study, the creation of a real-time fast seperating system with the support of the traveling salesman algorithm, performance evaluation and research and findings on the fast seperating model are presented.

KEYWORDS - Object recognition, Travel salesman problem, Seperating system, Production band, Food production

ON THE USE OF TIME SERIES DATASETS THROUGH GOOGLE EARTH ENGINE TO MONITOR THE FOREST COVER LOSS IN TURKIYE BETWEEN 2001 AND 2021

CIGDEM SERIFOGLU YILMAZ[1]

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ABSTRACT

As in the whole world, detailed information on global forest resources and their changes over the years is needed for forest management applications in Türkiye. Caused by various reasons, deforestation is one of the most important environmental problems of Türkiye. Determining deforestation in country-scale areas with traditional terrestrial techniques is very challenging, especially in cases where urgent actions need to be taken. Today, the ease of access to satellite images has enabled the observation of forests at different spatial and temporal resolutions. As a widely-used cloud computing platform, Google Earth Engine (GEE) makes it easy to observe the Earth and perform various analyses. The present study aims to monitor forest cover loss in Türkiye from 2001 to 2021 through the Hansen Global Forest Change (HGFC) data that is available on GEE platform. The pixels that had a tree cover density greater than 30% in the tree cover data for the year 2000 were used to specify the forest areas used for comparison. The results showed that, in Türkiye, the highest forest loss was observed in 2021, with an increase rate of 72.85%, compared to 2020. The analysis conducted on seven different geographical regions of Türkiye revealed that the greatest amount of forest loss was seen in the Mediterranean, Aegean, and Marmara regions.

KEYWORDS - Google Earth Engine,Hansen Global Forest Change Data, Time Series Analysis,Forest Cover Change

USER REVIEW CLASSIFICATION OF MOBILE BANKING APPLICATIONS WITH LIMITED NUMBER OF LABELLED DATA

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ABSTRACT

Nowadays more and more people connect to the Internet through their mobile devices. This forces firms to be present in the mobile field. Banks are an example of this. Most banks have their proprietary bank applications in the mobile application stores, and they provide most banking operations to be performed remotely. With each update, these applications receive a lot of feedback from the users either positively or negatively about some aspect of the program. The banks would like to receive this feedback rapidly to reflect on their development cycle. In this study, we collected approximately 1.5 million mobile user reviews made for banking applications from sixteen different banks in Apple Store and Google Play Store. These reviews are divided into classes according to their context under previously specified labels (e.g., Usability, System Problems & Bugs, Sign Up & Login, Coverage Rating, etc.). Approximately seven thousand user reviews are labeled manually with care. Since the number of reviews are so large, it was not feasible to manually label all of them. Another concern is to have quality labels. Not all sentences were easily classifiable, and some may be evaluated differently from labeler to labeler. To overcome the small number of labels and still come up with a decent classifier, we used zero-shot classification system. Together with the zero-shot we introduced BERT transformer classification system to the same problem. After comparing the performance of these algorithms, we also investigated the possible increase in quality by introducing semi-supervised learning methods.

KEYWORDS - Text classification, Zero-shot learning, Transformers, Semi-supervised learning

STATIC ANALYSIS OF MALWARE DETECTION USING MACHINE LEARNING ALGORITHMS

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ABSTRACT

Abstract - Nowadays, the diversity of malware is rising rapidly and exponentially and, for accurate identification and detection new techniques must be investigated and utilized. Machine learning methods provide high performance in detecting malicious software. Analysis of a software without running it is known as static analysis. By looking at the features that the software uses, such as functions, libraries, digital signatures, and other features, the functioning structure of the software can be resolved. The proposed method presents a comparative study of 8 different well-known machine learning algorithms such as K-Nearest Neighbor, Random Forest, Decision Tree, Gaussian Naive Bayes, CatBoost, LightGBM, Gradient Boosting and eXtreme Gradient Boosting. The dataset used in the study contains 2000 (1000 malicious - 1000 benign) balanced cyber-attack software selected from the real world was used. The result shows that the use of eXtreme Gradient Boosting classification method gives the best classification accuracy by 99.25%.

KEYWORDS - Malware Detection, Machine Learning, Static Analysis, Malware Analysis

EVALUATION OF TIME SERIES DECOMPOSITION ON STATISTICAL AND MACHINE LEARNING BASED FORECASTING MODELS

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[1] Eskisehir Technical University, Turkey

ABSTRACT

Decomposition separates the time series into components as trend, seasonality, and random effect. The aim of the decomposition of the time series is to increase forecast accuracy. In this study, a comparison of two decomposition methods Seasonal and Trend decomposition using Loess and Moving Averages on statistical and machine learning forecasting models is presented. These forecasting models are Naïve and Autoregressive Integrated Moving Averages (ARIMA) methods from statistical methods, and Support Vector Regression (SVR), K-Nearest Neighborhood, and Random Forests algorithms from machine learning methods. The forecasting results showed that decomposition mostly increased forecasting accuracy on considered datasets.

KEYWORDS - Time series forecasting, decomposition, statistical forecasting, machine learning

ELELECTRONIC PERSONALITY AND THE LEGAL LIABILITY ARISING FROM ARTIFICIAL INTELLIGENCE AI

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ABSTRACT

Artificial intelligence is a concept that has emerged due to the rapid development of computer technology in recent years. It was first mentioned by the cognitive scientist MIT professor John McCarthy in the USA in 1956. It has developed enormously and has a very important place in social life today. Artificial intelligence refers to the machine and the software that operates the machine, which is used instead of a human in some kind of work that requires a certain intelligence. Thanks to artificial intelligence, computers that can run this software perform tasks such as driving a car, collecting garbage, playing instruments, making smarter decisions, operating an automation system, medical diagnosis and treatment, and surgical intervention. In such cases, which require human intelligence and behavior, artificial intelligence can achieve near-perfect results with far fewer errors than humans. Artificial intelligence can learn like humans, thanks to its improvable feature. These computers, robots, and machines that are using artificial intelligence are constantly improving themselves thanks to their ability to learn. There is no doubt that this irresistible development and progress will make artificial intelligence dominate many fields very soon. It is an indisputable fact that this rapid development and change will result in new legal problems. The main question is: What kind of a solution should be offered to these new legal problems, which the classical legal doctrine is not accustomed to due to artificial intelligence? Should solutions be sought to these problems by developing the classical legal doctrine just like artificial intelligence and adapting the existing regulations? For example, if an artificial intelligence-controlled subway or a self-driving taxi collides with a pedestrian, will those responsible for pedestrians and passengers be liable under the revised tort provisions? Or will there be a need for new branches of law and liability regimes such as robot law, artificial intelligence law, and electronic law? In this study, an answer to this question will be sought and it will be discussed how to find a solution to such disputes in Turkish Law, where there is no regulation yet.

KEYWORDS - Artificial intelligence, legal liability, electronic personality, strict liability, hazard liability

SPEECH TO GENDER RECOGNITION BASED ON MACHINE LEARNING ALGORITHMS

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ABSTRACT

The aim of this study is to estimate the gender of people by using features obtained by various methods from audio samples taken from Turkish films and series. Within the scope of the study, 58 different series and films were examined and a new original dataset was created with 894 audio recordings consisting of 5-sec sections taken from them. Mel-frequency cepstral coefficients (MFCC) and spectrogram, which are frequently used in the literature, were used for feature extraction from audio data. The results were first evaluated separately using two features in one way. A hybrid feature vector was then created using two feature vectors. Different machine learning algorithms (LR, DT, RF, XGB, etc.) were tested in the classification process and it was seen that the best accuracy was achieved in the hybrid model and logistic regression with 89%. Recall, precision, and f-score values were obtained as 86.8%, 92%, and 89.3%, respectively.

KEYWORDS - Gender Recognition, Machine Learning, MFCC, spectrogram, logistic regression

REWARDING WATER ANALYSIS DATA IN PROOF OF STAKE BLOCKCHAIN NETWORK

BATUHAN GOKTAS [1] **, *NURETTIN DOGAN*** [2]

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ABSTRACT

In addition to being directly responsible for protecting their own health, people also need to think about the health of the people around them, and it is important that they contribute to the studies. There are environmental factors that directly or indirectly affect human health. The main environmental factors are water and food. Water, which is necessary for the continuation of vital events, should not contain harmful chemicals and small disease-causing organisms. In regions with unfavorable infrastructure, water can become a dangerous carrier for health. It is of great importance to analyze the water and to determine the total dissolved substance (TDS) amount in it in order to learn that it is healthy from the source to the stage when it is consumed. An incentive system is needed to analyze water in a widespread and sustainable way at the point of consumption. The aim of this study is to determine the total amount of dissolved substances in the water reaching the end consumer. In return for this data obtained by the consumer and provided to the people around him, the token named WTDS, produced in the energy-saving proof-of-stake (POS) Algorand blockchain network, was earned. For this purpose, water analysis data is transferred to the server with a TDS Meter and an IoT device, and in return, WTDS token gain is provided with a model suitable for the M2E model, which is a sub-model of the P2E model. 80% of the 10 billion produced WTDS tokens are planned to be distributed over 25 years. Daily 876,712 WTDS tokens are allocated and transferred to accounts that send data hourly at the end of the day. The user can access the obtained water analysis data and the gains obtained in return for these data via the mobile application interface. In this study, the server application was carried out with SpringBoot and the mobile application with Flutter, and the users who provided TDS data were rewarded with WTDS tokens in the Algorand network and successfully concluded.

KEYWORDS - Proof of stake, Blockchain, TDS, Water Analysis P2E, M2E, IOT, Algorand

ENHANCING VEHICLE ROUTING PROBLEM WITH CLUSTERING

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ABSTRACT

Vehicle routing problem (VRP) is one of the non-deterministic (NP-Hard) problem types in polynomial time. Route optimization is a method that aims to increase the logistics benefits according to the criteria determined in the sales and service strategies of the enterprises, and determines the optimum route by arranging the points to be visited for sales and service purposes in a region according to that region. Many limitations are taken into account, including the points to be visited and the frequency of visits, the characteristics and restrictions of the vehicles to be transported, the characteristics of the cargo to be transported, road fees, traffic, and road works. It is simple to arrange the visits of points on a single route. When several vehicles, multiple visit rules for a point, and thousands of sales points are entered into the problem, resolving the problem in the entire pool without geographic clustering takes days. The solution time using this technique created with the adaptive Kmeans++ algorithm, which is employed for the geographical zoning algorithm, is only a few minutes. The total transportation time, distance, and cost are minimized with the help of this developed algorithm, saving both time and money.

KEYWORDS - Machine Learning, Clustering, Routing Problem, Optimization, K-means Algorithm

A USE CASE FOR CUSTOMER SEGMENTATION IN THE SAVINGS FINANCE SECTOR USING DESCRIPTIVE ANALYTICS

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ABSTRACT

Eminevim is a company that has broken new ground in Turkey and in the world. The model of the system allows the person to buy the desired property from anywhere, according to their budget, without paying any interest. Since Eminevim has thousands of customers, it is inevitable to manage the customers according to their different characteristics and behaviors. At this point, customer segmentation is an important method to apply. Customer segmentation is the division of a company's customers into groups based on certain characteristics they have in common. Segmentation provides a simple way to organize and manage a company's relationships with its customers. There are many reasons why customer segmentation is critical, such as (i) profitability calculations based on clusters, (ii) campaigns, promotions, incentives, reward applications using customer segments, (iii) identifying customers on the verge of churn and taking preventive actions, (iv) regular segmentation assessments as part of membership and benchmarking. The most commonly used method for segmentation in the literature is clustering algorithms. There are several types of clustering methods, such as partitioning methods (K–Means), hierarchical (Agglomerative), density-based (DBSCAN), and model-based (Gaussian) clustering. In the study, a pipeline was implemented with the steps of data selection, data preparation, and clustering, which are general steps in data science. First, a dataset was created by integrating information such as organization fee, organization amount, down payment, and term of customers from various data sources as a data selection process. Then, in the data preparation stage, the features in the dataset were normalized using standard scaling functions, and the size of the data was reduced by using PCA (Principle Component Analysis) dimensionality reduction algorithm. Finally, clustering of customers was performed using K-Means, one of the most commonly used clustering algorithms. To determine the number of clusters, both the opinions of experts were taken into account and the elbow method was used. Evaluating the results of experimental studies on datasets created using preprocessed and newly created features with feature engineering, it was found that customers can be successfully divided into different segments such as loyal, potential, and risky.

KEYWORDS - Customer segmentation,finance analytics,data science,clustering, k-means algorithm

DETECTION OF SUSPICIOUS ACTIVITIES ON WINDOWS SYSTEMS WITH LOG ANALYSIS

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ABSTRACT

In recent years, rapid technological developments in many different fields have brought along various problems along with many innovations. One of these problems is cyber-attacks. Storing many records and data in digital media has made it very important to protect these records and data. Continuous log records play an important role in taking necessary precautions against cyber-attacks by system administrators. With the logging mechanism found in Windows systems, every transaction made on the system is recorded. These log records are analyzed with various algorithms and tools. As a result of these analyzes, suspicious or attacker behaviors on the system are detected. In this study, various cyber-attacks were tested in an environment where these Windows systems are located. As a result of these tests, the logs formed in the systems were collected and analyzed with the ELK Stack toolkit. As a result of these analyzes, the attacks were determined and associated with the tactics and techniques on Mitre ATT & CK.

KEYWORDS - Log analysis , Mitre Att&CK , ELK Stack , Windows Systems

HOW DO PANSHARPENING STRATEGIES AFFECT SPECTRAL INDICES ON WORLDVIEW 2 DATASETS

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ABSTRACT

Pansharpening, which aims to provide spatially enhanced multispectral (MS) images, produces images that can be used as base data for many remote sensing applications. To date, the remote sensing community has come up with a wide range of pansharpening strategies, some of which offer a better spatial fidelity whereas some provide a better spectral fidelity at the cost of spatial deterioration to some degree. The choice as to which pansharpening strategy should be used depends pretty much on the purpose of the application to be conducted. As known, spectral indices play a significant role in current remote sensing applications as they provide valuable information for land cover features. This study aims to investigate the effects of some of the widely-used pansharpening strategies on the spectral indices normalized difference vegetation index (NDVI), normalized difference water index (NDWI) and optimized soil-adjusted vegetation index (OSAVI) calculated on a WorldView-2 dataset. The pansharpening strategies focused on included the Gram-Schmidt (GS), additive wavelet luminance proportional (AWLP), partial replacement adaptive component substitution (PRACS), haze-corrected Brovey transform (BT-H), band-dependent spatial detail with physical constraints (BDSD-PC), morphological half gradient (MF), full-scale regression-based generalized Laplacian pyramid with modulation transfer function matched filter (MTF-GLP-FS), principal component analysis/wavelet model-based fusion (PWMBF), sparse representation of injected details (SR-D), pansharpening neural network (PNN) and target-adaptive PNN (TA-PNN). The results showed that the pansharpened images produced with the PRACS, BT-H, PWMBF, PNN and TA-PNN strategies provided the optimum spectral indices.

KEYWORDS - pansharpening,image fusion,spectral indices,digital image processing

COMMON CYBER OPERATIONS INCIDENTS OF MAJOR COUNTRIES SPONSORING ATTACKS

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ABSTRACT

These days, cyber operations are one of the most important practical assaults through which supporting countries plan to achieve their political or financial targets. Their cyber incidents, and the types of them, are often difficult to characterize. To accurately portray this, network analysis and visualization of data from various global reports can help. Based on reports of the Council on Foreign Relations, the Kaggle community has supplied a dataset of cyber operations for several countries from 2005 to 2020. By using this dataset, the top attack-sponsor countries can be shown, through network analysis, as well as cyber operations incidents and the types of them that they support. Organized research studies of these characterized countries have seemed to expose relationships as well as common incidents of cyber operations. Visualizations of this issue make clear the contours of ubiquity for these nations' common cyber-attacks. The network analysis method used in this study provides visualized specifications for the top five countries that are involved in sponsoring cyber-attacks. Furthermore, the study reveals similar and distinct cyber incidents sponsored by these countries where espionage, DoS, data destruction and financial theft appear to be four out of seven, thus indicating the impact manner of these countries to reach political objectives or financial.

KEYWORDS - cyber operations, cyber incidents, cyber sponsors countries, cyber activities reports, network analysis.

THE INFLUENCE OF DONOR AND RECEIVER COMBINATIONS ON IMMUNE PLASMA PROGRAMMING IN SYMBOLIC REGRESSION PROBLEMS

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ABSTRACT

Evolutionary computation is a computer intelligence system inspired by natural evolution. Automatic programming methods based on evolutionary computation, such as genetic programming (GP), ant programming (AP), artificial bee colony programming (ABCP), and immune plasma programming (IPP), successfully find effective solutions to various types of problems in many fields. This paper sets out to investigate the results of different configurations of IPP with the number of recipients (NoR) and the number of donors (NoD). To distinguish between these results, we used 10 different donor and receiver combinations and applied them to 15 symbolic regression problems. These results shows that IPP can successfully solve symbolic regression problems and the best combination of NoR and NoD is 2-1.

KEYWORDS - evolutionary computation, automatic programming, immune plasma programming, donor receiver configurations, symbolic regression problem

THE NEXT GENERATION VIDEO PROCESSING TECHNOLOGY A GUIDE TO AWS DEEPLENS

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ABSTRACT

Internet of things applications can handle more information operations owing to computational frameworks and improvements in hardware. In addition to improving latency and bandwidth, the proximity of resources also enables developers to handle security issues with sensitive data by lowering the risks involved with transferring information to distant servers. As a result, this is especially helpful for enhancing home and business security systems, whose present setups put their targets in danger by sending all their recordings straight to a virtualized platform for assessment. Using the product of AWS DeepLens, which is a customizable camera that offers consumers the chance to practice real-time streaming techniques for video and image processing, this study intends to investigate how to recognize things in real-time from a perspective.

KEYWORDS - AWS DeepLens, object detection, real-time processing, video processing, computer vision

A REVIEW ON DEEP LEARNING BASED METHODS DEVELOPED FOR LUNG CANCER DIAGNOSIS

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ABSTRACT

Lung cancer is one of the leading causes of cancer death worldwide. Today, although the medical world has discovered the cure for many diseases, it is still insufficient in diseases such as cancer and continues to result in death in most patients. Early diagnosis is the most important factor in preventing cancer. Histopathological diagnosis is a very time-consuming and error-prone process for medical professionals. Today, many artificial intelligence-based studies are carried out on early diagnosis. Considering these studies, it is predicted that systems based on artificial intelligence will replace human effort in pathological studies in the future. In this study, deep learning-based methods developed using microscopic images of lung tissues were examined. The aim of the study is to guide future studies by referring to the successful results of deep learning-based methods.

KEYWORDS - Deep learning, Lung cancer detection, Classification, Histopathological image analysis

A REAL LIFE USE CASE FOR PREDICTING SALES OF BUS TICKETS

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ABSTRACT

Enuygun.com lets users search, list, and evaluate domestic and international flights, bus tickets, and tens of thousands of hotels within seconds. In the bus ticket sales business, Enuygun works with different providers to get trip information between cities. So, many bus trips are coming from different providers that must be sorted smartly with regard to user preferences. This paper develops and proposes a machine learning-based ranking system using sales predictions of each bus company, route, and hour of departure. Different regression algorithms are utilized when predicting each company's route's sales prediction using collected historical data. Successful regression model results were obtained and the process was concluded by integrating the output scores into an intelligent ranking system. Enuygun.com, kullanıcılarına yurt içi ve yurt dışı uçuşları, otobüs biletleri ve on binlerce oteli saniyeler içinde arama, listeleme ve değerlendirme olanağı sağlamaktadır. Otobüs bileti satış alanında yer alan Enuygun, şehirler arası seyahat bilgilerini almak için farklı sağlayıcılarla çalışmaktadır. Farklı sağlayıcılardan gelen birçok otobüs yolculuğunun kullanıcı tercihlerine göre akıllı sıralanması bir ihtiyaç olarak ortaya çıkmaktadır. Bu makale, her bir otobüs firmasının, güzergahın ve hareket saatinin satış tahminlerini kullanarak makine öğrenimine dayalı bir sıralama sistemi geliştirmekte ve önermektedir. Toplanan geçmiş verileri kullanarak her şirketin rotasının satış tahminini bulurken farklı regresyon algoritmaları için bu verileri kullanılır. Başarılı regresyon modeli sonuçları elde edilmiş ve çıktı puanları akıllı bir sıralama sistemine entegre edilerek süreç sonuçlandırılmıştır.

KEYWORDS - Makine öğrenmesi, akıllı sıralama, satış tahmini, regresyon.,Machine learning, intelligence sorting, sales prediction, regression.

A PERFORMANCE WAY COMPARISON OF DOCKER SWARM AND KUBERNETES

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ABSTRACT

People always try to find the best way to deploy their applications. Thus, the first solution was bare metal servers. In the bare metal server solution, each server was responsible for one application but that required as many servers as the number of applications, and in addition that this solution also required so much space in the server room. Subsequently, virtualization technology emerges. This technology is based on the abstraction of computer hardware. Virtualization technology enables us to host multiple operating systems in one host. Virtualization brings along with many advantages. One of the significant benefits is to reduce the quantity of physical equipment needed in the data center and helps to scale our applications. One of the remarkable developments in information technologies is container technology which emerged in the middle of 2010. Containers allow to package an application with all the parts it needs, such as libraries and other dependencies, and deliver it as a single package. Docker, developed by Google, is the essential tool to use in container technologies. Docker resembles a virtual machine, but as opposed to a virtual machine, instead of creating a whole virtual operating system, Docker allows applications to use the same Linux kernel as the system they use. This provides a performance boost and reduces the size of the application. Also, the development of microservice-based applications in recent years has made container technologies widely used. Now, we can run each of our applications, perhaps thousands of containers. However, this solution brings with it another problem, how do we manage these containers? In recent years, there have been a few breaks in the server side, which underlies the rapidly developing information technologies. The last of these is container technology. Before virtualization, companies were running all their applications on physical servers, and these systems were getting complex over time, making even simple problems inextricable. Accordingly, in this study we compare Docker Swarm and Kubernetes in terms of their performances under heavy load, two of the most used tools for container management. Thus, we aim to inform readers about container management.

KEYWORDS - virtualization, containers, docker, docker swarm, kubernetes

PCA SVM RANDOM SEARCH OPTIMIZATION BASED APPLICATION FOR CLASSIFICATION OF DATE FRUITS ACCORDING TO PHYSICAL PROPERTIES

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ABSTRACT

Date fruit, which is an important source of income especially for African and Middle Eastern countries, has a religious and cultural importance for Muslims as well. Only a few (10%) of the date fruit, of which there are many species worldwide, are known. Therefore, it is necessary to distinguish between different types of date fruit. However, manual methods are slow and risky. This study uses a dataset containing physical properties of date fruits for date fruit classification. Experimental implementation includes two steps. In the first step, the Support Vector Machine (SVM), whose hyperparameters are adjusted by random search optimization, classifies the normalized features. In the second step, the normalized features are reduced by Principal Component Analysis (PCA). These reduced features are fed into the SVM whose hyperparameters are optimized. At the end of the study, the results obtained from both applications were 89.9% and 92.2%, respectively. As a result, features reduced and enhanced by PCA provide more successful date fruit recognition.

KEYWORDS - Date Fruit,Classification,PCA,SVM,Machine Learning, Random Search Optimization

A CLASSIFICATION AND SHORT LITERATURE REVIEW ON 3D USER INTERFACE 3D UI SENSING TECHNOLOGIES

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ABSTRACT

Since the 3D-UI sensing technologies involve precise electrical measurement of physical parameters like light intensity, pressure, temperature, etc. in a user dependent dynamic environment where human-computer interaction occurs, a multidisciplinary work from sensor design to signal processing and even further to the artificial intelligence techniques are involved. In the 3D-UI applications, physical quantities under measurement are first sensed and turned into an electrical quantity (or quantities) like voltage, current or impedance and then an instantaneous user-action is required to be simultaneously implemented with an appropriately developed signal processing technique as fast and precisely as possible. Here, a classification discussion of 3D-UI sensing technologies regarding the application fields (i.e., proximity, tactile, brain wave, etc.), physical principles and methods (i.e., laser based, camera based, etc.), instrumentation methods (i.e., direct sensing, indirect sensing, analog/digital signal processing, etc.), and application style (i.e., wearable, mobile, etc.) are discussed and the related literature is classified accordingly. Our dimensional analysis of the essential literature according to these classifications is intended to be helpful as a quick guide especially for the scholars and researchers in the field.

KEYWORDS - 3D-UI, 3DUI, 3D User interface, 3D-UI sensing technologies, Human-Computer interaction

A RECOMMENDATION SYSTEM STUDY ON USER PRODUCT DATA

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ABSTRACT

This study presents a new recommendation system for the online reservation of tourism customers for hotels with the features they need, saving customers time. This new system combined collaborative and content-based filtering approaches and created a new hybrid recommendation system. Two datasets containing customer information and hotel features were analyzed by Recency, Frequency, Monetary (RFM) method in order to identify customers according to their purchasing nature. The main idea of the recommendation system is establishing correlations between users and products and make the decision to choose the most suitable product or information for a particular user. For example, there is an issue of data overload, which is a potential problem for many internet users, due to the many options available on the internet. Filtering, prioritizing and beneficially presenting relevant information reduces this overload. There are following three main ways that recommendation systems can generate a recommendation list for a user; content-based, collaborative-based and hybrid approaches1. This paper describes each category and their techniques in detail. RFM Analysis is used to identify customer segments by measuring customers' purchasing habits. It is the process of labeling customers by determining the Recency, Frequency and Monetary values of their purchases and ranking them on a scoring model. Scoring is based on how recently they bought (Recency), how often they bought (Frequency) and purchase size (Monetary).

KEYWORDS - Recommender system, hybrid approach, RFM Analysis, collaborative filtering, content based filtering

DUPLICATION DETECTION IN VIDEOS USING DWT ALGORITHM

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ABSTRACT

Videos are the best evidential data that can be used to narrate events in today's technology. However, to be used as evidence, their accuracy needs to be determined. In this study, we propose a solution to duplication forgery in video forgery detection extracting DWT features. The proposed method consists of three stages: feature extraction from frames and visualization of these features in binary form, finding the correct positions on the image, eliminating the incorrect positions. The method solves the problem of frame duplication forgery using the slope of line by increasing and decreasing the number of consecutive frames at the same rate. The method was tested on three different databases. It was tested against compression and blurring attacks. While the average accuracy rate obtained from uncompressed videos from the SULFA database was 0.9973, the average accuracy rate was 0.9878 for blurred videos, 0.9510 for MPEG4 compressed videos, and 0.9683 for H264 compressed videos. In terms of time, the study gave effective results compared to the compared studies with an average of 0.0271sec per frame.

KEYWORDS - Forensic, passive detection techniques, intra forensic, video forgery, duplication detection, blurring attack

DUPLICATION FORGERY DETECTION BASED ON WEBER ALGORITHM

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ABSTRACT

The use of videos is increasing day by day. This increases the usability of videos as evidence. In order to use videos as evidence and to increase their reliability, their accuracy and integrity must be determined. Changes to videos can be easily made by anyone who can use a mobile application. Especially inter-frame forgeries are used to cover up or hide an event without the need for time and expertise. In this paper, we propose a new texture-based solution to the frame duplication forgery that cover frauds in videos. In the proposed work, we first extract the features of video frames converted from RGB color space to gray level color space using Weber's algorithm. The structural similarity ratios of the extracted frame features with the reference frame are analyzed to determine whether the matching frames are duplicated. When the results obtained are viewed, it is shown that the study proposed high accuracy performance to detect frame duplications in videos.

KEYWORDS - Video forensic, passive forgery detection, inter forgery, frame duplication, fraud analysis

USAGE AND PERFORMANCE COMPARISONS OF MACHINE LEARNING METHODS FOR TEXT CLASSIFICATION

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ABSTRACT

Natural language processing describes the method by the machines which understand human language. Thanks to NLP, inferences can be made using artificial intelligence's power in areas such as e-commerce, banking, and social media. The text classification method is mostly used for these operations. With machine learning, the text classification process takes place much faster than the classification with the human eye. In this way, analyzes are made on big data. Rule-based classification or machine learning-based classification methods can be used for text classification. The methods we discuss in this article are the deep learning method with Bert under the heading of machine learning and the Term Frequency Inverse Document Frequency (TF-IDF) method. The deep learning method is developed with inspiration from the human brain. In this technique, artificial neural networks are created between the input and output data in the training data. With this approach, high-performance results can be achieved with little effort. The TF-IDF method is to vectorize documents over calculated values using the frequency of each term in the data set and the frequency in the document. The document vectors created are also classified by processing with classifiers such as Naive Bayes and Support Vector Machines (SVM). In this method, preprocessing texts gains more importance compared to deep learning. For this reason, more work is required to obtain successful results. It is of great importance to compare these two methods, which are frequently used in the industry, in terms of accuracy, performance, and ease of development.

KEYWORDS - artificial intelligence, machine learning, text classification, bert, deep learning, TF-IDF

A BORDA COUNT BASED INITIALIZATION METHOD FOR SELF ORGANIZING MAPS

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ABSTRACT

In data science, data visualization has long been of interest since it is necessary to explore the patterns and underlying structure of data. Over the years, various data visualization methods have been developed. Among them, Self-Organizing Maps (SOM) is one of the most widely used methods due to its simplicity. However, the robustness of a SOM largely depends on the initial choice of prototype vectors in it. On the other hand, this problem has not been extensively studied in the literature. In this study, we introduce a novel method for initializing the prototype vectors of SOM, which we call BCI and which has its roots in Borda Count (BC), a ranked voting system. A large set of experiments confirmed the effectiveness of BCI and showed that it outperforms both the random initialization and PCI, the state-of-the-art initialization method, in terms of quantization error, which indicates how well the SOM reflects the original feature space.

KEYWORDS - Data Mining,Data Visualization,Self-Organizing Maps,Borda Count -

COMPARISON OF FEATURE SELECTION METHODS IN THE ASPECT OF PHISHING ATTACKS

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ABSTRACT

Feature selection methods are commonly used to reduce the number of features that are believed to be more relevant to the classes. These methods aim to decrease the run-time complexity of the models without reducing their accuracy. In some cases, they also may increase the accuracy. On the other hand, phishing attacks are internet fraud attacks that target stealing the valuable information of users by using fake web pages. Therefore, feature selection methods can be used on phishing datasets to increase the performance of models without reducing the accuracy. In this study, we compared the efficiency of feature selection methods on phishing datasets by using Multilayered Perceptron (MLP) algorithms. According to obtained results the Information Gain (IG), Fisher's Score (FS) was the best ones although the number of the selected features is low.

KEYWORDS - feature selection, phishing, classification.

CLASSIFICATION OF UPPER EXTREMITY BONES WITH ENSEMBLE MACHINE LEARNING METHODS BY CNN BASED FEATURE EXTRACTION

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ABSTRACT

It is very important to identify problems in the medical diagnosis process accurately and sensitively. Experts benefit from different methods and tools in the diagnosis process. X-ray is one of those medical imaging techniques that is used in the imaging of body parts, especially bone imaging. Misdiagnosis or underdiagnosis originated from images or doctors could be seen during the detection of abnormalities from x-ray images. For this reason, x-ray image interpretation with a computer-aided system in a short time would prevent probable errors. In this study, an ensemble learning-based classification method is proposed to detect whether abnormalities in upper extremity bones. Firstly, feature extraction is done with Xception, which one the CNN model and then, extracted features, are used to gain optimum results in training different machine learning algorithms and ensemble learning methods. Performance results of machine learning algorithms, ensemble learning methods, and the Xception model used in X-ray image abnormalities detection is compared at end of the training.

KEYWORDS - Convolutional Neural Network, Ensemble Learning, Bone Fracture, Feature Extraction

DATA SECURITY ANALYSIS BASED ON DATA CLASSIFICATION ACCORDING TO DATA SENSITIVITY CASE STUDY DATA ON PUBLIC AND PRIVATE UNIVERSITIES IN THE REPUBLIC OF KOSOVO

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ABSTRACT

Sensitive data represents information that has a level of confidentiality. These data have a wide range of comprehensiveness and are not only personal data. The large volume of data that is constantly transmitted through different computer systems made many of us start to think about data threats. In recent times, the threat to privacy is quite worrying because we have a lot of personal data that circulates in computer networks, and it is very easy to fall into the hands of criminals. Preservation of privacy can be done by providing integrity in the software where these data are processed, integrity in the computer networks where these data circulate, and, in any case, the prohibition of unauthorized access to information. A solution to prevent unauthorized access is by setting the level of sensitivity of the data. In our research, the collected data are classified into two categories (student data and employee data) and into three subcategories according to their sensitivity: the nature of the data, the amount of data, and the inclusion of these data in computer systems. The purpose of our research is to provide a classification of the sensitivity of data against access to sensitive information.

KEYWORDS - data, sensitivity, confidentiality, privacy, unauthorized access

ANALYSIS OF DATA SECURITY AND PRIVACY IN PUBLIC INSTITUTIONS ACCORDING TO GDPR IN THE REPUBLIC OF KOSOVO

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ABSTRACT

Data security is a major issue for every institution. The data for each individual who interacts with an institution, whether an employee or a seeker of services from the institution, must be stored and protected. The process of securing data and implementing privacy requires a high degree of investigation and certain professionalism. In order to provide such a service, many institutions use high standards to prevent data attacks and privacy violations. GDPR - 2016/679 - General Data Protection Regulation) comes in two versions OJ L 119, 04.05.2016; cor. OJ L 127, 23.5.2018. In this paper, we present the harmonization between the regulation which contains the privacy laws and the current state of data security in public institutions and the preservation of privacy. The paper used the method of analysis of current documents and comparison with GDPR - 2016/679 - General Data Protection Regulation.

KEYWORDS - attaks, security, privacy, GDPR, data, and institution

VOICE CONTROL OF VIRTUAL OBJECTS IN AUGMENTED REALITY APPLICATIONS

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ABSTRACT

Augmented reality (AR) is a technology that combines 3 Dimensional (3D) virtual objects created in a computer environment with real world images. In the scene created in this way, it is possible to interact with virtual objects in real time. AR technology applications are used in education, defense, medicine, e-commerce, manufacturing, tourism and many more. Interaction with sound in AR environment provides ease of use in applications. In this study, voice control of virtual objects in the AR environment created by using the Vuforia package in Unity software is provided. For this purpose, a data set was created with the voice recordings of five different commands taken from two people of different genders. Mel-frequency Cepstral Coefficients (MFCC), Linear Predictive Coding (LPC) and Mel-spectrogram features obtained from voice data were applied to Decision Tree, Random Forest and Support Vector Machines (SVM) algorithms and the results were compared. The best accuracy rates were found to be 86% and 89% for male and female voice datasets for SVM, respectively. The accuracy rate for the data set formed by the combination of the two data sets was found to be 85%. On the other hand, the accuracy rate of the k-Nearest Neighbor (kNN) algorithm, which used the Dynamic Time Warping (DTW) method with MFCC features, was found to be 89% and 88% for male and female voice data sets, respectively. The accuracy rate of kNN for the data set formed by the combination of two data sets was found to be 83%. The results for all machine learning algorithms were obtained by cross validation.

KEYWORDS - Augmented Reality,Voice Recognition,Machine Learning

DEEP FOREST APPROACH FOR ZERO DAY ATTACKS DETECTION

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ABSTRACT

The rapid development and spread of information and communication technologies has increased the use of the internet, the size and volume of data, technology and the number of devices using the internet. With this increase, cyber attacks have increased. One of these attacks is the zero-day attack. A zero-day attack exploits an undiscovered vulnerability to infect/damage networks or programs. Instrusion Detecting Systems and methods are required to prevent the harm that cyber attacks can cause to individuals and institutions. Effective results are obtained with machine learning methods in IDS studies. In this study; It is aimed to detect zero-day attacks with deep forest. In the proposed deeply model, the data set is divided into 80% for training and 20% for testing. Performance metrics obtained during the training and testing phases were revealed and compared with other machine learning methods

KEYWORDS - Cyber-Security, Zero-Day Attacks, Machine Learning, Deep Learning

BENCHMARKING OF RESNET MODELS FOR BREAST CANCER DIAGNOSIS USING MAMMOGRAPHIC IMAGES

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ABSTRACT

Breast cancer is one of the cancer types with a high mortality rate worldwide. Early diagnosis is of great importance to reduce this mortality rate. Computer-aided early diagnosis systems enable doctors to make more precise and faster decisions. The Mammographic Image Analysis Society (MIAS) dataset was used in this study. The breast area was selected by masking in mammography images. The number of images was increased using data augmentation techniques. Mammography images were classified as normal, benign, and malignant using four different ResNet models. The highest classification accuracy was achieved by using ResNet 18 model with 93.83%. The accuracies obtained with ResNet 50, ResNet 101, and ResNet 152 were 87.24%, 87.44%, and 91.25%, respectively.

KEYWORDS - Breast cancer, cancer diagnosis, ResNet models, CNN

BITCOIN PRICE PREDICTION BY TRAIN TEST EDUCATION OF LINEAR REGRESSION VIA MACHINE LEARNING IN PYTHON

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ABSTRACT

In this work, Bitcoin (BTC) data is parsed from Yahoo-finance and the candle-stick values of the BTC prices in a specific time domain are used to predict the opening value of the upcoming candle-stick values in a train-test education of linear regression via Machine Learning in Python by testing two different assumed models. Our first model assumes that the opening value (O) of each candle-stick depends only on the other values of the same candle-stick, namely, close (C), high (H), and low (L) values. Our second assumption involves the prediction of the opening value of the related candle-stick being dependent on the values of the preceding three candle stick values. Hence, opening value of a candle-stick is predicted from the given last three preceding candle-stick values. The methodology in our models is presented and the success is discussed along with the related Python codes.

KEYWORDS - BTC,Bitcoin price prediction,crypto-currency,block-chain,linear regression,machine learning

AGENT BASED MODELLING OF CELL CYCLE BEHAVIOR

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ABSTRACT

Cell cycle is a series of events that continue throughout the life of the cell. The cell cycle behavior is a vital process for cell growth and cell division. In this study, the biological life cycle of the stem cells is modelled by using Repast Simphony 2.7 agent-based simulation platform, making use of the agents, a new generation programming paradigm. The stem cell behavior is difficult to predict in the laboratory and costly for infrastructure. The simulation environment provides the opportunity to observe the behavior of the stem cell model at the micro level. In this study, the simulation environment includes 3 types of agents which are cell agent, growing cell agent, and blood vessel agents that feed the cells. Agents' attributes, their actions and relationship of agents are defined in the agent classes. This study presents an agent based model that includes in the processes about cell nutrition, cell growth, cell death, cell movements, cell division stages, and cell life cycle control mechanism. This study has the potential to be modelled on a large scale with studies such as tissue modeling, behavioral model of specialized cells by increasing agent classes and interactions.

KEYWORDS - Cell, cell cycle, agent based modelling, interphase, Repast Simphony.

HEART ATTACK RISK ANALYSIS AND ESTIMATION USING MACHINE LEARNING METHODS

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ABSTRACT

Heart disease is a disease that is difficult to diagnose and leaves serious damage to individuals like many other diseases today. It is not known whether the risk of this disease is carried or not, and it is observed that there is an increase in the number of individuals at risk today. This increase; It requires accelerating the diagnosis of the disease to humanity by making early intervention and risk analysis together with developing technologies. Machine learning methods are developing rapidly in this field, facilitating early diagnosis in medicine. Diagnosing the disease with the developed methods provides a great advantage in terms of time cost. With the developments made, the diagnosis of diseases related to more than one parameter is carried out in a very short and reliable way. In this study; with the dataset consisting of the parameters and values of carrying the risk of heart attack, the classification of the risk of heart attack with high / low probability was made using Logistic Regression, which is one of the machine learning methods. By referring to what the parameters are, the distribution and values of these parameters on the dataset are determined. Obtained values; The effect of the parameters on the result status was analyzed using visualization methods. The main purpose of these analyzes is to determine the need for corrections on the dataset before training the network. As a result of the experimental analysis, 97% overall accuracy was achieved with the proposed approach.

KEYWORDS - Heart Disease, Artificial Intelligence, Classification, Logistic Regression, Analysis, Visualization

CLASSIFICATION OF DOG BREEDS WITH DEEP LEARNING

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ABSTRACT

Dogs are one of the most common pets. More than 180 dog breeds are currently known to exist. Each dog breed has its own characteristics and health conditions. In order to provide appropriate treatments and training, it is important to identify dogs biometrically and to identify breeds. In this study, it was aimed to identify their breeds using images of dog faces.The Stanford Dogs dataset, consisting of 120 different dog breeds, was used. A transfer learning was performed by retraining various pre-trained convolutional neural networks (CNNs) to identify and classify dog breeds. In addition, an architecture that is a combination of several neural networks with different depths and structures is also proposed to improve classification performance.

KEYWORDS - convolutional neural networks, dog breed detection, deep learning, transfer learning

AN INTERNET OF THINGS IOT BASED AUTOMATION SYSTEM FOR GREENHOUSES

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ABSTRACT

Greenhouses are buildings which create the appropriate conditions for plant growing. When growing plants, the most important factors are the controls of physical parameters like temperature, humidity, water content in soil etc. Controlling these physical factors manually is a difficult and time-consuming task. Therefore, people need automated systems for controlling physical factors and sending alerts if unwanted situations arise. In this study, we implemented an Internet of Things (IoT) based automation system for greenhouses that address those issues. In the system, the physical parameters are measured with sensors and stored in a database with the help of Arduino sets. Users access those parameters and control the operation of the sensors with a mobile application.

KEYWORDS - IoT, greenhouse, Arduino

CLASSIFICATION OF HEALTHY AND DEFECTIVE APPLES VIA CONVOLUTIONAL NEURAL NETWORKS

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ABSTRACT

One of the most important aspects of fruit industry in the world is fruit quality. Shelf life is a critical parameter in terms of quality. If we consider apples, they are more durable than many fruits and can be preserved for a long time in cold storage at an appropriate temperature. In order to have a longer shelf life for apple, it is crucial to separate defective (rotten/bruised) apples from healthy ones to prevent the rotten/bruised fruits from rotting the healthy ones. In this study, with the help of deep learning, apples are classified as healthy and rotten/bruised by using a convolutional neural network (CNN). For this purpose, we created a dataset by capturing a total of 1034 apple images. 637 of these images include healthy apples, and rest of them contain rotten/bruised apples. Since the stem and calyx parts of apples make it difficult to detect a rot/bruise on the apple, we approached to the problem from a harder aspect, and prepared our dataset by including also some apple images where the stem and calyx parts are also visible. By using 583 of healthy apple images and 306 of rotten/bruised apple images for training, we trained a CNN model. Utilizing the remaining images in testing, we obtained a test accuracy of %98.

KEYWORDS - Apple Classification,Deep Learning,Convolutional Neural Networks,Rotten Apples,Bruised Apples

ANALYZING THE EFFECT OF PERSONAL CHARACTERISTICS ON SUPPLY CHAIN CONTRACTING DECISIONS THROUGH DATA MINING

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ABSTRACT

In this paper we analyze contracting decisions in a simple one-manufacturer-one-retailer supply chain which faces linear consumer demand using data mining techniques. Our study is based on a lab experiment. We consider a simple one-manufacturer-one-retailer supply chain facing deterministic consumer demand as a linear function of the selling price. First the manufacturer determines their share of the selling price, then the retailer determines their share. We consider the effect of several personality characteristics such as self-esteem, altruism, honesty-humility, emotionality, extraversion, agreeableness, conscientiousness, and openness to experience on the contract decisions. We use data mining techniques such as feature selection and cluster analysis to study the correlation between these characteristics and experiment performance.

KEYWORDS - Data Mining, Feature Selection, Cluster Analysis, Behavioral Operations, Supply Chain Management

DESIGN AND DEVELOPMENT OF SMART CONTRACT FOR PUBLIC ADMINISTRATION FOCUSED ON REAL ESTATE CERTIFICATES MANAGEMENT BY USING ETHEREUM AND IPFS

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ABSTRACT

In this paper we propose a design methodology for smart contracts to implement a project, which enables users to securely access real property's certificate. Current implementations focus on centralised solutions where there is a single point of failure. This means that attacks such as DDoS can render the service inaccessible. Furthermore, such attacks might even wipe out all the data if necessary backups have been performed. Another key disadvantage is that the information is stored unencrypted in one place, making it easier to steal data from servers. Our blockchain solution prevents any type of DoS by utilising multiple nodes as entry points/gateways. In the case of a public blockchain such as Ethereum, such attacks would be practically impossible. On top of this, data stored is encrypted using an encryption key which is stored off-site, which means that the attacker cannot view the data unless he has access to all encryption keys. This system proves to be more responsive under heavy load because multiple nodes can be used to serve data, as opposed to a single server. Additionally, it could facilitate the procedures and process of administrative records because of being tamper proof and data record immutability.

KEYWORDS - smart contracts, blockchain, IPFS, e-government, real estates' certificate

MACHINE LEARNING BASED DECISION SUPPORT SYSTEM FOR PULMONARY TUBERCULOSIS DIAGNOSIS

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ABSTRACT

Purpose: Tuberculosis (TB) is an airborne disease caused by the Mycobacterium Tuberculosis bacteria. Although it mostly affects the respiratory system, it can be seen in many organ systems. Main methods for diagnosis of TB are tuberculin skin test and tuberculosis blood test. These tests do not indicate if the disease is active or not. The definitive diagnosis of tuberculosis is bacteriological. The sputum of the patient suspected by the physician is examined microscopically. Diagnosis is made by finding tuberculosis bacillus in sputum and by the bacillus produced in the medium. New diagnostic methods are needed to find the disease more quickly, precisely and easily. In this study, an artificial intelligence-based diagnosis algorithm has been proposed as a new method to support the physician's decision. Materials and Methods: An open-source database from Kaggle containing coronal chest X-rays of 3500 healthy and 700 TB patients were used in the study. A decision support system for tuberculosis diagnosis was designed by processing this database appropriately. First, the images were pre-processed. Systematic sampling method was used (700 Healthy, 700 TB) to increase the accuracy performance by subsampling. The images were pre-processed to remove noise and grain. 25 time domain features were extracted from every image. In order to increase model performance ETA correlation coefficient-based feature selection algorithm was used. 80% of the data was used for training and 20% was used for testing. Decision trees, support vector machine (SVM) and neural network classification algorithms were used. Performance of the models trained were evaluated at last. Results: Performance was evaluated using performance evaluation metrics such as accuracy, specificity, sensitivity, F-Score, Kappa coefficient and Area under the Receiver Operator Characteristic Curve (AUC). Highest performance was achieved with decision tree method. Model performance evaluation metrics sensitivity, specificity, F-Measure, Kappa coefficient and AUC were 0.9957, 0.9857, 0.9906, 0.9786 and 0.9907, respectively. Conclusion: According to the results of the study, a rule-based system that does not cost any money, has a high accuracy rate, is useful for the physician and is applicable was created.

KEYWORDS - Chest X-Ray, Pulmonary Tuberculosis Diagnosis, Artificial Intelligence, Machine Learning, Image Processing

BINARY HYBRID FEATURE SELECTION BASED ON GREY WOLF OPTIMIZATION AND HARRIS HAWK OPTIMIZATION

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ABSTRACT

Swarm-based optimization methods, one of the optimization types, are frequently preferred in many areas. Two of these, the Grey Wolf Optimization (GWO) and the Harris Hawk Optimization (HHO), have been very popular recently and there have been many studies that prefer these methods. In this study, a binary hybrid feature selection method which takes the good aspects of GWO and HHO algorithms, has been developed. This method aims to select the most important features that contribute more to the classification. In this way, it is aimed to increase the classification success by processing fewer data and reducing the size of the data set. After feature selection, the selected features are given to the classifier. BreastEW, WineEW datasets from the UCI database are used to measure the success of the proposed method. In addition to the average classification success, the worst, average, the best fitness function values and the average of the selected features are calculated. The mean classification success is found to be 99% for BreastEW, 100% for WineEW, and these values are compared with the literature. According to the results, it is seen that the proposed method is promising in feature selection and can be applied to other systems.

KEYWORDS - Feature selection, Harris Hawk Optimization,Classification,Grey Wolf Optimization

HYBRIDIZATION OF THE GREY WOLF OPTIMIZATION WITH HARRIS HAWKS OPTIMIZATION

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ABSTRACT

In this study, a hybrid optimization method was obtained by combining the Grey Wolf Optimization (GWO) and the Harris Hawks Optimization (HHO). In the proposed method, first, fitness functions are calculated for both HHO and GWO after the initial population is created. Then, positions are calculated according to the method that is closer to the target value, and the most suitable population is used in the next iteration. This process is repeated until the specified maximum iteration is reached. 7 benchmark test functions which are composed of unimodal test functions have been used to demonstrate the success of this algorithm, and the average results have been obtained by running the hybrid algorithm 30 times. These results have been compared with the literature. According to the algorithms compared in the literature, the proposed algorithm has achieved the most optimal result in 7 out of 7 functions for unimodal test functions. It has been observed that the average results obtained are quite promising and can be applied in engineering applications.

KEYWORDS - Grey Wolf Optimization, Harris hawks optimization, Benchmark Test Functions.

DETECTION OF PERSONALITY FEATURES FROM HANDWRITING BY MACHINE LEARNING METHODS

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ABSTRACT

Handwriting contains a lot of information about the person who wrote it. Handwriting is a sign of personality traits represented by neurological patterns in the brain. In other words, our brain and subconscious actually shape our character as a result of our habits. It is possible to get an idea about the mood of the individual by examining the handwriting. Joy, sadness, anger and anxiety are some of them. In this study, a dataset was created from the writings of people in different professions and age groups, and this dataset was applied to machine learning algorithms after the application of necessary image processing methods for feature extraction. The results of the personality analysis were compared with the results of the personality test provided by the expert psychologist.

KEYWORDS - Handwriting Analysis, Machine Learning, Graphology

SURVIVAL PREDICTION OF HEART PATIENTS WITH MACHINE LEARNING METHODS

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ABSTRACT

According to data from the World Health Organization, around 17.9 million people die annually from cardiovascular diseases. This is equivalent to approximately 32% of all global deaths. Over seventy-five percent of these deaths occur in low- and middle-income nations. Determining the features that have the greatest impact on the death or survival of heart patients and developing models that accurately predict patient survival is an important issue of the present day. . In recent years, machine learning has been used to predict patients' survival during follow-up by combining their medical records with other features such as gender, age and weight. However, the enormous quantity of features makes it challenging for physicians to diagnose diseases and severely impacts the prediction performance of machine learning in terms of cost and time. In this regard, it is essential to keep an optimal number of features and select the most effective ones. In the proposed study, a dataset was used on the survival of heart patients from the data repository at the University of California Irvine. This dataset includes a total of 13 different patient features, which were collected from 299 different individuals. The recursive feature elimination method was used for feature selection in order to identify the parameters that have the most impact on patient survival. The yeo-johnson power transformation was applied from the normalizing approaches to make the feature sets that do not have a normal distribution from the selected features closer to the normal distribution. Finally, Support Vector Machines, Naive Bayes, Random Forest, Decision Tree, Logistic Regression, XGBoost, CatBoost, and the K-Nearest Neighbor machine learning algorithms were used to predict the survival of patients with heart disease. As a result of the study, the number of features used to predict patient survival was reduced to six, and a confusion matrix was produced to assess and compare the results of machine learning models in terms of accuracy, recall, and precision. According to the obtained results, the algorithm XGBoost best predicts the survival of patients with a 90% level of accuracy.

KEYWORDS - Machine Learning,Classification,Survival Prediction,Feature Selection,Normalization

USING PERMISSIONED BLOCKCHAIN IN EDUCATION SYSTEM FOR INTERNSHIP

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ABSTRACT

Blockchain technology has been used in many sectors such as healthcare, supply-chain management, and energy. In this paper, we use blockchain technology in the education system for internship. We provide a system that allows the recruiter to choose an appropriate candidate (student) that satisfies the requirements of the internship position. Moreover, the student's data privacy (grade, identity, course information) is preserved in the blockchain. Furthermore, storing the students' data in the blockchain and the centralized database does not allow students to lie about their academic history. In addition, the recruiters can only be able to view/retrieve students' records once they are authorized to.

KEYWORDS - Blockchain,education,internship,privacy,authorization

REDUCED DIFFERENTIAL TRANSFORM METHOD WITH FIXED GRID SIZE FOR SOLVING GAOUSAT PROBLEM

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ABSTRACT

Problems encountered in many fields of science through applied mathematics can be solved with mathematical models. The Goursat problem is a hyperbolic partial differential equation that appears in the analysis and calculation of many science and engineering problems. Many other problems such as stationary mass equations, Dirac and Maxwell fields, stochastic systems are solved with the Goursat problem. The solution is calculated serially and converges to the exact solution. In this study, the Goursat problem is solved with the Fixed Grid Dimension Reduced Differential Transformation Method (RDTM vs. FGS), different from many problems solved so far, and compared with methods such as the variational iteration method (VIM), Adomian decomposition method (ADM) in the literature. Thus, the success, reliability and effectiveness of the method have been demonstrated..

KEYWORDS - RDTM with FGS, VIM, ADM, Gausat Problem

PRINT ATTACK DETECTION FOR EAR BIOMETRICS WITH FUSION OF TEXTURE BASED AND CNN BASED APPROACHES

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ABSTRACT

The emerging ear recognition systems need to counter against spoofing attacks. Consequently, ear anti-spoofing is a new problem in biometrics. In this study, texture-based Binarized Statistical Image Features (BSIF) method and deep learning based Convolutional Neural Network (CNN) model are exploited to propose a novel anti-spoofing technique for ear identification systems. Currently, there have not been any study which focused on ear anti-spoofing problem by using texture-based and CNN-based methods in the literature. In our study, BSIF is employed to extract features using Independent Component Analysis (ICA) texture filters from ear images. Besides, CNN model is employed to learn deep representations of ear images in order to detect fake ear images. In order to propose a robust method, BSIF and CNN methods are fused by implementing decision-level-fusion (DLF) technique. In this paper, print attack scenario is studied. Since there is no publicly available ear spoofing database in the biometric community, we have created ear spoofing databases by using print attack scenario. Corresponding experiments have been conducted on 6 different ear databases. The performance of the proposed method shows that it achieves to detect fake ear images. The proposed method is compared with a few ear anti spoofing systems. Additionally, several state-of-the-art methods that employed CNN based deep learning approach on various biometric traits are used for the general comparison of the proposed method against print attacks.

KEYWORDS - convolutional neural network,deep learning,ear biometrics,spoofing attacks,texture-based learning

INTERNET OF THINGS COMMUNICATION TECHNOLOGIES USED IN SMART PUBLIC TRANSPORT

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ABSTRACT

The Internet of Things technology has paved the way for the production of high-efficiency smart solutions by enabling physical objects to network with each other over the Internet. Within the scope of smart transportation systems, IoT-based applications are becoming widespread today, while making a great contribution to public transportation activities. Traffic congestion, loss of time, fuel consumption and energy losses, which are among the urban transportation problems, constitute social economic losses. In order to avoid these problems, IoT applications, which are one of the technologies used in public transportation systems, create a quality transportation service thanks to their features such as data collection, networking, support of different communication protocols, and data processing. In this study, the preferred communication technologies in IoT applications used for the public transportation system are examined. Communication technologies that provide a fast communication network are used in IoT systems in order to develop better planned transfer solutions for public transportation vehicles such as metro, bus, shared taxi. The benefits provided by choosing the right communication technology in IoT-based smart public transportation systems; time efficiency, fuel consumption, the increase in public transport usage rates and the effect of reducing traffic congestion, keeping transportation times and density information and future forecasts are observed as planning the travel times of the passengers. Emphasizing the importance of communication technologies used in IoT applications for a better transportation system planning thanks to the developing technology, this study aims to guide solutions to future urban transportation problems.

KEYWORDS - Communication technologies, Internet of things, Intelligent transportation systems, Smart public transportation, Urban transportation solutions.

WORD CLOUD IMPROVEMENTS WITH NATURAL LANGUAGE PROCESSING TECHNIQUES FOR TURKISH LANGUAGE

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ABSTRACT

In this study, Natural Language Processing (NLP) based methods are recommended to make more descriptive and straightforward regarding the word cloud, which is produced by calculating the frequency of the words in the documents. The proposed method aims to find the syntactic similarity of words or bigrams after the preprocessing operations and then group belonging to the same root. Within the scope of this study, the Turkish dataset was studied, and rule-based algorithms were proposed. Since Turkish is an agglutinative language, it aims at the group by using root information of words or bigrams. As a result of the study, it was observed that the use of bigrams rather than the use of single words summarizes the documents better while creating the word cloud.

KEYWORDS - Word Cloud, Turkish, Bigram, Lemmatization, NLP, Preprocessing

INVESTIGATION OF THE EFFECT OF DATA AUGMENTATION ON TURKISH PARAPHRASE DETECTION

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ABSTRACT

Natural languages are extremely complex structures and require high cognitive abilities. The general aim of natural language processing research is to enable the understanding and interpretation of this complex structure to be partially or completely done by computers. Paraphrase is a different syntax form of a text with the same semantic content in the same language. Determining whether a collection of texts contains synonyms for another text is an important research topic for natural language processing. Large datasets and human-labeled data are needed to develop a model that can detect paraphrase. Within the scope of the study, the effect of data augmentation for the detection of paraphrase in the dataset consisting of limited and short texts was examined. The dataset includes 41 different texts and 2 paraphrases of each text. There are 121 texts in total. Vector representations of texts were obtained with Word2Vec and FastText which are word embeddings, Bidirectional Encoder Representations from Transformers (BERT) which is a language model, and Term frequency-Inverted document frequency (Tf-Idf) which is the common traditional method. Experimental studies proved that data augmentation improves classification performance. Furthermore, it has been seen that the BERT representations of the texts achieved successful results with an accuracy of 0.878 in the original data using Naïve Bayes and with an accuracy of 0.976 in the augmented data using Support Vector Machine in the detection of paraphrases in short texts.

KEYWORDS - Paraphrase detection, Data augmentation, BERT,Natural Language Processing

NEWSVENDOR DECISION ANALYSIS WITH DATA MINING TECHNIQUES

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ABSTRACT

Case studies and laboratory experiments have revealed that supply chain decisions made by humans do not conform to the expectations of supply chain management theory. There have been many studies investigating the factors causing this gap between the theory and the practice. In this paper we employ several data mining techniques in order to analyze and understand the stock quantity decisions made in a lab experiment. Our experiment is based on a simple inventory management model where the decision maker decides on the stock quantity of a perishable product facing stochastic consumer demand. Any unsold product at the end of the selling season loses its value and is discarded, and any unmet demand is lost. The feature selection study reveals that number of lost sales is the most frequently selected attribute for a large majority of the subjects followed by the ratio of actual profit to the expected profit, and the number of unsold products. We also conduct individual multiple regression analysis using the most frequently selected attributes and find that the R-squared values of the analyses are quite high implying a high predictive power. Finally, we conduct a cluster analysis based on the selected features.

KEYWORDS - Data Mining, Feature Selection, Cluster Analysis, Behavioral Operations, Supply Chain Management, Newsvendor Model

THE EFFECT OF GRADUALLY INCREASING MICROWAVE POWER ON THE DRYING KINETICS COLOR PARAMETERS AND ENERGY ASPECTS OF CARROTS

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ABSTRACT

Carrot is an important food source rich in vitamins, carotene, and dietary fibers. Due to its perishable nature, it is critical to choose a proper preservation method to preserve its nutritive properties. By drying the carrots, the products are evaluated economically in the post-harvest processes and the shelf life of the products is extended. In the present study, the effects of gradually increasing microwave power levels on the drying kinetics, color and rehydration properties were determined. In addition, the specific energy consumption, specific moisture extraction rate, energy efficiency, thermal efficiency, effective moisture diffusivity and activation energy values of different microwave power levels were determined. In the study, the color characteristics (R, G, B, L, a, b, H, S, V) of the dried products were obtained by image processing method and the discrimination of the products according to the drying conditions was performed by machine learning approach. As a result, accuracy values above 0.80 were obtained in the discrimination. Color characteristics were found to be statistically significant in the study ($p<0.05$).

KEYWORDS - Microwave, carrot, rehydration, effective moisture diffusivity, machine learning

ANALYSIS OF DRYING CHARACTERISTICS OF DRIED DAMSON PLUM BY MICROWAVE DRYING

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ABSTRACT

Due to the high moisture content, respiration rate and rapid ripening process, most of the fruits turn into waste product. For this reason, products must be dried and stored in order to maintain their availability and allow consumption even out of season. Plum is one of the most important fruits preferred by consumers due to its high vitamin, mineral and antioxidant content. In this study, the effects of different microwave drying conditions on the kinetics, rehydration, energy and thermal properties of damson plum were determined. In addition, the color properties of the dried products were determined by the image processing analysis and the classification of the products according to the drying conditions was performed using machine learning. In addition, the moisture ratio was modeled by using a multilayer perceptron-artificial neural network (MLP) algorithm. The studied parameters were subjected to comparative statistical analysis. According to the findings, successful results were obtained for classification (accuracy>0.80) and prediction (R>0.85).

KEYWORDS - Plum, kinetic, energy, color, image processing

A NOVEL TRAFFIC VIDEO DATASET FOR VEHICLE TRACKING

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ABSTRACT

For computer vision applications like intelligent transportation systems (ITS), accurate vehicle detection and tracking are becoming more and more crucial. In this study, we created a dataset, which contains 500 videos of different traffic scenes. To create this dataset we used a game, named "Traffic Racer". As object detector we used You Only Look Once X (YOLOX) algorithm. In addition, we used Observation Centric Sort (OC-SORT) and ByteTrack algorithms to produce the Multiple Object Tracking Accuracy (MOTA) scores. For our new vehicle tracking dataset the mean MOTA scores are obtained as 82.65 and 80.32 with ByteTrack and OC-SORT, respectively.

KEYWORDS - Traffic flow,Video Processing, Coding ,Image processing,deep learning

AN EMPIRICAL ANALYSIS OF HOW USERS WITH DIFFERENT GENDERS ARE NOT EQUALLY AFFECTED BY THE RECOMMENDATIONS

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ABSTRACT

One of the main concerns related to personalized recommendations in recent years is how fair the provided referrals are for individuals differentiating in terms of particular features. In this study, we consider a critical protected attribute related to individuals, i.e., gender, and aim to analyze how the most prominent recommenders show varying performance for users of different genders. The experimental studies conducted on a real-world benchmark dataset and selecting eight state-of-the-art algorithms from different families demonstrate that males considerably receive more accurate recommendations than females. However, the obtained results also show that the recommendations produced for women are usually more qualified in diversity and novelty aspects when compared to those generated for men. These findings denote the unfair nature of the recommenders across users of different genders, and such disparities can occur differently for a specific aspect of the recommendations.

KEYWORDS - Recommender systems, unfairness, gender discrimination, accuracy,beyond-accuracy

MOVING THE TEACHING FROM TRADITIONAL CLASS TO LEARNING MANAGEMENT SYSTEM HELPING STUDENTS LEARN FROM HOME

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ABSTRACT

Online and distance teaching and learning has progressively gained in popularity among teachers and students with the introduction of various Learning Management Systems (LMS). Moving teaching and course content from traditional classroom to LMS can assist teachers in creating a more dynamic learning environment, as well as students in focusing their learning and mastering learning objectives even if they are unable to attend their classes with physical presence. This paper will look at ways to transition teaching from a typical traditional classroom to LMS so that absent students can learn online from home.

KEYWORDS - Learning Management System (LMS), distance teaching, distance learning.

DESIGN OF A FUZZY EXPERT SYSTEM FOR DETERMINING ASPIRIN DOSAGE

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ABSTRACT

: In this study, the realization of a fuzzy logic system method of the amount of use of the most used aspirin drug in our lives is discussed. Aspirin doses vary depending on the type of disease, age, weight, metabolism of the patient, and so on. Choosing the right amount among them is often a problem. In this work, we show a general approach to the design of fuzzy expert systems. It can be expanded to include other background data, such as the type of disease, which plays an important role in determining aspirin dosage. The design consists of the following stages: Definition of the inputs and outputs for the system to be designed, Creation of the set of fuzzy values, graphical outputs, mathematical expressions and calculating results (fuzzification processes), Creation of fuzzy rules, Determination of the method inference mechanism, and Testing the system with examples.

KEYWORDS - Fuzzy logic, aspirin dosage, fuzzification, fuzzy rules.

THE ROLE OF LSTM RECURRENT NEURAL NETWORK WITH MULTIPARAMETRIC MRI PARAMETERS FOR DIFFERENTIATING PEDIATRIC POSTERIOR FOSSA TUMORS CEREBELLAR MEDULLOBLASTOMA EPENDYMOMA PILOCYTIC ASTROCYTOMA AND BRAINSTEM GLIOMA

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ABSTRACT

Pediatric brain tumors are the leading cause of death from solid tumors in childhood. The most common pediatric brain tumors are Cerebellar Medulloblastoma (CMB), Ependymoma (EP), Pilocytic Astrocytoma (PA) and Brainstem Glioma (BG). Pediatric brain tumors are highly heterogeneous for histology, prognosis, and therapeutic response. The differentiation between these four types of tumors is essential in the field of pediatric radiology. Therefore, in this study, we proposed an Long Short-Term Memory (LSTM) Recurrent Neural Network (RNN) model to classify these tumors. The screening MR examinations of 112 patients; CMB (n=42), EP (n=11), PA (n=25) and BG (n=34) were included in the analysis. We, in this study, used multiparametric (mp) magnetic resonance imaging (MRI) features including tissue characteristics of lesion outlining its cellularity, diffusivity, and vascularity. A four-layer LSTM model was proposed to differentiate these tumors. Each LSTM layer was consisting of 64 neurons. In addition, model was compiled with Adam optimizer and Binary Cross-Entropy loss function as parameters and was trained in a batch size of 16 and for 200 epochs. The area under the receiver operating characteristic curve (AUROC), accuracy, precision, recall and F1-score are the performance metrics used for analyzing the algorithm. LSTM model showed the good classification performance with 0.98 AUROC and 0.89 accuracy score. The precision, recall and F1-score values for the model range from 0.65 to 1.0, 0.70 to 1.0, 0.76 to 0.95, respectively. This study indicates that LSTM model should be considered for discriminating of posterior fossa brain tumors.

KEYWORDS - Cerebellar medulloblastoma, Ependymoma, Pilocytic astrocytoma, Brainstem glioma, Magnetic resonance imaging, Long short-term memory network

PERFORMANCE ANALYSIS OF GENETIC ALGORITHM FOR PREDICTING THE TREATMENT OUTCOME OF HIGH INTENSITY FOCUSED ULTRASOUND ABLATION OF UTERINE FIBROIDS

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ABSTRACT

Uterine fibroids are common benign gynecologic tumors in pre-menopausal women. Magnetic resonance imaging (MRI)-guided high-intensity focused ultrasound (HIFU) plays an important clinical role in the treatment of uterine fibroids. However, a major limiting factor for HIFU is the current patient screening protocols, which are unable to accurately differentiate suitability and efficacy, based on tissue conditions, for the majority of uterine fibroids. Therefore, in this study, we evaluated Genetic Algorithm (GA) model performance for predicting the treatment outcome of HIFU ablation with an immediate nonperfused volume (NPV) ratio of at least 90%. We used multi-parametric (mp) MRI parameters outlining its cellularity, diffusivity, and vascularity. GA model with two different fitness function such as logistic regression and support vector machine were tested in 39 generation, separately. The diagnostic ability of the GA models were evaluated using standard performance metrics, including the area under the receiver operating characteristic curve (AUROC), accuracy, sensitivity, and specificity and F1-score. The GA was configured to have 12 individuals and was run for 100 generations in each trial. GA with logistic regression fitness function gave performance with an AUROC of 0.92 and accuracy of 0.97. GA with support vector machine fitness function had 0.83 AUROC score and 0.92 accuracy, respectively. In addition, specificity, sensitivity, precision, recall, F1 score ranged from 0.67 to 0.83, 1.0, 0.90 to 1.0, 0.67 to 1.0, 0.80 to 0.95, respectively. This preliminary study indicates that GA algorithm should be considered in assisting physicians to fully evaluate the outcome of the HIFU therapy.

KEYWORDS - Uterine fibroids, Magnetic resonance imaging, Genetic algorithm

AN INVESTIGATION OF HYPERSPECTRAL IMAGE FUSION STRATEGIES ON REAL DATASETS

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ABSTRACT

Owing to their abilities to discern land cover objects, hyperspectral satellite imageries are used in many remote sensing applications. Despite their high spectral content, hyperspectral imageries suffer from coarse spatial resolution due to some technical sensor limitations, which restricts their use in applications where high spatial detail content is required. Image fusion is a frequently-used method to improve the spatial resolution of hyperspectral images. Such a fusion concept aims to produce spatially enhanced hyperspectral images with the aid of the spatial information of higher spatial resolution imageries. Many image fusion strategies have been introduced for this purpose to date and the developed strategies have been tested mostly on simulated hyperspectral imageries since they provide full reference. The aim of this study is to evaluate the performances of nine widely-used hyperspectral image fusion strategies on real datasets. The evaluated fusion strategies include the maximum a posteriori with stochastic mixing model (MAPSMM), coupled nonnegative matrix factorization (CNMF), Lanaras, guided filter principal component analysis (GFPCA), generalized Laplacian pyramid-based hypersharpening (GLP-HS), hyperspectral super-resolution (HySure), fast fusion based on Sylvester equation with naïve Gaussian prior (FUSE-G), coupled sparse tensor factorization (CSTF) and learning a low tensor-train rank-based method (LTTR). The evaluations showed that the GLP-HS and MAPSMM methods exhibited the best fusion performances in the study area.

KEYWORDS - Image Fusion, Hyperspectral Imagery,Image Enhancement,Digital Image Processing

OPEN DATA IN EDUCATION A SYSTEMATIC REVIEW

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ABSTRACT

A new trend has already appeared for open data, which now has a great importance in the digital transformation of education as a growing innovation through students, professors and researchers for the purpose of data collection and after enable them to understand the concept of data through different methods such as analysis and interpretation in the real world. The aim of this research is the application of open data in order to improve the universities in order to better rank and review the research papers. The systematic literature review aims to collect and process the data that we select and in which case we obtain information about current solutions. To have more detailed information about, I collected publications from the last six years from the most popular bookstores such as Springer, IEEE Xplore, Elsevier, and DL ACM. The information processed in the research papers shows that there is a possibility of having a model that can rank the publications of university professors on an open data platform. The process of research papers gives us the data from the research done by systematically reviewing where the specified findings are discussed and have a conclusion on it.

KEYWORDS - Open data, Open Education, Big Data, Machine Learning, Data Mining, Higher Education.

THERMAL BEHAVIOR ASSESSMENT OF XLPE INSULATED MV POWER CABLES UNDER DIFFERENT CONDITIONS

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ABSTRACT

Population growth in central settlements necessitates the transmission and distribution of electrical energy from underground. Changes that may happen to ambient conditions during the use of cables cause the cables to breakdown, with a negative effect on the temperature change of the cable and therefore on the current carrying capacity. In this study, the effects of external factors and possible defects in cable insulation on the temperature change in the cable during the installation of XLPE cables were investigated. Thermal analysis was carried out using the Finite Element Method based COMSOL Multiphysics program, considering the presence of air gaps and water droplets in the cable insulation, the change in soil surface temperature and the change of cable burial depth in an XLPE insulated cable with a 20.3/35 kV, 240 mm2 conductor cross section. It has been observed that the soil surface temperature affects the cable directly and linearly. It has been determined that the cable burial depth leads to different results and the qualification of the defects in the cable insulation is important.

KEYWORDS - Cable, Electric Distribution, Finite Element Method, Thermal Assessment, XLPE.

USES OF LIGHT EMITTING DIODE LED LIGHT AS AN ACTIVE INGREDIENT IN MEDICAL TREATMENTS A REVIEW STUDY

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ABSTRACT

The first studies on the use of light in medicine show that light energy can provide metabolic processes within cells and this process is done through a series of bio-chemical complex processes. Especially in the last 10 years, LED (Light Emitting Diode) lighting systems have been used as an energy efficient light source. Thanks to the superior features of LED light sources (low energy consumption, long life, ease of control and unlimited switching number, etc.), it is not only used for lighting purposes, but also in many areas such as greenhouse cultivation, communication with electronic devices, defense industry, medical fields. LED technology is used in the treatment of many diseases in the medical field. In the health sector, it is used for many purposes such as wound healing, skin rejuvenation, inflammation reduction, diabetic foot ulcer, psoriasis, osteoporosis (bone loss), neurological diseases, optogenetic, oral and dental health treatments, as well as irled blood analysis. In today's conditions, LED systems are widely used in wound healing, skin rejuvenation and dental health treatments, and it is seen that their use in other treatments is increasing day by day. It has been observed that when LEDs are used in the wavelength range of 600-900nm, they are good for many skin diseases and the treatment times change with the change of power applied to unit area and energy applied to unit area. In this study, studies of LED as a light source as adjunctive treatment methods in medical applications were compiled and brought together. In addition, a comprehensive analysis of the studies was made and the results of our study were drawn.

KEYWORDS - LED therapy, LED usage in medical, LED treatments, adjunctive therapy, LED technolog

ANALYSIS OF THE HARMONIC EFFECTS OF ELECTRIC RAIL SYSTEMS ON THE ENERGY DISTRIBUTION NETWORK

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ABSTRACT

The important thing in energy systems is the minimum number of power cuts. Various studies are carried out to minimize interruptions in energy systems. In this study, the harmonic analysis of electric rail systems in the energy transmission network will be examined. Electric trains are powered by distribution grids fed by the transmission grid. The increase in the number of electric rail systems means an increase in the harmonics they produce. Therefore, the increase in harmonics in the distribution network also affects the transmission network. The fact that the electric railway lines are connected to each other causes the failures that may occur to affect the entire energized system connected to the network. For this reason, the effect of electrified rail systems on transmission networks should be reduced. Since the distribution network is connected to the transmission network, the reduction of harmonics occurring in the distribution network will also reduce its effects on the transmission network. In this study, information will be given about the analysis of harmonics created by electric rail systems in the interconnected network. Information about the electrical systems to which the rail systems are connected will be given. The faults that occur in electric rail systems and the harmonics that occur at the time of this fault will be examined. As a result, information will be given about the measures taken in the transmission network to reduce the harmonic effects of electrified rail systems in the transmission and distribution network.

KEYWORDS - Energy systems, rail electrical systems, harmonic analysis, electrical transmission and distribution systems, high voltage

ISM 2 4 GHZ BAND ANTENNA DESIGN FOR RF ENERGY HARVESTING SYSTEMS

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ABSTRACT

In this study, the design and optimization of a low profile, compact antenna that is easy to manufacture have been conducted for 2.4 GHz RF energy harvesting applications. The proposed antenna with the directivity of 2.33 dBi and radiation efficiency of 92.5% at 2.4 GHz resonance frequency is designed and numerically computed. The proposed antenna can be used in a wireless recharging element system for various on-body sensor devices.

KEYWORDS - RF Energy Harvesting, ISM Band, Microstrip Antenna, 2.4 GHz, Rectifying Antenna

A TECHNICAL EVALUATION OF THE PERFORMANCE ANALYSIS OF BAYBURT SOLAR POWER PLANT USING HELIOSCOPE SOFTWARE AND ACCORDING TO IEC 61724

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ABSTRACT

The issues affecting the performance of a photovoltaic (PV) power plant can be explained by mounting tilt angle, geographical location, partial shading effect, optimizer effect and mounting type and similar parameters. In this study, the parameters affecting the performance of a PV power plant are addressed by HelioScope software and a preliminary examination has been made for the main subject of this article. In addition, the annual performance of a solar power plant with a power of 7.14 MW in Bayburt, under the responsibility of a private company, was evaluated according to the IEC 61724 standard, using the energy production data of 2020. The performance of the power plant is determined by calculating parameters such as specific energy, performance ratio, mean array efficiency and capacity factor by taking the data from the solar energy potential atlas prepared by the General Directorate of Meteorology in Bayburt and the Ministry of Energy and Natural Resources as a reference. The performance ratio varies between 83-94% according to the energy production values of the power plant, and the capacity factor varies between 9.3-25.3%. According to 1-year data, the average panel efficiency varied between 13-25% based on ambient temperature and seasonal effects. According to the solar energy potential map used in the analysis, results show that the energy production performance in 2020 was 12.23% higher. Bayburt has a larger solar energy potential than many regions in Europe, with a total annual solar radiation data of 1500-1700 kWh/m2. It has been concluded that the energy production performance of solar power plants is satisfactory because the capacity factor has reached 25% in Bayburt and places with similar geographical features.

KEYWORDS - Photovoltaic energy, performance ratio, mean array efficiency, capacity factor

A NUMERICAL APPROACH FOR MODELING THE SHUNT DAMPING OF THIN PANELS WITH ARRAYS OF SEPARATELY PIEZOELECTRIC PATCHES

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ABSTRACT

Two-dimensional thin plates are widely used in many aerospace and automotive applications. Among many methods for the attenuation of vibration of these mechanical structures, piezoelectric shunt damping is a promising way. It enables a compact vibration damping method without adding significant mass and volumetric occupancy. Analyzing the dynamics of these electromechanical systems requires precise modeling tools that properly consider the coupling between the piezoelectric elements and the host structure. This paper presents a methodology for separately shunted piezoelectric patches for achieving higher performance on vibration attenuation. The Rayleigh-Ritz method is used for performing the modal analysis and obtaining the frequency response functions of the electro-mechanical system. The effectiveness of the method is investigated for a broader range of frequencies and it was shown that separately shunted piezoelectric patches are more effective.

KEYWORDS - piezoelectric patches, Rayleigh-Ritz model, shunt damping, electromechanical systems

CLASSIFICATION OF BRAIN TUMORS USING CONVOLUTIONAL NEURAL NETWORK CNN

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ABSTRACT

One of the deadly cancer diseases is brain tumor. When cancer-related deaths are examined, it is seen that there are more death cases in patients with brain tumors. Tumors can be in different parts of the brain and in different sizes, and they can also differ because of type. Brain tumors are classified as cancerous or non-cancerous, low-grade and high-grade, benign and malignant. Because of diagnose diseases, images are taken from different parts of the body and these images are evaluated using different methods. Examples of these methods are X-rays, ultrasonic imaging (UI), positron emission tomography (PET), computed tomography (CT) and magnetic resonance imaging (MRI). The most commonly used method is magnetic resonance imaging. Diagnosis and correct classification of brain tumor is vitally important. Relying solely on human supervision to classify acquired images is inevitably dangerous for the patient. In this study, Resnet 50, Googlenet, VGG16, Resnet18, machine learning models of Convolutional Neural Networks (CNN), were used for the classification of brain tumors. These models were trained with images and retrained for brain tumor classification using transfer learning. The dataset consists of Meningioma, Glioma, Pituitary and non-tumor MR images. In the study, 5712 images were used. These MR images consist of 70% training images and 30% test images. After the models were trained, the classification efficiencies were compared and very good results were obtained.

KEYWORDS - Image Processing, Convolutional Neural Network (CNN), Classification of Brain Tumors

ASPECTS REGARDING THE OPTIMISATION OF AN ENERGY SYSTEM FOR A UAV DESIGNED FOR LONG TERM MONITORING MISSIONS

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ABSTRACT

The use of a photovoltaic system to supply power to electrical consumers on board a UAV provides it with the ability to fly over considerably longer distances and time intervals. In this respect, the research carried out following the practical realization of a solar UAV, with a wingspan of 151 cm and powered by three different energy sources, created the premise to identify a technical solution on how to optimize the energy system and mitigate the transient effects observed during the switching of electrical sources. The study carried out on the profile of a long-duration aerial monitoring mission along the Baku-Tbilisi-Ceyhan pipeline route highlights how an optimisation algorithm generated on the basis of actual UAV operating parameters ensures efficient and uninterrupted power supply to the power grid throughout the flight. Contextually, the applicability of the results obtained is materialized in the development of new UAVs, with outstanding performance, for which the process of selecting an energy source suitable for flight conditions and supplying power to electrical consumers is carried out in an optimal and efficient way, without any operational risks.

KEYWORDS - photovoltaic cells, UAV, drone, battery, fuel cell

A REVIEW OF POWER LINE DISTURBANCES AND THEIR MITIGATION DEVICES

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ABSTRACT

The developments in industrialization and automation technologies have been increasing in recent years. Along with these developments in these fields, the device Technologies also change and become more sensitive than before. Programmable Logic Controllers(PLC), variable speed drives (VSDs), microprocessors are just a few of these devices where significant developments have taken place and also, these devices are vulnerable to the power quality issues. To keep the progress in industrialization and automation uninterrupted, the term of power quality parameters and their effects become more significant. Voltage fluctuation, flicker, harmonics, voltage imbalance are the just some of the power quality problem that is ability to lead enormous failures and serious economic losses. In order to alleviate the adverse impact of power quality and improve it, various equipment-based methods are developed. Some of methods improved to ameliorate the power quality, various power quality problems and their characteristics are examined in this paper. Unified power quality conditioner (UPQC), uninterruptible power supply (UPS), distribution static synchronous compensator (D-STATCOM), dynamic voltage restorer (DVR) and filters are evaluated in this study.

KEYWORDS - Power Quality , Power Quality Mitigation Devices

A GAAS P HEMT VOLTAGE CONTROLLED OSCILLATOR DESIGN FOR 5G MILLIMETER WAVE APPLICATIONS

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ABSTRACT

A design procedure of a Monolithic Microwave Integrated Circuit based Voltage Controlled Oscillator at millimeter wave frequencies for 5G applications is presented in this paper. The circuit is designed in a commercially available 0.15um InGaAs pHEMT process. The circuit design adopts the negative resistance approach using a depletion mode pHEMT device with feedback. The design steps include co-simulation results which use full chip ElectroMagnetic simulations and foundry supplied compact models. The VCO has a 1 GHz tuning range with the center frequency of 31.9 GHz for tuning voltage range of 2-6 V.

KEYWORDS - Voltage controlled oscillator (VCO), GaAs pHEMT, negative resistance, feedback, 5G mm-wave.

C BAND MICROSTRIP ANTENNA ARRAY ON PHOTOGRAPH PAPER SUBSTRATE

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ABSTRACT

In this study, a 2x1 microstrip antenna array is designed for C band applications. Glossy photograph paper is used as dielectric substrate in four layers. The conductive surfaces of the antenna are manufactured using by self-adhesive copper tape and graphite based conductive spray paint then their performances are compared. Simulations of the antennas are realized in ANSYS HFSS. From measurements, it is seen that this antenna array is suitable for flexible C-band communication applications. In addition, the antenna manufactured with copper tape has a better performance than the conductive spray method.

KEYWORDS - C-band, ANSYS HFSS, microstrip array, photograph paper

COMPARISON OF SIMULATED EVS ENERGY CONSUMPTION WITH PHYSICAL ROAD TEST

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ABSTRACT

Studies on mathematical modeling and development of electrical vehicles (EVs), the use of which are rapidly becoming widespread, have been increasing. While the vehicles to be produced reach the design stage, their components are selected according to the results of mathematical calculations. In addition, the design is completed according to the data obtained in the simulation. Energy Consumption Test of the prototype vehicle produced within the scope of Vehicle Dynamics Tests is carried out. With this test, the energy consumption and maximum distance of the vehicle are measured. Component changes made according to physical test results in prototype vehicles cause losses in terms of time and cost. With this study, it is aimed to compare the simulation results with the physical test results. Then, with the data obtained from the comparison results, it is aimed to perform the maximum distance and energy consumption test in the simulation environment before the prototype vehicle is produced, thus minimizing the loss of time and cost. In this study, a mathematical model of an electric minibus used in urban transportation was created according to its dynamic characteristics and energy consumption was calculated in simulation. MATLAB Simulink is used in the scope of this study. Additionalt to simulation study and mathematical modelling, physical tests are also performed to compare simulated results. According to the UITP PROJECT E-SORT procedure, the prototype vehicle was instrumented with the data logger, GPS, V-Box devices connected to the Can communication path of the vehicle and the energy consumption amount is observed. Within the scope of this study, it is aimed to compare the simulation results with the data obtained as a result of the test. As a result of the study, the accuracy of the results obtained in the simulation with physical tests, the margin of error and the deviations in maximum distance calculations will be evaluated.

KEYWORDS - EVs, Energy Consuption Calculations

AN APPROACH FOR REDUCING TORQUE RIPPLES ON PERMANENT MAGNET SYNCHRONOUS MOTORS SLITTED STATOR CORE

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ABSTRACT

Recently, permanent magnet synchronous motors (PMSMs) have been used in many traction applications. Although they have many advantages about energy saving, power-torque density and efficiency, main disadvantage of these motor type is torque ripples. In general, there are two ways for reducing the torque ripples. These methods are motor core magnetic design method and current control method. In this study, slitted stator core teeth geometry has used for reducing the torque ripple. One of the basic missions of slitted cores is generating the useful reluctance torque and helping the more symmetrical distribution of the flux density on magnetic cores of the motor. In this study, an outer rotor PMSM has been used for required performance comparisons. There have been two numerical models created for the performance analysis of outer rotor PMSM. Primarily, a classical analytical outer rotor PMSM model has been created and dynamical analysis of this model has been operated with Finite Element Analysis simulation programme. Afterwards, another FEA performance analysis for same physical and electrical featured but slitted stator core numerical model of outer rotor PMSM has been achieved. Magnetic flux density distributions, torque ripple values and other performance values of each prototype motor have been given in study.When the obtained performance values evaluated, torque ripple value of slitted core PMSM has been %5 less than traditional outer rotor PMSM, besides it has been shown that, mean torque value of slitted core PMSM is %3 bigger than classical outer rotor PMSM.

KEYWORDS - Traction Motors, Permanent Magnet Synchronous Motor, Torque Ripple, Stator Core Design, Reluctance Torque Improve, Slitted Stator Core Structure.

PRINCIPLES AND UTILIZATION OF A SINGLE PHASE Z SOURCE INVERTERS

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ABSTRACT

In this paper, the single-phase Z-source inverter simulation and modeling along with their methods of control for application of conversion dc-to-ac power is presented. The Z-network design and inverter as full bridge of a single-phase is performed in environment of MATLAB-Simulink. An input voltage as fixed DC is given to the inverter and an output voltage as controlled AC is gained through variable cycle of duty or adjusting the on and off periods of the inverter components. The duty variation of cycle might be attained through utilizing controlling methods of pulse width modulation (PWM). Two control PWM strategies are presented, like Simple Boost Control and Sinusoidal carrier-based PWM. In detail, such methods are defined and comparison was done on the simulation basis in MATLAB/ Simulink. The Z-source element ripple, voltage as output, current and the profile as harmonics, are controlled with modulation index variation and frequency of switching. Likewise, the shoot effect by state on the inverter as traditional is eliminated in the z- source inverter. Similarly, two diverse applications are offered for modeling and simulated system verification along with 2 strategies of controlling 1st is based on performance and simulation analysis of photo voltaic (PV) system based on Z-Source inverter. Second application is based on M&S of inverter of Z- source for controlling the Induction Motor speed.

KEYWORDS - power system modeling, power system simulation, Network topology

LOW COST ENERGY MANAGEMENT SYSTEM IN HOMES

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ABSTRACT

Energy management in homes has attracted the attention of many researchers in recent years since houses consume a high amount of energy produced by different energy sources. Energy management in residential buildings is a complex procedure due to the number of interconnected variables in the system. To effectively manage the energy in the residences, an efficient energy control system is required that can reduce the total energy consumption without going too far from the comfort level requested by the user inside the residence. In this study, a low-cost alternative method for energy management in residences has been developed using fuzzy logic. Light, motion, and sound sensors are used as system inputs. Three different fuzzy logic inference engines were used. Lighting, heating, and cooling output powers were controlled according to sensor data, lighting conditions, ambient temperature, and consumer conditions. The control of the system is provided by a microcontroller, sensors, and Nextion HMI display. As a result of this study, electricity consumption has been reduced to a minimum effect on consumer comfort. Electricity, water, and natural gas consumptions were controlled when the consumers were not in the residences, unnecessary consumptions were prevented, and water and natural gas savings were achieved.

KEYWORDS - Energy consumption, Energy management, Home automation, Consumer electronics, Smart home

EFFECTS OF VOLTAGE SAGS ON VARIABLE FREQUENCY DRIVE IN INDUSTRIAL FACILITIES

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ABSTRACT

Thanks to the rapid development in technology, there is a remarkable increment in the amount of energy consumed all over the world. Especially in industrial facilities, the demand for energy has been developing day by day. With the increasing of energy consumption in the industry, some concepts such as efficient use of existing energy, energy saving and power quality gain importance.Power quality, which can be defined as the ability of power systems to transmit and distribute electricity to end users within predetermined reasonable limits, is of great importance in industrial facilities with continuous production. The fact that electrical energy goes beyond the determined limits will cause great problems for energy consumers. Today, many industrial establishments such as pharmaceutical, chemistry, paper, textile and semiconductor industries work 24 hours nonstop. Production stages of these systems form of extremely important and interrelated process stages. The corruption in power quality will affect the whole production. Devices, like variable frequency drives (VFDs), advanced microprocessors, programmable logic controllers (PLCs), relays, contactors and etc., used in all industrial sectors are easily affected by the variations in electrical power. In this study, the impression of "voltage sags" events on the variable frequency drives are evaluated by measurements carried out. The obtained results have been evaluated by means of the MATLAB/SIMULINK program. When the simulation results were examined, it was determined that the DC bus voltage was kept within acceptable limits thanks to the battery-based solution that is installed and also, system connected to the variable frequency drive was not affected by voltage sag events.

KEYWORDS - Power Quality ,Voltage Sag ,Variable Frequency Drive

DETERMINATION OF THE SAR VALUES OF THE ELECTROMAGNETIC FIELD EMITTED FROM THE PATCH ANTENNAS AT 900 MHZ AND 1800 MHZ FREQUENCIES

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ABSTRACT

The effects of electromagnetic radiation emitted from mobile phones on human health continue to be an important topic of public debate. Due to the fact that the temperature increase in the tissues is felt by mobile phone users, the concern that GSM frequencies may be dangerous is considered in terms of public health day by day. In this study, a numerical analysis of the specific absorption rate (SAR) was presented and the temperature variation in the head region was demonstrated. While doing this, two separate antennas are designed to mimic cell phone radiation at frequencies of 900 MHz and 1800 MHz. Two separate antennas were applied to the head models, which imitate the electrical properties of the human head, from a distance of 3 cm. Then, the highest SAR values for both frequencies were observed as 0.0125 W/kg and 0.0390 W/kg. Antenna models designed to have these values below international standards have shown that they are successful

KEYWORDS - GSM, SAR, 900MHz, 1800MHz, Thermal Effect

A METHOD TO IMPLEMENT TERNARY LOGIC GATES VIA MULTI THRESHOLD TRANSISTORS

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ABSTRACT

Multi threshold transistors are available in advanced technology nodes. In this work, the author presents a methodology to implement ternary logic gates via multi-Vt transistors. The presented method is used to implement ternary AND and OR gates as well as a ternary half adder circuit. Functionality of the implemented circuits are verified via SPICE simulations.

KEYWORDS - Ternary Logic, Multi Threshold Design

VIOLENCE DETECTION IN VIDEOS BASED ON DEEP LEARNING APPROACHES

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ABSTRACT

Abstract - Violence detection in videos and live broadcasts using machine vision and artificial intelligence approaches has become a hot research area attracting the attention of many researchers worldwide. Detecting violence in videos is a challenge because videos have Spatio-temporal features that are difficult to analyze when compared to other types of data that only have spatial or temporal parts. Deep learning is a subclass of artificial intelligence that uses deep structures and hierarchical learning approaches that offer many solutions to such a challenging task. Due to their construction that contains many layers or networks between the input and output layers, deep learning approaches are very successful in pattern classification and extraction of Spatio-temporal features. This study aims to build a neural network using deep learning approaches to perform real-time violence detection in videos. Under this scope, this work suggests using MobileNets alongside ConvLSTM for violence detection in videos, making this work a pioneer in applying this combination to solve this problem. MobileNets is used to extract the spatial features from successive video frames. On the other hand, the ConvLSTM part analyzes the relations between these frames in time manners while maintaining the local spatial features. Around 2000 video clips were used to train and test the developed neural network. The proposed model achieves a test accuracy of 93.33%, exceeding the performance of the previous works.

KEYWORDS - Artificial Intelligence, Deep Learning, Convolutional Neural Networks, Spatio-temporal Features, Violence

DESIGN OF A CMOS OPERATIONAL TRANSCONDUCTANCE AMPLIFIER FOR CURRENT CONTROLLED 2ND ORDER ACTIVE FILTER DESIGN

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ABSTRACT

In this work, a CMOS operational transconductance amplifier is designed for use in 2nd order controlled active filters. The developed operational transconductance amplifier employs a differential pair and a cascode current mirror in which the cascode current mirror at the output stage guarantees high output impedance. 0.35µm CMOS technology parameters are used for the verification of the designed operational transconductance amplifier in PSPICE. The results show that the gain of the operational transconductance amplifier can be varied in a wide range using the control current. After the verification of the proper operation of the operational transconductance amplifier, a 2nd order Butterworth type lowpass filter is implemented using the proposed OTA structure. The PSPICE simulation results of the active filter demonstrates the variability of its cutoff frequency easily using the control current of OTAs.

KEYWORDS - operational transconductance amplifier, active filter, CMOS technology

DIGITAL CURRENCY TIME SERIES PREDICTION BASED ON FINANCIAL SIGNAL PROCESSING ANT COLONY OPTIMIZATION AND MACHINE LEARNING TECHNIQUES

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ABSTRACT

Nowadays, digital currencies are very popular among individual and institutional investors and their usage is becoming more and more common. It has started to be important for people in the whole sectors what the value of digital currencies, which emerged as an alternative to existing currencies at the beginning, will be compared to existing currencies for the next day. In this study, external time series are derived by using trend indicators and oscillators from financial signal processing approaches on BTCUSD, ETHUSD and BNBUSD time series data. Trend indicators such as Moving Average (MA), Average Directional Moving Index (ADX) and Parabolic Stop and Reverse (SAR) and oscillators such as Moving Average Convergence Divergence (MACD), Rate of change (ROC) and Commodity Channel Index (CCI) are used. A total of 155 features are extracted by using close, high and low price time series data. Using time series and derived data, Support Vector Machines (SVM) with Gaussian kernel from machine learning approaches are trained to predict accurately the next step close price. A wrapper-based approach is used to select relevant features by using Ant Colony Optimization (ACO) and SVM. The 10-fold cross validation approach is used for model validation. Model performances are compared using statistical error criteria such as Root Mean Square Error (RMSE) and Mean Absolute Error (MAE).

KEYWORDS - Digital Currency, Financial Signal Processing,Ant Colony Optimization,Bitcoin,Ethereum,Binance Coin

IMPLEMENTATION OF MODIFIED KARNIK MENDEL ALGORITHM BASED INTERVAL TYPE 2 FUZZY INFERENCE SYSTEM FOR AIRCRAFT PITCH CONTROL

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ABSTRACT

In this paper, Modified Karnik-Mendel Algorithm is implemented for a control problem. This is the first control study of the Modified Karnik-Mendel Algorithm (M-KMA) in the open literature. Type-2 fuzzy inference systems need a type-reduction method to be reduced to interval type-2 fuzzy inference systems. Karnik-Mendel Algorithms is one of the type-reduction methods. The proposed type-reduction methods in the open literature do not allow Adaptive Neuro-fuzzy Inference System (ANFIS) training. So, the M-KMA is proposed in 2021 to train antecedent and consequent parameters of interval type-2 fuzzy logic systems by using ANFIS. In this study, the recently proposed M-KMA is tested on aircraft pitch control. PID controller is used as a conventional controller. The M-KMA based Interval Type-2 FIS is used to tune PID parameters with respect to error and error derivative. The performances of controllers are compared for settling time, overshoot, root mean square errors and steady-state errors. It is seen that the M-KMA gives superior results than conventional PID controllers.

KEYWORDS - Karnik Mendel Algorithm, Modified Karnik Mendel Algorithm, Type-2 Fuzzy Inference System, Fuzzy PID, Aircraft Pitch Control.

ELECTROMAGNETIC COMPATIBILITY EMC SIMULATION AND APPLICATION IN AUTOMOTIVE ELECTRONICS

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ABSTRACT

To ensure electromagnetic compatibility in automotive electronics, some standards and design methods should be considered during design. One of these standards is UNECE R10 which defines conducted and radiated emissions. In this study, an automotive grade power supply was designed and simulated that meets the conducted emission standards by UNECE R10.

KEYWORDS - EMC, EMI, LTspice, Common-mode choke, Automotive electronics, UNECE R10, Artificial network (AN), Conducted emissions, Noise.

PULSE DENSITY MODULATION CONTROLLED HIGH FREQUENCY RESONANT CONVERTER FOR WIRELESS POWER TRANSFER SYSTEMS

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ABSTRACT

Abstract - In this study, a wireless power transmission (WPT) system which has 4.1kW maximum power is simulated by controlling the output power of the high frequency resonant converter with pulse density modulation (PDM). In order to provide high-frequency wireless power transfer with maximum efficiency, the series resonant converter is controlled by PDM under zero current switching (ZCS) and zero voltage switching (ZVS) conditions. Implemented 8 irregular PDM control algorithm is provided with C block in PSIM software. ZCS and ZVS are achieved for each of 4 different reference power levels, 250W, 1kW, 2.2kW and 4.1kW. Considering the simulation results, the system efficiency is approximately %96 at all power levels.

KEYWORDS - resonant converters, wpt,pdm

EFFECTS OF PSO ALGORITHM PARAMETERS ON THE MPPT SYSTEM UNDER PARTIAL SHADING CONDITION

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ABSTRACT

Abstract - Maximum Power Point Tracking (MPPT) systems enable photovoltaic (PV) panels to work at their Maximum PowerPoint (MPP), which can significantly increase PV system efficiency. To do this, several algorithms have been developed, including conventional, intelligent, and meta-heuristic. Once a partial shading condition (PSC) occurs, more than one peak emerges in the power-voltage curve of photovoltaic arrays. Under this condition, conventional algorithms get stuck at the local maximum point and fail to reach the global maximum point. Being an alternative method, a metaheuristic algorithm Particle Swarm Optimization (PSO) has been frequently employed for MPPT systems under partial shading conditions. This algorithm has some parameters that affect its performance to reach the global MPP of the PV panel. Therefore, with welltuned parameters, the effectiveness of the PSO will increase for the different partial shading conditions. In this study, the effects of cognitive learning and social learning parameters of the PSO algorithm are investigated under different partial shading conditions. An MPPT system consisting of 3 series PV panels, a boost-type DC-DC converter, and the PSO algorithms is created in MATLAB®/Simulink®. Simulation studies show that the PSO algorithm fails to track global MPP with constant cognitive and social learning parameters under changing partial shading conditions. Furthermore, the results show that these two parameters affect the time to reach the MPP of the PSO algorithm.

KEYWORDS - MPPT, Photovoltaic, PV, PSO Parameters, Partial Shading, Solar Energy

ENSURING BUSH DEBURRING OPERATION PROCESS TRACEABILITY AND AUTOMATIC PROCESS CONTROL

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ABSTRACT

Bushings are used at the connection points of the suspension parts to transfer the movement, to prevent sudden movements and vibrations. The runner channels in the bushings ensure that the rubber material coming from the injection machine is transferred to the mold core surface. In the current system, the bushing cleaning process and the accuracy of the cleaned product are recorded with the operator's declaration. In this system, which is at the operator's discretion, the operator can keep his or her performance higher than it should be and can count the uncleaned bush as cleaned. This results in incorrect operator productivity or uncleaned product in the logs. In this study, which was carried out in order to eliminate similar errors; The operator places the products on the conveyor belt after cleaning. The bushing, which moves on the band, is first met by the areal laser sensor. The piece, which continues to move on the band, provides the inspection of the cleaning process of the runner points by using the image processing technique with the camera placed in the last process. If faulty cleaning is detected, the counted product is canceled and sent to the rejection conveyor. With this study, it is aimed to monitor personnel tracking and cleaning control more efficiently.

KEYWORDS - Bushing,İmage Processing,deburring,traceabilty

A DESIGN STUDY FOR MEMS COMB DRIVE RESONATOR

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ABSTRACT

This paper presents a design study for the MEMS comb-drive resonator with a resonance frequency of approximately 532 kHz. The theoretical calculation of the MEMS comb-drive resonator is performed by considering the second-order spring-mass-damper model. On the other hand, the simulation study based on the finite element method (FEM) is also performed by using open-source Elmer FEM software to obtain both values of the eigenfrequency and the capacitance of the designed resonator. A comparison table is also given to compare the theoretical values to the simulation results. The designed resonator can be used as a mass sensor mainly depending on the resonance frequency shift after integrating a sensing layer. Furthermore, the main benefits of the presented comb-drive resonator are to have independent mechanical springs and proof mass regions compared to the examples of the mass sensors given in the literature. Therefore, this can contribute to the improvement of the sensing features. Keywords – MEMS, comb-drive resonator, FEM analysis.

KEYWORDS - MEMS, comb-drive resonator, FEM analysis

MATHEMATICAL MODELING AND SIMULATION OF SOLAR PHOTOVOLTAIC MODULE IN MATLAB SIMULINK

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ABSTRACT

In this paper, the mathematical modeling and simulation of a solar photovoltaic module are presented using the equivalent circuit of a solar photovoltaic cell with its parameters in Matlab/Simulink environment. The analysis is based on the equations of the single-diode equivalent circuit model. For the mathematical modeling and simulation, a 320W photovoltaic module is chosen. The main characteristics of the module required for the analysis are obtained from the datasheet supplied by the manufacturer. Under different environmental parameters such as temperature and solar radiation, the Current-Voltage and Power-Voltage characteristic curves are provided. The effects related to the changes in temperature and solar radiation on simulation results are observed.

KEYWORDS - Solar energy, Photovoltaic cell, Modeling, Temperature, Solar radiation

USING TEMPLATE MATCHING ALGORITHM IN WELDING ROBOTS

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ABSTRACT

Intelligent robotic welding is an indispensable part of modern welding production, and vision-based seam tracking is one of the key technologies for performing intelligent welding. The biggest challenge in robotic applications is interaction with humans and a dynamic environment, typically constrained by the capacity of visual sensors and the computational cost of signal processing algorithms. The aim is to speed up the welding process and reduce the cost. Since the welding process is very fast, the process is accelerated by using image sensors and various image processing algorithms instead of operators. However, the adaptability and robustness of most image processing algorithms are insufficient during resource implementation. In this study, an event-driven embodied system was designed for feature extraction and object recognition as a new and efficient sensory approach in robotic applications. In the study, it is aimed to decide which welding type is closer to the welding process after the welding process of the robot is performed. Thus, the selection of parameters according to the source type and the processing of the results were facilitated and it was checked whether the weld was made of good quality. In the test results, it was seen that the algorithm has good adaptability for multiple typical weld seams.

KEYWORDS - Feature Extraction from Image, Image Preprocessing, Template Matching, Welding Robots, Smart Welding Process

PRODUCTION AND CHARACTERIZATION OF SCOTCH PINE POWDER ADDITIVE PLA COMPOSITES FOR FOOD PACKAGING

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ABSTRACT

In recent years, studies on increasing physical and mechanical properties of food packaging materials, which have diversified depending on consumption amount, have come to the fore. This study aims to produce and characterize scotch pine powder-added polylactic acid (PLA) green composite packaging films and to improve the properties of the obtained packaging films by comparing them with pure PLA packaging films. For this reason, PLA composite films with scotch pine powder additives at 0%, 0.25%, 0.5%, 1%, 2.5%, 5%, and 10% by weight were prepared using the solution casting technique. The produced powders were characterized by a variety of characterization techniques such as thermogravimetric analysis (TGA), scanning electron microscopy (SEM), laser particle sizer, Fourier transform infrared (FTIR) spectroscopy, and mechanical test. According to SEM analysis, scotch pine powder was homogeneously dispersed in the packaging films. Moreover, the FTIR, micrometer, and mechanical test results showed that the physical and mechanical properties of PLA added with different amounts of scotch pine powder improved.

KEYWORDS - Scotch pine powder, PLA, Food packaging film, Green composite.

FATIGUE PROPERTIES OF HOT DIP ALUMINIZED INCONEL 718 SUPERALLOY

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ABSTRACT

Hot dip aluminizing (HDA) is a diffusion based surface treatment applied to various metals to improve their oxidation and corrosion resistance due to the formation of aluminide layers at the surface. The purpose of diffusion annealing (DA) after HDA is to modify the aluminide layers for more homogeneous structure by interdiffusion of the elements in these layers to obtain improved properties. Even though there are several works concerning surface characteristics, wear and oxidation resistance of the surface after HDA and subsequent DA processes, their effects on fatigue properties of Inconel 718 superalloy have not been investigated much. In this study, the effect of these processes on the fatigue behavior of a solution treated Inconel 718 superalloy was investigated. Experimental results showed that application of these coating methods significantly reduced fatigue strength of Inconel 718. Considering the fact that fatigue cracks mostly start from the surface, it was concluded that the reduced fatigue properties were arisen from the brittle nature of the phases at the surface after the application of HDA and DA processes.

KEYWORDS - Aluminizing, Diffusion Annealing, Fatigue, Inconel 718.

THE ATOMIC FORCE MICROSCOPY STUDY OF AMORPHOUS BISBTE THIN FILM WITH THE VARIOUS DEPOSITION PRESSURE

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ABSTRACT

Designing and engineering thin films with the unique morphologies tailored to essential criteria for a number of particular applications has long been crucial. The implication from this is the surface microstructure of the materials is anticipated to be particularly significant for electron scattering in the electrical and thermal components and, consequently, for thermoelectric applications. The thermoelectric BiSbTe thin film is deposited on Si(100) substrates by the magnetron sputtering method with various deposition pressure circumstances to unsure the different atomic composition of thin films. X-ray diffraction XRD), Scanning electron microscopy (SEM), and Atomic force microscopy (AFM) measurements were used to characterize the film's structural properties in order to control its growth performance. Moreover, other specific goal of the study is to demonstrate the measurements made from amorphous crystalline using AFM, which enables the calculation of the RMS roughness, the most common parameter used to characterize the morphology of surfaces. ACKNOWLEDGMENT This work was supported by the Scientific and Technological Research Council of Turkey (TUBITAK) with project number 221M470.

KEYWORDS - BiSbTe ,AFM,Energy harvesting ,Thin film,Amorphous

POWDER METALLURGICAL SYNTHESIS AND CHARACTERIZATION OF FE AL SI ALLOYS

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ABSTRACT

The interest in iron-based alloys is increasing due to their properties such as excellent corrosion properties in oxidizing and sulfidizing environment, high-temperature oxidation resistance and wear resistance [1–3]. Since the alloying elements such Cr, Ni and Nb are critical raw materials, the Fe-Al-Si alloys are one of the most suitable alloys to replace Cr and Ni-containing alloys with their properties. In this study, Fe- (5, 10 wt %) Al - (5, 10 wt %) Si alloys were synthesized via powder metallurgy method which includes subsequent events of high-energy ball milling, cold pressing under 600 MPa and sintering 900 and 1100 oC at varying durations. The effect of sintering temperature and duration were investigated as well as amount of Al and Si in the Fe matrix. Microstructural characterization and phase analyses of the prepared composite powders and bulk samples were carried out by X-Ray diffraction (XRD) and scanning electron microscopy (SEM)/energy dispersive spectroscopy (EDS) techniques. Archimedes Density Method were applied to the bulk samples to calculate the densification rates. Microhardness tests of sintered composites were measured via a microhardness tester by applying 100 g load for 15 s. Wear properties of Fe-Al-Si alloys were investigated via reciprocating wear test at room temperature.

KEYWORDS - Intermetalli alloys,mechanical alloying,Iron-based alloys

METHOD AND CHARACTERIZATION OF BIO PREPERATIVES MADE FROM ORGANIC STRUCTURES WITH MACERATION AND DIGESTION EXTRACTION MODELS IN NANO SIZE

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ABSTRACT

In this nano-size particle recovery process, nanoband (0-100 nm) recovery and characterization of "Red California Worm" (E. foetida) vermicompost, which is gaining popularity in our country in the field of advanced materials, was investigated. Samples taken from Konya region were created under optimum conditions in laboratory conditions and a flow chart was developed and the dimensions of the final products were measured to compare with the product to be obtained in the next flow steps. In this method; It was applied in the bioreactor in the pilot plant, which was designed with a high rpm mixer with cavity formation and venturi logic, and the samples obtained for the characterization study, especially the nano dimensions, were tested. In the bioreactor designed with the data at hand, the organic structure of the vermicompost was analyzed without deteriorating the samples and Zeta-Sizer nano size analyzes were made for the nano band, and particles in the band range of 0-100 nanometers were obtained. As a result of the method applied for the characterization, it was predicted that it complies with the regulations and limitations of the relevant ministry and is in a form that can be licensed as a bioorganic nano fertilizer. Although the content values are at a usable level for plant nutrition, it has been observed by the analyzes; It has also been determined that the nanoscale size differences between the dimensions of the sample in the laboratory environment and the samples recovered from the bioreactor are distinguishable. As a result; This is an original and original study, which reveals the first organic-based advanced functional and pure bionano product on the E. foetida vermicompost, which is both organic in terms of the literature, both in terms of content and on obtaining an organic material in nano size.

KEYWORDS - Advanced Material, Biyonano, Eisenia Foetida, Nano-Bioorganopolymer, Zeta-Sizer

INVESTIGATION OF STIRRING SPEED ON FLOTATION FOR ENRICHMENT OF POLYAK EYNEZ LIGNITE COAL

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ABSTRACT

ABSTRACT An increase in the amount of very fine coal has been observed with the application of mechanized excavation methods in coal mining. Technical difficulties are encountered in cleaning these carbons. For this reason, it is important to determine technically appropriate methods for cleaning very fine sized coals. The modern production methods applied in the coal industry in recent years are continuously increasing the amount of very fine coal. Much of this fine-sized coal was discarded and remained an idle investment that could not be incorporated into the economy. Today, with the rising costs of mining, the supply of these fine-sized coals has become necessary both economically and environmentally. Coal with a very fine grain size is difficult to recover by conventional beneficiation methods. Fine separation accuracy and low efficiency have limited the use of conventional methods. Instead of these, enrichment agglomeration or flotation methods can be used depending on differences in physicochemical properties. Flotation is a widely used method for the enrichment of fine coals. In coal flotation, it is sufficient that the size of the coal particles is less than 0.5 mm. In this method, the separation is performed according to the difference between the surface hydrophobicities of coal and gangue minerals. Flotation is the most widely used method of removing ash from coal. In this context, studies have been carried out to determine the optimal parameters in the flotation study in order to reduce the ash content of the powder material and obtain higher quality powdered coal at Polyak Eynez Energy Generation and Mining. The effect of stirrer speed was investigated by testing various speed values between 900 rpm and 1700 rpm. The speed of the mixer ensures that the sample and pure water are mixed and homogenized. It is used to separate carbon and debris samples by penetrating the mixture of foam chemicals added during the flotation process and the homogenized pure water sample in the collector. Mixing speed is important so that the added chemicals penetrate the mix very well. When the mixing speed is low, the separation efficiency decreases since the chemicals and the sample do not mix well. When the mixing speed is too high, turbulence occurs and the chemicals that stick to the surface of the coal and cause decomposition break off from the surface of the coal and this time the decomposition efficiency decreases.

KEYWORDS - Coal Flotation

LEVULINIC ACID PRODUCTION BY CATALYTIC DECOMPOSITION OF FRUCTOSE GLUCOSE AND CELLULOSE

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ABSTRACT

Levulinic acid (LA) is a platform chemical and may be used as a raw material in various types of chemical industrial processes with end products such as biofuels, resins, solvents, pharmaceuticals, etc. LA was first manufactured by heating fructose with hydrochloric acid. HMF is the most important intermediate product in biomass hydrolysis and the formation of levulinic acid. In the context of the study, representative monosaccharide molecules of fructose and glucose with the same chemical formula (C6H12O6) were selected to identify the difference in the mechanism of decomposition of biomass in a hydrothermal medium based on the structural features. Fructose differs from glucose in the functional groups they have and their position in the molecular structure. This variation was investigated with the product yields and amounts obtained with fructose and glucose decomposition into LA. From this point of view, the decomposition characteristics of cellulose and cellulosic biomass will be enlightened. Experiments are done in batch autoclave reactor system with PID temperature controller. The objective of the study is to obtain maximum LA yields and to investigate the effect of temperature (120, 140, 160, and 180° C), reaction time (20, 30, 40, 60 min), pH levels of an aqueous hydrochloric acid catalyst (0.5, 1.0, 1.5). The analysis of the aqueous product is done by an HPLC instrument. Remarkably fructose gives a higher yield (47%) than glucose (22%) and cellulose (20%). The most appropriate conditions are obtained as 30 min of reaction time, 140°C of reaction temperature, and pH of the catalyst as 0.5, with 47 % of LA yield. For comparison, an additional experiment is done with a microwave reactor under these reaction conditions. Due to the more easily controllable heating and cooling feature, the short reaction time of the microwave reactor minimized the formation of the side products and gives a higher yield of LA, that is % 53.

KEYWORDS - Hydrothermal decomposition, Biomass, Levulinic acid, fructose

DEVELOPMENT AND CHARACTERIZATION OF DUAL ACTIVE MATERIAL CATHODES FOR SECONDARY LITHIUM ION BATTERIES

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ABSTRACT

The biggest obstacle to the widespread use of electric vehicles is the lack of suitable battery technology, and the inability to obtain required energy density, power density and safety with the layered oxides, phospho-olivines and spinels, which are mainly used as cathode materials in lithium-ion batteries. For this reason, numerous studies are carried out to improve the performance of each of these three main cathode active material groups by techniques such as nano-configuration, doping and surface modification. At the cathode scale, one of the relatively new strategies for performance improvement is to physically blend two or more materials from different groups to produce superior electrodes that balance the advantages of each material group. By blending, the deficiencies of the base materials can be minimized and the resulting blend can be adjusted to have a higher energy or power density with greater stability at lower cost. In this study, we present the results of electrochemical measurements taken CR2032 coin cells with composite cathodes that are produced by blending layered oxide (Li[Ni0.5Mn0.3Co0.2]O2) and phospho-olivine (LiFePO4) active materials.

KEYWORDS - Li-ion battery, blended cathode, electrochemistry

SIMULATION OF MICROSTRUCTURE EVOLUTION DURING DESTABILIZATION AND TEMPERING HEAT TREATMENTS OF WHITE CAST IRONS

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ABSTRACT

High chromium cast irons show unique wear resistance performance due to the hard carbide phases within their microstructure. The quantity, type, size, shape and distribution of these carbides are subject to changes during solidification and subsequent heat treatments. Therefore, to tailor the mechanical response of the material it is important to predict and control the evolution of these microstructural features during processing. In this study, we present the results of non-equilibrium solidification and precipitation calculations for white iron alloys that enables investigation of the microstructure evolution during heat treatment processes.

KEYWORDS - High chromium white cast iron; microstructure; solidification simulation; destabilization; tempering; heat treatment simulation; precipitation kinetics; MatCalc; alloy design

DETERMINATION OF HANSEN SOLUBILITY PARAMETERS OF SINGLE WALL CARBON NANOTUBES FOR COATING SYSTEMS

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ABSTRACT

Carbon nanotubes (CNTs) are one of the most promising carbonic materials due to their unique properties like flexibility, chemical stability, etc. [1, 2]. Especially electrical and thermal conductivity of CNTs makes them very attractive in the automotive industry. Apart from all these advantages, the solubility of CNTs is very problematic for common solvents which makes CNTs difficult to use in applications[3]. CNT addition to any automotive coating system is an attractive topic in terms of enhancing the electrical conductivity of the coating. However, the solubility parameters of the CNTs and coating materials should be investigated in detail to obtain the best performances. In other cases, undesired results like agglomerations, hot spots, or variations in the electrical conductivities could be observed. In this study, the HSPiP program was employed to predict the HSP of CNTs by using up to 20 solvents to be able to predict the most appropriate solvent and system. Predicted Hansen Solubility Parameters (HSP) help us to find the best appropriate solvent/system by predicting dispersion (dD), polar (dP), and hydrogen bonding (dH) contributions of CNTs. The importance of the solubility properties of CNTs in an Acrylic/Polyester Polyol system was investigated by roughness and sheet resistance measurements. Thanks to this study, time-consuming and expensive experiment sets are not required to find the best suitable solvent system.

KEYWORDS - Carbon nanotubes,Hansen Solubility Parameters,coating

CURE KINETICS STUDIES OF POLYURETHANE BY DIFFERENTIAL SCANNING CALORIMETRY

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ABSTRACT

Polyurethane is in the class of widely used thermoset polymers especially in the automotive industry because of its various applications in different forms like foams, elastomers, and, coatings [1]. These mechanical and rheological properties of polyurethane strongly depend on the rate and the extent of polyurethane formation [2]. That is the reason, specifying the parameters of the curing kinetics is essential to understand the impact of the structure and properties of polyurethane. It is possible to monitor the formation rate by quantitative measurement of NCO concentration from FTIR measurements[3]. However, FTIR analysis works better for isothermal and slow reaction conditions[4]. Thermoanalytical techniques like Differential Scanning Calorimetry (DSC) are one of the best methods to explain the reaction process. Kinetic and thermodynamic information could be obtained by constant heating rates, and molar enthalpy could be determined for kinetic parameters. In this study, the curing kinetics of the polyurethane system which is widely used in the automotive industry was investigated by DSC analysis. The degree of curing was calculated by optimizing the curing parameters and DSC parameters. Scanning of thermograms from -20oC to 400oC at constant heating rates and the effect of heating rates in terms of curing temperature and enthalpy was investigated. Additionally, the optimization of the PU system was studied in terms of curing temperature and time. This study would help us to understand the optimized curing conditions for the PU systems which are essential, especially in the automotive industry.

KEYWORDS - Polyurethane,Cure Kinetics,Differential Scanning Calorimetry

PRELIMINARY INVESTIGATION ON THE SYNTHESIS OF HEXABORON MONOXIDE

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ABSTRACT

The potential of non-oxide ceramics, including carbides, nitrides, and borides, has long been recognized, owing to their superior properties such as high hardness, high temperature resistance, and chemical inertness. Character of the chemical bonding that results in high melting temperature does not always favor the sintering process, where densification is quite challenging. Hexaboron monoxide (B6O) is a boron-rich compound known for its outstanding hardness and lightweight. B6O is considered a promising alternative to boron carbide in terms of hardness but also better fracture toughness. Therefore, it is a potential candidate for ceramic armors in the defense industry. Also, it can be utilized in cutting, grinding and drilling as wear-resistant coatings. While the hardest materials known, diamond and cubic boron nitride, are obtained under high pressure synthesis conditions, boron suboxide can be successfully synthesized at ambient pressure. In this study, through mixing elemental boron and amorphous B2O3, the synthesis of B6O was conducted in the 1200-1350°C range for 2-6 hours under argon atmosphere. B6O in a star-like structure was synthesized at a temperature of 1300 °C and a holding time of 4 hours.

KEYWORDS - superhard materials, synthesis,hexaboron monoxide

INVESTIGATION OF PHOTOCATALYTIC EFFECT IN TABLEWARE GLAZES

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ABSTRACT

Microorganisms such as mold and fungus can adhere to the surface of tableware products and threaten human health. By imparting photocatalytic properties for these surfaces, microorganisms can be self-destructed by the influence of solar-light. For this purpose, it is aimed to study on ensuring the anti-microbial properties to the surface of ceramic and porcelain tableware. Hence, nano particle size and anatase phase of TiO2 was selected as starting powder. 1% TiO2 by weight was added into the glaze recipe and the surface properties were examined. Microstructural characterization of TiO2 added glazes were investigated by scanning electron microscope (SEM) and analyzes. The phase analyses were accomplished by using X-Ray diffractometer. The surface properties, transparency, morphology and the effect of TiO2 addition were evaluated by comparing the traditional tableware glazes.

KEYWORDS - Tableware, Photocatalytic, Antimicrobial, TiO2, Glaze

CHARACTERIZATION OF BORIC ACID DOPED NI FE THIN FILMS GROWN BY ELECTROCHEMICAL DEPOSITION METHOD

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ABSTRACT

In this study, Ni-Fe alloy thin films were obtained by electrochemical deposition method on Indium tin oxide (ITO) with the addition of 0.06 and 0.10 M boric acid (H3BO3). The effects of boric acid on the structural and morphological properties, chemical composition and optical properties of these films were investigated. For this, firstly, the structural changes of the films were examined and the contribution of these changes to the film was determined. Various structural parameters for thin films with different contents of boric acid at room temperature were calculated using appropriate methods and formulas. The surface morphologies of the electrodeposited Ni–Fe/ITO thin films imaged through the SEM measurements and the films exhibit an uniform surface structure consisting of nodular particles. Chemical composition of the films was analyzed with energy dispersive X-ray. From the basic absorption spectra of the obtained Ni-Fe:B films at room temperature, it was determined that the Ni-Fe:B semiconductor films have a direct band transition. It has been seen that the optical band gap values determined with the help of graphs are in harmony with the value in the literature. The dispersion parameters i.e. extinction coefficient and refractive index are calculated in the wavelength range (350–1000 nm). Other parameters; such as real and imaginary parts of dielectric constants, dissipation factor, volume and surface energy loss functions have also been determined.

KEYWORDS - Electrodeposited Ni–Fe/ITO thin films, Boric acid content, optical and dispersion parameters, structural and morphological properties

THE EFFECTS OF HARD WASTE ON YARN QUALITY

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ABSTRACT

Recovery of textile solid waste materials by recycling methods provides economic, environmental and social advantages such as energy saving, protection of natural resources, and reduction of environmental pollution. During cotton yarn production, wastes such as licker-in waste, flat waste, sliver waste, sliver pneumafil waste, combed noil, roving pneumafil waste, roving waste, ring pneumafil waste, and hard waste arise in the yarn preparation and spinning part. -In this study aims to reveal the effects of hard waste on yarn quality and performance in compact yarns obtained by blending cotton waste. The study results show that waste content in blended yarns with hard waste negatively affects yarn quality of which evenness, imperfection, hairiness etc., and reduce yarn performance in terms of tensile properties.

KEYWORDS - Hard waste, combed compact yarn, cotton, yarn properties, blend yarn.

INVESTIGATION ON KINETICS AND THERMODYNAMICS OF POLY METHYL METHACRYLATE PMMA DEGRADATION BY ARTIFICIAL NEURAL NETWORK MODELING

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ABSTRACT

Modeling thermal degradation of polymers involves uncertainties because of the complex reaction mechanisms that result in uncontrollable process dynamics. The objective of this study is to understand the thermal degradation behavior of poly(methyl methacrylate)-PMMA and to estimate the kinetic and thermodynamic parameters of the process. For this purpose, an artificial neural network (ANN) model was developed to predict the thermograms with fewer experiments based on the thermogravimetric analysis data obtained at different heating rates (from 5 to 40 °C) under a controlled N2 atmosphere. As a result, the findings showed an excellent agreement between the experimental and predicted thermogravimetry values. The appropriateness of the kinetic mechanism was also confirmed by the compensation effect. Consequently, the model's experimental validation showed that ANN had superior prediction abilities of kinetics and thermodynamics for subsequent design and modeling of the pyrolysis systems on larger scales.

KEYWORDS - ANN,poly(methyl methacrylate),thermogravimetric analysis

STIFFNESS IN THE KNITTED FABRICS WITH VORTEX YARNS

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ABSTRACT

Fabric stiffness is the resistance to bending and determines the touch of the fabric. Vortex knitted fabrics have less dimensional changes and stiffness values after washing compared to knitted fabrics with ring yarns. In the study, it is aimed to reveal the effects of fiber type, yarn, and fabric properties on the stiffness of single jersey fabrics knitted from pure and blended vortex yarns with different raw materials. The study results show that only effective factor on stiffness of knitted fabrics is yarn loop length (lfa), and fabric stiffness decreases with increasing loop length.

KEYWORDS - Fabric stiffness, vortex yarn, loop length, fiber type, yarn-fabric properties.

WEAR RATE PREDICTION OF TI 6AL 4V ALLOY USING ARTIFICIAL NEURAL NETWORK

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ABSTRACT

The Ti6Al4V alloy is a high-strength, low-density titanium alloy with high fracture toughness, outstanding corrosion resistance, and excellent biocompatibility. Ti6Al4V, often regarded as the most well-preferred titanium alloy, accounts for over half of all titanium goods used today. This super biocompatible, lightweight yet durable alloy reduces weight in loaded constructions, making it ideal for human bodies, especially as bone material. The bone material must be resistant to abrasion. Because bones, which are the most interacting structures in the body, are subject to wear when exposed to excessive friction. In prosthetic bone applications, there may be wear and even fractures in the bones over time. For this reason, when developing bone material, the wear properties of the material should be checked. There are many studies on the wear of Ti-6Al-4V alloy in the literature. In this study, some variables that affect the wear rate are analyzed using tribology data from studies in the literature. The constants in the study are Ti-6Al-4V as alloy, pin on disk for wear test, and hardened steel as counter part. All data are from experiments conducted under dry conditions. Machine learning algorithms (ML) can provide a better understanding of how tribological and material properties are related. An ML algorithm, Artificial Neural Network (ANN), is presented in this study to predict wear rate using hardness, load, and sliding distance data.

KEYWORDS - Ti6Al4V ,Wear Rate,Machine Learning,Artificial Neural Network

INFLUENCE OF ALUMINUM OXIDE ON MAIN ELECTRICAL RESISTIVITY FEATURES OF BI 2212 CERAMIC COMPOUNDS

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ABSTRACT

In the present study, the variation of the basic dc electrical resistivity behaviors including conductivity property, resistivity at the room temperature state of 300 K, residual resistivity ratios (RRR), residual resistivity (ρres), resistivity at 90 K temperature, and the deduction parameters of ρnorm and Δρ were determined as a function of the different aluminum oxide (Al2O3) mole-to-mole ratios between 0.0 and 0.10 of ceramic cuprate layered Bi2.1Sr2.0Ca1.1Cu2.0Oy (Bi-2212) perovskite materials. The Al2O3 added ceramic materials searched were prepared at 840 °C annealing temperature for 24 h duration considering the standard solid-state reaction technique. The changes of dc electrical resistivity parameter against the environmental temperatures were performed in the temperature range of 30 K to 105 K. Besides, the differentiation of ρres quantity with the additional mechanism was semi-empirically examined by Matthiessen's rule ρ(T)=ρ i (T)+ρ res. The experimental and theoretical approach results indicated that the fundamental dc electrical behaviors depend sensitively on the addition level of aluminum oxide impurity. In this context, the increment in the aluminum oxide impurity atoms in the bulk ceramic system caused a dramatical decrement in the fundamental electrical resistivity proprieties. This was because the presence of Al2O3 materials in the main matrix triggers the formation of permanent basic crystal structure problems such as internal omnipresent flaws, stress raisers, microscopic structural faults, partial melting, grain misorientations, structural inhomogeneity, porosity, distortions, defects, crystallinity quality problems, lattice strains, impurity residues, main grain boundary coupling problems and weak-connectivity problems between grains. All in all, the addition idea of Al2O3 materials in the Bi-2212 crystal system was ploughed for the improvement of general electrical resistivity nature. Correspondingly, the un-added bulk Bi-2212 ceramic compound presented the highest electrical conductivity quantities while the maximum Al2O3 impurity added Bi-2212 sample obtains the minimum electrical conductivity features due to the serious increase in the fundamental problems in the crystal structure.

KEYWORDS - Bi-2212 ceramics,Al2O3 impurity,Electrical resistivities,Basic crystal structure problems.

FABRICATION AND CHARACTERIZATION OF ANODIC FILMS ON 304 STAINLESS STEEL

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ABSTRACT

The anodization technique provides a layer with a porous structure formed by different oxide phases on the 304 stainless steel. Anodic films are created with direct current anodization on 304 stainless steel. As an electrolyte, ethylene glycol solution with different compositions of NH4F and H2O is used at different temperatures. Depending on the electrolyte composition, the formed films become yellow, green, or grayish. The calcination process was carried out in a tube furnace at 500 °C for 2 hours. Current time graphs were examined. The formation of a porous structure was caused by the oxide layer formed as a result of ion movement. Considering the XRD and morphology results, Fe2O3 and FeCrO3 phases were observed more intensely in the anodic film at lower temperatures. Compared to the structure without Fe2O3 and FeCrO3 phases, more crack formation was observed in this structure formed at low temperatures. Anodic layers are also characterized electrochemically to get information about the corrosion characteristics of anodized 304-type stainless steel. Anodized samples show less corrosion resistance than non-anodized samples.

KEYWORDS - anodization, stainless steel, glycerol, NH4F

SYNTHESIS PROPERTIES AND APPLICATIONS OF SILICA AEROGELS A REVIEW

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ABSTRACT

Porous materials can be divided into several groups concerning their properties like pore type (open or closed), pore distribution (uniform or non-uniform), and pore dimension (microporous, mesoporous, or macroporous). Today, zeolite, active carbon, silica aerogel, metal organic frameworks (MOFs), and Porous organic Frameworks (POFs) are among the most studied porous materials. Aerogels are light porous materials that are synthesized by removing air in the porous networks of the gel. They can be organic, inorganic, or carbon-based materials. Resorcinol-formaldehyde (RF), and melamine formaldehyde (MF) are the precursors of organic aerogels. Carbon-based aerogels are synthesized by pyrolysis of organic aerogels. Inorganic aerogels can be produced with metal alkoxide precursors. The most eminent member of the inorganic aerogel family is the silica aerogel [1]. The synthesis procedure of silica aerogel is carried out in three steps: gel formation with a sol-gel process, aging of the gel, and drying of the gel. Drying of the gel can be made by using lyophilization, atmospheric pressure, or supercritical conditions. There are important properties of a silica aerogel like low density, high surface area, high porosity, changeable surface chemistry, and morphology. So, the application area of silica aerogel is wide. It can be used as a thermal insulator in space and construction sectors, a catalyst, in biomedical and pharmaceutical areas, in adsorption and environmental remediation, and energy storage device [2]. Silica aerogels can be used as drug support [3]. They have low thermal conductivity [4]. In environmental remediation, silica aerogels are used in volatile organic carbon (VOC) and carbon dioxide removal from the air. Besides that, they can be used in heavy metal and oil removal from water [2].

KEYWORDS - silica aerogel, sol-gel,drug release,thermal isolation,catalysis,adsorption,environmental remediation,microporous and mesoporous materials,nanomaterial synthesis and characterization

ELECTROCHEMICAL STORAGE BEHAVIOUR OF PTBA AS ELECTROACTIVE MATERIAL FOR FLOW BATTERIES

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ABSTRACT

Global energy demand is continuously increasing with population growth and the development of new electrical devices. So, the need for energy storage systems is growing, and academia and industry agree that it is a top priority. Redox flow batteries (RFB) are one of the newest and most exciting technologies of these energy storage systems. Vanadium RFBs (VRFB) are the most popular among the RFB types. However, since vanadium metal is a toxic and expensive material, organics, which stand out as alternative materials, are cheap and safe, besides having numerous derivatives. Organic RFBs (ORFBs) are prepared with water-soluble electroactive materials that have high electrical conductivity and kinetics. This is considered as the most important aspect of studies on ORFBs. In this study, polythiophene boronic acid (PTBA), which is water-soluble and electrically conductive polymer, was investigated as an electroactive material. Reduction-oxidation characteristics were studied by cyclic voltammetry tests. In 3-electrode cells, the glassy carbon electrode as the working electrode, the platinum electrode as the counter electrode, and the Ag/AgCl electrode as the auxiliary electrode were used. PTBA was dissolved in a 1 M NH4Cl solution. According to the preliminary works, the half-wave potential is near to 0.4 V.

KEYWORDS - PTBA, cyclic voltammetry, 3-electrode cells, flow batteries

MICROSTRUCTURE AND MECHANICAL PROPERTIES OF FUNCTIONALLY GRADED FLG REINFORCED AL 6ZN BY POWDER METALLURGY

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ABSTRACT

Functionally Graded Materials (FGMs) are novel advanced engineering materials with superior properties which have some advantages such as combining different materials and providing a high-strength interface between incompatible materials compared to conventional composite materials. Powder metallurgy (P/M) is the most appropriate method due to its controllable, uniform design, lower cost, and higher productivity in FGMs. Aluminium (Al) alloys are widely preferred in some potential fields kind as aerospace, automobile, defence, and energy because of their properties such as low density, high specific strength, and good ductility. Graphene can be an ideal reinforcement for its good mechanical, electrical, and thermal properties in FGMs. In the current study, few-layered graphene (FLG) that was produced by the electric arc discharge (EAD) method was added to the Al-6Zn alloy matrix powders using various weight fractions of 0, 0.1; 0.2; 0.3; 0.5, and 0.7 by mechanical alloying. The FGM with six layers which have stacked considering the FLG content was formed by using a uniaxial press at 450 MPa and they were sintered at 590 °C for 3 h under Argon (Ar) atmosphere. The FLG provides a barrier in the Al-6Zn matrix with increasing FLG content through the layers. The FLG with wrinkled surface morphology leads to a good bonding in the matrix structure. According to the optical images, as the content of the FLG increased from 0 wt% to 0.7 wt% across the layers, the FLG resulted in a decrease in grain size with a flattened appearance. As the FLG content increased through the layers, an increase in hardness (HV) of approximately 69% was achieved from the first layer to the last layer.

KEYWORDS - Aluminum Alloy, Arc Discharge, Functionally Graded Materials, Graphene, Powder Metallurgy

EFFECT OF ALUMINUM OXIDE ON MAIN SUPERCONDUCTING FEATURES OF BI2 1SR2 0CA1 1CU2 0OY CERAMICS

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ABSTRACT

This study was sensitively interested in the determination of the influence of aluminum oxide (Al2O3) impurity within the different molar addition amounts (0.0 ≤x≤ 0.10) on the fundamental superconducting topographies of bulk Bi2.1Sr2.0Ca1.1Cu2.0OyAlx (Bi-2212-Al) superconducting ceramic compounds by means of the variations of dc electrical resistivity parameters over the environmental temperatures between 20 K and 105 K. The pure and Al2O3 added Bi-2212 superconducting chemical samples are produced using the standard solid phase reaction technique at the constant sintering temperature of 840 °C for the period of 24 h. the experimental curves measured enable us to find the change in the offset and offset critical transition temperatures (Tc offset and Tc onset) and degree of broadening (ΔTc =Tconset - Tc onset) properties of Bi-2212 superconductors with the Al2O3 impurity addition. It was evaluated that all the main superconducting features mentioned above were obtained to depend dramatically on the impurity addition amount. It was determined that, the presence of Al2O3 impurity damages seriously the ΔTc, Tconset , and Tc onset quantities as a result of degradation in the hole mover concentrations (P) per Cu ions in the Cu-O2 layer x2 − y2 bands in the Bi-2212 crystal nature. Similarly, the increase in the impurity level is noted to trigger destruction in the overlapping of Cu-3d and O-2p wave functions, formation of super-electrons, cooper-pair coupling probabilities in the strongly covalently bonded Cu-O2 layers, amplitude of pair wave function, equalities in the oxidation states, and hole trap energy values in the superconducting paths. Besides, the presence of impurity atoms in the Bi-2212 crystal system was found to worsen harshly the effective electronic state densities at Fermi energy level. Moreover, the decrease in the Tc onset, Tc offset and ΔTc parameters was determined to stem from the reduction of metallic connections depending on the increase of basic crystal structure problems including stress raisers, microscopic structural faults, internal omnipresent flaws/defects/distortions/porosity, weak-interaction problems between the superconducting grain, and grain borderline coupling diffuculties in the Bi-2212 crystal system. We also determined the numerical values of Tc onset, Tc offset and ΔTc and P parameters for the pure and Al2O3 added Bi-2212 superconducting solid compounds in the paper.

KEYWORDS - Bi2.1Sr2.0Ca1.1Cu2.0Oy system ,Al2O3 impurity,P,Tc onset,Tc offset ,ΔTc

AN APPROACH BASED ON MINIMIZING ERROR CRITERIA FOR TRAJECTORY TRACKING OF A SCARA ROBOT MANIPULATOR

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ABSTRACT

SCARA Robot manipulators are widely used in the manufacturing industry as part of automation systems. Typical applications of robots include welding, painting, assembly, picking, and placing. On the other hand, PID controllers have long been used in these industrial processes, and tuning PID coefficients is a challenge to enhancing working performance. This study aims to realize trajectory tracking of a SCARA robot by the PID coefficients that are optimized in the Matlab/Response Optimization Toolbox which includes many different algorithms. A cost function is used to minimize universal performance evaluation criteria such as Integral Absolute Error (IAE), Integral Time Square Error (ITSE), Integral Time Absolute Error (ITAE), and Integral Square Error (ISE) for improving controller performance considering the controllability and stability of the manipulator. Moreover, a comparison is handled between the values obtained by using performance evaluation criteria.

KEYWORDS - Optimization, PID controller, Performance evaluation criteria, Robot manipulator,SCARA

WELDING ROBOT DESIGN WITH MACHINE LEARNING BASED INTELLIGENT VISION SYSTEM

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ABSTRACT

In manufacturing sectors, the use of welding continues from past to present. Welding is frequently used in many areas such as the aviation industry, the production of ship parts or the furniture industry serving daily use. Today, one of the main reasons for the increase in production and production speed is the use of various sensors and the design of artificial intelligence supported systems. Thus, artificial intelligence supported welding robots have emerged and better quality welding processes have been directed. In addition to the development of autonomous welding robots, the process of teaching the welding trajectory to the robots by the operators still continues. This situation increases the processing load and requires re-doing the transactions according to the welding trajectory. With the concept robotic system to be designed within the scope of this study, it is planned to use artificial intelligence supported and autonomously determining the welding trajectory, following the welding trajectory, performing the welding process and using it with high efficiency in the robotic welding field.

KEYWORDS - Robotic welding, artificial intelligence, machine learning, deep learning, welding robot design

ANTI SWAY CONTROL OF A GANTRY CRANE SYSTEM USING GENETIC ALGORITHM TUNED MODEL PREDICTIVE CONTROLLER

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ABSTRACT

Anti-sway control of the gantry cranes is important in industrial applications (1) to be able to have an environment which follows the job health security issues, (2) to create opportunities to increase the positioning accuracies for the load carrying tasks and (3) to provide contributions to create fully autonomous cranes in the near future. In this study, Genetic Algorithm (GA) based Model Predictive Control (MPC) is designed in order to control position and sway of an overhead gantry crane system. A general linearized gantry crane mathematical model, which is presented in state-space form, is generated by the use of Lagrange formulation. A soft sensor is developed by following the principles of soft sensor approach and it is validated via using the data obtained from a real sensorial system. A 3D simulation environment and an experimental system are built. Performance of the proposed MPC structure whose parameters are optimized by GA method is tested by the use of simulation environment and the experimental setup. To make a comparison and demonstrate the enhancement of the system proposed, simulation and experimental studies are also conducted using proportional-integral-derivative (PID) and Linear Quadratic Requlator (LQR) control strategies. The mathematical background of the system developed, simulation environment created, the mechatronics experimental setup built and the simulation-experimental studies performed and the comparisons are presented in detail in this paper.

KEYWORDS - Gantry crane, MPC, genetic algorithm, control, sway

MODELING OF DYNAMIC TESTING OF STEERING SYSTEM TIE ROD ASSEMBLY USING HYDRAULIC SYSTEM

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ABSTRACT

Steering system components transmit motion from the steering wheel to the wheels. Vehicle rotations consist of moving parts made up of ball joints. Ball joints operate at specific angles and torques. These parts are exposed to forces from the road and the vehicle during operation. Articulated parts must be tested dynamically. The backlash and torque values measured before the test must remain within the appropriate limits after the applied life test. In this study, life tests were carried out for the rod systems produced by installing a hydraulic test setup. The power of the installed hydraulic system is determined as 30 kN. Tie rod end and axial joint piece tested at the same time. The tie rod end and the axial joint were connected to each other and tested in the test setup. Purpose Before and after the test, it is to determine how many millimeters of movement in the body and what the torque change is for the articulated parts in both parts. Before the test, the breaking torque of the tie rod end was 7.75 nm and the operating torque was 3.12 nm. Tie rod end clearance was measured between 0.007 millimeters in the axial positive direction and -0.006 millimeters in the negative direction in the static test. The breaking torque of the pretest axial joint was 11 nm and the operating torque was 4 nm. In addition, the gap value was determined as 0.039 millimeters in the positive direction and -0.071 millimeters in the negative direction. In the fatigue test, the change in torque and clearance values for both parts remained below 10 percent at a frequency of 5 Hz and at the end of one million cycles, and the accuracy of the production parameters was ensured.The control of the hydraulic test system was checked with the Labview program and reporting was made after the test. In the study, the rod parts working on the vehicle were simulated successfully.

KEYWORDS - Dynamic, Hydraulic, Test, Tie rod, Labview

GEOMETRIC MEASUREMENT SYSTEM FOR ENGINE VALVE PARTS VIA MACHINE VISION

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ABSTRACT

Today, machine vision systems are widely used in the mass production factories. The present work focuses on measurement of critical valve sizes using image processing techniques. For this, a experimental setup has been prepared to hold digital camera in a fixed plane to capture the images of valve. This work has been done for measurement of valve stem diameter, head diameter and overall length. The images are captured by using high resolution digital camera which are fixed in the experimental setup. OpenCV programming function was utilized in Python scripting language to perform image processing. High resolution captured images of valve are processed a sequential operations which are correcting defective images caused by working environment. Developed image processing algorithms are applied to measurement of valve sizes. The acquiring results are compared with the results obtained by conventional systems. Dimension Control system decrease faulty production and minimize the unnecessary consumption of raw materials. Experimental results show that the system can quickly measure the dimension of valve parts within the allowable range of error.

KEYWORDS - Image Processing, Quality Control, Measurement

THE CHARACTERIZATION OF ELECTROSPUN PANI PEO NANOFIBERS AT DIFFERENT ELECTROSPINNING CONDITIONS AT ROOM TEMPERATURE

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ABSTRACT

Nanofiber structures have wide usage area thanks to their excellent properties from sensor technologies to biomedical systems, tissue engineering, drug delivery systems. Electrospinning method is a versatile method that can produce very fine nanofibers with a simple production mechanism. On the other hand, it is important to optimize the fabrication parameters in order to obtain the appropriate nanofiber structure. In this study, PANI/PEO (Polyaniline/Polyethylene oxide) electrospun nanofibers are fabricated under ambient conditions and the effects of solution viscosity and collector rotation speed on fiber structure are discussed. Electrospun PANI/PEO nanofibers structures are investigated by Scanning electron microscope (SEM). According to the SEM results, it is seen that the high viscosity nanofibers have straight and rigid structures. However, the low viscosity nanofiber structures break down at each collector speed, but the fiber orientations increase as the collector rotation speed increases. It is estimated that this study will be guide for future work on PANI.

KEYWORDS - PANI,nanofiber,electrospining,viscosity

AN INVESTIGATION ON THE USE OF MULTI ROTOR UAVS IN MEASURING RADIATION AROUND NUCLEAR FACILITIES

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ABSTRACT

The importance of the use of unmanned aerial vehicles (UAVs) in places that are dangerous for humans or difficult to reach is increasing day by day. Undoubtedly, one of the most important of these dangerous places are those near nuclear facilities where nuclear radiation can occur. In such places, although the measurement of the radiation level is usually done by placing the radiation sensors in fixed positions, the use of UAV is gaining importance especially in order to make these measurements in continuously variable positions. Unlike fixed-wing drones, rotary-wing drones allow for easier and more reliable measurement of radioactive leaks due to their ability to hover. In other words, since rotary-wing UAVs can be positioned more precisely due to the flight principle, they are more suitable for the precise determination of the place where nuclear radiation is emitted. In this study, a rotary wing UAV system that can measure the nuclear radiation dose with the sensor on it by making autonomous flight in an orbit determined around the nuclear facility has been proposed. If two different doses of radiation are detected during this autonomous flight, the UAV starts a new autonomous flight mission from the point where the detected nuclear radiation dose is measured low to the point where the dose is measured high. The UAV continues its autonomous flight until the point where the nuclear radiation dose is highest is determined. The coordinate information of this determined point is transferred to the ground station by the UAV.

KEYWORDS - Nuclear plant,Multi-rotor UAV,Radiation safety,Remote measuring

EXPERIMENTAL INVESTIGATION OF THE USABILITY OF FOSSIL FUEL ENGINES IN ROTARY WING UAVS

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ABSTRACT

Unmanned Aerial Vehicles (UAVs), one of the most popular academic study areas of recent years, are rapidly moving towards becoming a strategic commercial product due to their dexterity. These vehicles are divided into two main categories, fixed-wing and rotary-wing. Although fixed-wing UAVs have more flight time and speed compared to the energy they consume, they cannot be preferred in some areas of use due to the need for a special runway for take-off and landing. On the other hand, although rotary wing ones have a shorter flight time, they are preferred in many areas of use because they do not need a special runway for take-off and landing and have high maneuverability. While fossil fuel engines are mostly used in fixed-wing UAVs, brushless electric motors are mostly used in rotary-winged UAVs. Brushless electric motors are highly preferred in multi-rotor rotary wing UAVs because they can provide more precise speed control and cause less mechanical vibration. Both precise speed control and partially low mechanical vibration are two important factors in ensuring the stability of multi-rotor UAVs. However, the long charging times of the batteries feeding the electric motors used cause the long-term flights of these UAVs to be interrupted. Although this problem can be partially overcome by having extra spare batteries, this problem becomes more pronounced on longer missions. For this reason, within the scope of this proposed study, the feasibility of a multi-rotor UAV that can perform longer missions with less waiting time was examined by examining the usability of fossil fuel engines in rotary-wing multi-rotor UAVs. Obtained results are presented both graphically and numerically.

KEYWORDS - Fixed-wing UAV, Rotary-wing UAV, Fossil fuel engine, Experimental study, Control

AN EVALUATION OF INERTIAL NAVIGATION SYSTEMS

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ABSTRACT

The conventional inertial navigation systems that have been used for decades rely on inertial sensors. One of the most significant of these sensors is the accelerometer. The speed of a moving object can be estimated by computing the integral of the acceleration. In some circumstances, the accelerometer is insufficient, especially when the object moves in more than one dimension. In such a case, combining an accelerometer with another inertial sensor such as a gyroscope helps to obtain more accurate results. Despite that, some errors may still occur during the calculations of the speed. Moreover, the inertial sensors, mainly those of low-cost, themselves are leaning to various errors such as drift and bias. Another point is that the errors of inertial measurement units (IMUs) are complex and nonlinear. Therefore, the calculation of the speed leads gradually to false information. In the literature, several methods have been developed to minimize the errors, focusing primarily on calibrating the microelectromechanical systems (MEMS). There are recently proposed approaches that make use of artificial intelligence. Some of these methods combine the data of the gyroscope and accelerometer with visual data, while others regress the speed by using IMUs outputs. In this work, various inertial navigation methods are investigated, and a comparative analysis is made regarding the efficiency.

KEYWORDS - Inertial navigation system ,Inertial sensors,neural networks,speed estimation

RAPID LASER PROTOTYPED MICROFLUIDIC DEVICES FOR ON CHIP EMULSION GENERATION

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ABSTRACT

Microfluidic platforms provide numerous benefits in fluid manipulation for sample preparation, disease diagnostics, and material syntheses. Especially for precise chemical processing and formation of personalized drugs for drug delivery studies, the field of microfluidics offers extremely well-controlled dosing and reagent concentrations. In addition, controlled and closed environment of the microfluidic devices offer contamination-free chemical synthesis and bio-sample analysis. While the microfluidics provide these benefits, current device fabrication methods are costly and time consuming. The traditional approach for microfluidic device fabrication requires expensive cleanroom fabrication facilities that cannot be found in most of the research institutes. Therefore, more accessible, and simpler means of microfluidic device fabrication is necessary for low-resourced laboratory environments. In this work, rapid laser prototyping is adopted to fabricate microfluidic devices. For this, the microfluidic device is designed as multiple layers, and each layer is fabricated by using CO2 laser cutting. The middle layer of the device contains the fluidic channel. This layer is covered with industrial double-sided tape. Top, middle, and bottom layers are pressed together to obtain a leak-free microfluidic device. For proof of concept, a microfluidic device with three inlets and single outlet is designed for water in oil droplet generation. Various flow rates ratios are tested, and different size droplet generation is studied in the fabricate microfluidic device. Overall, the rapid-laser prototyping is shown to be a suitable method for general purpose microfluidic platform. This approach can be a viable option for various applications in biology, medicine, and engineering.

KEYWORDS - droplets, emulsions generation, laser prototyping, microfluidics, microsystems

INVESTIGATION ON ELEVATOR ROPES AND BELTS EXPOSED TO TENSILE LOAD

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ABSTRACT

ABSTRACT Elevator systems provide interfloor transportation in multi-storey buildings and it has a duty to make human life easier. As in every mechanism, stresses and strains occur with time and damage which reduce its strength occur in the lifting equipment. Steel wire ropes and belts are used as load carrying member in the elevator systems. Those mechanical properties such as endurance load, stress and strain values are used to determine elevator car capacity since all of rated load, car weight and additional mechanical device weight are lifted by ropes or belts. In this study, two samples have been used to determine endurance load, stress-strain variations. One of which is elevator rope with 6 mm in diameter and second is elevator belt having 50 mm width. Mechanical properties and maximum lifting capacities of investigated rope and belt samples have been determined by using tensile testing machine.

KEYWORDS - Elevator belts, Elevator ropes , Tensile strength

EFFECT OF GEAR DESIGN PARAMETERS ON CONTACT STRESSES

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ABSTRACT

There are two main factors taken into account in the strength analysis of gears. One of them is the tooth root stress calculation and the other is the contact stresses calculation that occurs at the gear contact line. Both the tooth root stress and the contact stress vary with the design parameters of the gears and can be optimized. The basic design parameters of gears can be expressed as the number of teeth to work together, the modulus of the gear, the pressure angle, and the tooth width of the gears. While spur gear design can be done with these basic terms, for example, for helical gears, the helix angle is a parameter that needs to be determined additionally. In addition to these, modifications such as profile shifts, and tooth tip relief modifications are among the parameters that affect the performance outputs of gears. In this study, the change in contact stress for gear pairs with the change in the number of teeth, module, and pressure angle, which are the design parameters of spur gears, were investigated with the same torque. The contact stress changes along the contact line of the gear pair were investigated. For this, three different teeth numbers (24, 36, 48), three different modulus of gear (3, 4, 5 mm), and two different pressure angles (20o, 25o) were determined. The change in contact stresses was investigated with theoretical calculations made by loading with a single torque value. Decreases in contact pressures are presented comparatively.

KEYWORDS - Module, number of teeth, pressure angle, spur gear.

THERMOMECHANICAL AND VISCOELASTIC PROPERTIES OF PA6 GO NANOCOMPOSITES PRODUCED BY IN SITU POLYMERISATION

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ABSTRACT

In this study, the thermomechanical and viscoelastic characteristics of nanocomposites made of polyamide 6 and graphene oxide (PA6/GO) that were produced by in-situ polymerization were examined. Because of its remarkable mechanical properties, GO has become a new generation of fillers for polymer composites. However, the performance of nanoparticle-filled composites is hindered by its uneven dispersion in the matrix. Thus, by being evenly distributed throughout the polymer matrix, in-situ polymerization enables GO to impart its extraordinary properties. By using differential scanning calorimetry, the thermal stabilities of the PA6/GO nanocomposites were examined (DSC). The increase in GO contents had minor effect on the melting temperatures. Additionally, the effect of GO on crystallinity is negligible. Using dynamic mechanical analysis (DMA), the storage modulus (E'), loss modulus (E''), and tan delta were determined. In PA6/GO nanocomposites, the storage modulus increased as the stiffness was imposed by increasing the GO component. Lower tan delta values were obtained with higher GO content, indicating an efficient stress transfer from the PA6 matrix to GO. Additionally, Tg values changed favourably as GO concentration increased, demonstrating the efficiency of in-situ polymerization. Furthermore, creep behaviours were characterized with strain levels. The findings highlighted that, in comparison to neat PA6, fewer strain values were obtained with PA6/GO nanocomposites as the GO weight fraction increased.

KEYWORDS - Graphene Oxide, Nanocomposites, Polyamide 6, Thermomechanical, Viscoelastic

ANALYSIS OF THE AZIMUTH ANGLES OF A PHOTOVOLTAIC SYSTEM IN NON IDEAL POSITIONS

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ABSTRACT

With the increase in energy prices, Photovoltaic (PV) panel applications on building roofs are becoming more common. In the past, installations were only made in the direction of the South, but now the roofs of the buildings facing west, east, and even north are also considered for PV panel installations. In this study, a PV system with an installed power of 148 kWp grid-connected system at the Konya Technical University (KTÜN) campus is modeled with PVsyst software. In order to determine the performance of the PV systems on building roofs oriented in different geographical directions (North, South, East, and West), a 30° fixed inclination angle was investigated. In the modeling, the amount of radiation coming to the surfaces of the PV panels, electricity production values , and performance ratios were calculated and compared. The highest effective radiation value on the panel surface was obtained from the system facing South with 1964.4 kWh/m². This value at 0° azimuth angle is 20.77%, 22.87%, and 73.48% higher than the radiation obtained at -90, +90, and 180 azimuth angles, respectively. Similarly, the highest annual electricity production was obtained from the system installed in the 0° azimuth direction with a value of 254.77 MWh. The annual total electricity generation value is 19.66%, 22.55% and 69.41% higher in systems modeled toward East (-90°), West (+90°), and North (180°) directions, respectively. Performance ratio, defined as the ratio of the amount of radiation coming to the panel surface and the electricity produced, has close values between 0.843 and 0.862 for four different azimuth angles. It has been seen that the electricity generation amounts of PV systems are highly dependent on the azimuth angle, and PV systems can be applied to roofs facing east and west. However, it is not technically and economically suitable because the electricity production for the roofs in the north direction is deficient.

KEYWORDS - Azimuth angle, photovoltaic panel, PVsyst, solar energy

ENERGY ANALYSIS OF A DOUBLE PASS SOLAR AIR COLLECTOR

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ABSTRACT

With a better understanding of the problems arising from the use of fossil fuels, the interest in renewable energy resources has increased a lot in recent years. At this point, solar energy comes forward as an important energy resource. There are two different types of solar collector used in thermal systems utilizing solar energy; one with air fluid and the other with liquid fluid. Today, mostly collectors utilizing water as fluid are used due to their advantages in terms of heat transfer. On the other hand, solar air collectors are mostly used for space heating of residential and small commercial buildings, industrial heating processes, and drying of agricultural/forest products. Air heated collectors are systems that convert solar energy into heat and transfer this energy to the air inside. In this study, a mathematical model was created based on energy balance equations for a double-glass covered, flat absorber plate, double-pass solar air collector. Energy performance of the collector was determined by a simulation with Matlab code. Solutions were carried out for solar radiation values of 400-1000 W/m2 and air mass flow rates of 0.01-0.30 kg/s. An analytical study was carried out to investigate the effects of solar radiation and air mass flow rates on the thermal characteristics of the collector. The results show that the collector efficiency increases as the mass flow rate of the air and the solar radiation incident on the collector surface increase. The highest collector efficiency was obtained for the mass flow rate of air 0.3 kg/s.

KEYWORDS - Heat transfer, solar air collector, thermal efficiency, energy analysis

INVESTIGATION OF THE EFFECT OF THE USE OF TOP DEFLECTORS ON AERODYNAMIC PERFORMANCE IN VEHICLES WITH CFD ANALYSIS

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ABSTRACT

Carbon-containing waste gases from vehicle exhausts are one of the main causes of climatic disasters. This problem is tried to be solved by reducing the amount of energy consumed by vehicles while they are in motion. To reduce fuel consumption, it is necessary to reduce the effect of aerodynamic drag force, which is the resistance on the solid surface in motion. It is known that high aerodynamic drag force increases fuel consumption. Reducing aerodynamic drag force is important not only for fuel consumption but also for wind noise and roadholding. Heavy vehicles such as trucks have high drag forces due to the width of their surface areas. However, this situation can be minimized with changes to be made in vehicle designs. In this study, the effect of the use of top deflectors on the drag force for trucks has been investigated. In this theoretical study, separate calculations have been made for different vehicle velocities and the results have been compared among themselves. In this study, which has been carried out using the computational fluid dynamics method, k-e has been preferred as the turbulence method. As a result, it has been concluded that the use of top deflectors reduces drag force, which in turn reduces fuel consumption.

KEYWORDS - Aerodynamics, Computational fluid dynamics, Drag force, Top deflector.

CHEMICAL RECOVERY FROM CO-PYROLYSIS OF NAPHTHALENE AND POLYSTYRENE

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ABSTRACT

Naphthalene have been classified as an aromatic compound. Fuel and waste streams include naphthalene commonly. Pyrolysis of Naphthalene occurs at nearly 800 °C. Compared to the other aromatic compounds like benzene and toluene, naphtalene has high boiling point so it can be easily collected after pyrolysis. Besides that, some studies have shown that naphthalene is a more reactive aromatic hydrocarbon than benzene. Polystyrene is a thermoplastic polymer and it is one of main plastic types in the municipal solid waste in Europe. Polystyrene (PS) pyrolysis occures at around 350 °C. It is expected that the pyrolytic oil of PS composes of aromatic hydrocarbons like toluene, ethylbenzene, styrene. In this study, it was aimed to determine the effect of naphthalene amount in feed (1, 5, 10 wt./wt. %) and pyrolysis temperature (375, 400, 450 °C) on the liquid yield and composition. Pyrolytic set-up was a stainless steel autoclave and the liquid products were analyzed by using GC-MS. At a constant temperature, it was determined that maximum styrene yield in the pyrolytic liquid was taken as nearly 40 %. At a constant naphthalene ratio in the feed, it was found that maximum styrene yield was determined as approximately 50% in the liquid. It was obtained that naphthalene adding to the feed increases styrene, methyl styrene and ethlybenzene yield.

KEYWORDS - fuel, gc-ms, naphthalene, polystyrene, pyrolysis

TOWARDS AN EFFICIENT MAINTENANCE MANAGEMENT PLAN

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ABSTRACT

Importance measures are used in reliability engineering to prioritize complex system components. The present importance measures did not sufficiently consider the incurred costs as a result of components' failures that differ from one to another. Some component failures result only in their maintenance costs, while others may result in major economic losses. The more realistic the failure cost modeling; the more credible the component classification. This paper proposes the use of a cost-based importance measure to Turbo-compressor oil lubrication and sealing system to improve both system availability and maintenance plan. When comparing the obtained results to the Birnbaum importance measure, several components that were regarded as less significant in the Birnbaum classification were shown to be important in the cost-based importance classification.

KEYWORDS - Cost Importance Measure, Complex System, Failure Costs, Maintenance Management.

LARGE DEFLECTIONS OF BI DIRECTIONAL FUNCTIONALLY GRADED CANTILEVER BEAMS

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ABSTRACT

The large deflections of a bi-directional cantilever beam that obeys Ludwick's type of material behavior and made of FGMs is analyzed in this study. The nonlinearly elastic cantilever beam is subjected to a moment at the free end. The modified Ludwick's type of material model and functionally graded material properties are defined by using Marlow's material model in finite element analysis. The results show that the number of laminae in thickness direction is one of the most important properties in the evaluation of both stress distribution through the thickness and deflections of the free ends. On the other hand, the variation of the number of laminae trough beam length has no significance effect on the stress distribution on the bi-directional cantilever beam.

KEYWORDS - Cantilever beams, functionally graded materials, large deflections, Ludwick's law, nonlinearly elastic

DYNAMICS ANALYSIS OF A HEAD NECK REHABILITATION ROBOT USING NEWTON EULER EQUATIONS

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ABSTRACT

This study addressed the motion and dynamic analysis of a dual-arm rehabilitation robot proposed for the treatment of various head-neck orthopedic disorders. In this robotic system, each arm has six degrees of freedom (DOF) and only the first four joints of the arm are actuated. The whole system is designed kinematically to form a closed loop and to move without locking during operation. A dynamic model was created using Newton-Euler equations to calculate the driving torques and reaction force/moments of the arms that make the rehabilitation robot performed on the desired motion. Considering the whole robotic system, this dynamic model creates a redundant structure. In order to realize the desired head-neck motions safely, the set of the inverse dynamic equations is resolved according to the optimization of the reaction force/moments at the gripper point to hold the head and actuator torques.

KEYWORDS - Dynamic analysis, Head-neck rehabilitation robot, Newton-Euler equations, Redundant manipulators

EASY TO CARRY AND MOBILE BIOGAS SYSTEM DESIGN

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ABSTRACT

With the rapidly increasing population on earth, the need for energy is also increasing. With the inadequacy of the energy sources used, the orientation to alternative energy sources has become mandatory. With the increasing population and the increase in urbanization and consumption, a serious solid waste problem has occurred. The elimination of those wastes has gained great importance. In biogas power plants established in fields determined by certain regulations, electricity is obtained by burning the obtained biogas through the engine. Thermal energy need is met by utilizing waste exhaust gas thermal energy by means of a boiler. In addition, heating need in the facility is met by using the engine cooling jacket water. Currently, those systems are usually sent to the site in parts and assembled on site. In addition, a soundproofed steel or reinforced concrete building is required for the installation of the facility. In this study, a system design that can serve multiple facilities with a single investment is conceptualized. The designed system is easy to implement and also mobile. Another feature of the design is sound damping feature. The main motivations are limited area conditions and need for sound insulation. A flow diagram which shows the working principle of the system is provided. The design comprises a container that is sound proof and can carry the equipment inside it statically. The sound insulation is designed to have a sound level of 65 dB from a distance of 10 m. The dimensions of the container are; the length is 12.000 mm, the width is 3.000 mm, and the height is 2.855 mm.

KEYWORDS - biogas, container, silencer

INVESTIGATION OF DIFFERENT AIR CURTAIN DESIGNS IN INDUSTRIAL TYPE VERTICAL REFRIGERATOR CABINETS

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ABSTRACT

Industrial type vertical refrigerator cabinets designed as open and close are widely used in the world. While there is a physical barrier between the surrounding environment and the cabinet interior for close types, air curtain is used in open refrigerator cabinets. Air curtains used in open refrigerator cabinets ensure that the air exchange between the two environments is minimized. This reduces heat transfer and ensures the humidity value at a desired level for the cabinet and the surroundings. It also reduces the energy required to cool products down to optimal storage temperatures. In this study, numerical analyzes were carried out by CFD method to observe the effect of air curtains to the system performances. Different velocity profiles caused by the angles of the guide sheet were tested. Average shelf temperatures in a typical open-cooled vertical refrigerator cabinet were found by the simulations. Realizable k-epsilon turbulence model was used for turbulence modelling. The surroundings was adjusted according to the conditions specified in the ISO 23953-2-89 Class-3 standard. As a result of all those CFD analyzes, it is determined that the velocity profiles in the air curtain have a significant effect on the average shelf temperature. The average shelf temperature values obtained in the air curtains with a higher vertical velocity into the cabinet were observed to be lower than the air curtains with the parabolic velocity profile.

KEYWORDS - air curtain, cooling, refrigerator, velocity profile, vertical display cabinet

INVESTIGATION OF EFFECTS OF COOLING CHANNELS ON FLOW PROPERTIES IN NASA C3X TURBINE BLADE

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ABSTRACT

Cooling of turbine blades play a significant role in the studies carried out to increase efficiency in gas turbines. As the cooling process in turbine blades is enhanced, gas turbines are enabled to operate at higher temperatures. This allows higher efficiency to be obtained from the fuel burned in gas turbines. The NASA C3X turbine blade has been a turbine blade model that has been frequently studied in scientific studies on cooling turbine blades. In this study the effect of cooling channels on the flow of the NASA C3X turbine blade, which was modeled by obtaining geometric coordinate data from the literature, was investigated. Solid modeling of the original turbine blade with 10 cylindrical cooling channels were made by using SolidWorks® program and the flow analyzes were performed by using ANSYS Fluent® simulation program. This study aims to measure the accuracy of the designed solid model, flow volume and the selected turbulence model for using them in further studies. The data obtained as a result of the analyzes on how the cooling channels affect the flow properties are presented in the results section of the study.

KEYWORDS - cooling channels, flow analyzes, gas turbine, turbine blades, turbine blade cooling.

DEVELOPMENT OF ENERGY SAVING AND ECO FRIENDLY COMMERCIAL DISHWASHERS USING OZONE

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ABSTRACT

Commercial dishwashers are used in commercial establishments (restaurants, shopping malls, hotels, dormitories, etc.) to wash large amounts of dirty equipment (plates, glasses, etc.) in a short time (maximum 3 minutes). Consumer demands are increasing for using environment friendly water and detergent/rinse aid in washing processes in commercial dishwashers and reducing energy consumption. Depending on the amount of detergent and rinse aid used in existing washing systems creates risks for the environment after the washing process. Ozone is used in various fields, such as food preservation and wastewater treatment (turbidity removal, etc.) due to its many superior properties (its oxidation power being more effective than many disinfectants). With the superior properties of ozone, it contributes to the reduction of energy consumption values by reducing the use of detergent and rinse aid in a uniquely designed commercial dishwasher prototype and creating an environmentally friendly system, as well as the effective reaction temperatures of ozone being below the current washing temperature (~55-60°C) provided. Acknowledgment This study was prepared from the project study numbered 3130929 within the scope of TÜBİTAK-TEYDEB 1501 coded Industry Research Technology Development and Innovation Projects Support Programme. We would like to thank TÜBİTAK-TEYDEB Transport, Defense, Energy and Textile Technologies Group (USETEG) for their contribution to the project work.

KEYWORDS - Commercial dishwasher, eco-friendly product, energy saving ozone technology

DUAL AXES SUN TRACKING SYSTEM WITH PLC CONTROL

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ABSTRACT

Nowadays, due to the increasing population and industrialization, the need for energy is increasing day by day. Costs and environmental damage are increasing due to limited energy resources. It is important that renewable energy sources create hope in meeting new energy needs. Significant developments have been made in solar energy, one of these energy sources. Solar tracking systems that increase the efficiency of PV systems are used in studies to generate electricity from solar energy. In this study, a two-axis tracking system was controlled by PLC method. The tracking process, which moves according to the determined sun orbits, was carried out with a mechanism designed with two axes.

KEYWORDS - Modelling, Simulation, Tracking System. PLC

PULSATING PERFORMANCE TESTS OF HYDROFORMING PRESS

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ABSTRACT

Hydraulic systems are widely preferred in the industrial field today. The cause for this is that the cost is economical, and the life of the system is long. It can also be used efficiently in many production methods. Hydraulic systems are widely used especially in press machines and test systems. Today, with the need for new production methods, productions are made by hydroforming method using high pressure fluids in hydraulic presses. Pressure intensifiers are used to increase the fluid pressure to the desired value. The low pressure taken from the pump can be increased to remarkably high pressures thanks to the pressure intensifiers. By integrating computer control to hydroforming presses, desired pressure profiles can be applied. A new way in hydroforming to increase formability of materials is applying pressure in a pulsating manner. This process named as pulsating hydroforming. The success of the process depends on to apply the pressure at desired frequencies and amplitudes. Therefore, it is important to control the pressure values in hydroforming press momentarily and to apply these values at the intended level. In this study, performance tests were carried out on a hydroforming test system working with a pressure intensifier. Experiments were performed in triplicate. These experiments were applied at different frequencies and amplitudes. The amplitude limit of the system was determined as 2.5 MPa and 10 MPa. The frequency limit is determined as 1 Hz and 3 Hz. The system was able to apply all frequency values with 90% accuracy. The error rate of the system is 0.33% at the lowest 5 MPa and 2 Hz frequency values, and the highest error rate is 39.67% at 10 MPa amplitude and 3 Hz frequency.

KEYWORDS - Amplitude, Frequency, Hydroforming, Performance Test, Pressure Intensifier

INVESTIGATION OF TRIBOLOGICAL BEHAVIOR OF SUNFLOWER OIL AS A BIOLUBRICANT IN INTERNAL COMBUSTION ENGINES

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ABSTRACT

Currently, 29% of the energy is consumed through industrial processes, transport sectors form 28% of energy consumption worldwide. these two main energy consumer sectors need lubrication to facilitate machine working and make them work more efficiently and more effectively to produce more powerful work. Both two main energy consumer sectors contribute to increase in harmful emission gases increasingly, these exhaust emissions have a damaging effect on the living things. Recently, increases in energy consumption worldwide generated concern about energy depletion. Fossil fuel is considered the main energy source. Increase the concern about global warming and air pollution and focus on the causes of these problems which are considered the main challenges facing worldwide. Paying more attention to the internal combustion engine efficiency and making it work smoothly by lubricating the moving parts continuously can improve the fuel economy and reduce harmful exhaust gases. Biolubricants are considered the superior solution to replace mineral oils lubricants in the future. New generation of biolubricants can be obtained from from edible and non-edible oil sources as (jojoba, soybean, canola, palm oil, rapeseed, Sunflower oilseed, and jatropha). Biolubricants have several benefits such as non-toxic, eco-friendly lubricants, zero-emissions, and degradable. This study reviews the physicochemical characteristics of Sunflower oil, also summarize the chemicals modifications as adding Nanoparticle to Sunflowers oil, and summarize the studies that investigated tribological attitude of Sunflower oil when using it in internal combustions engine as Biolubricant to reduce coefficient of friction and reduce wear rate in moving parts.

KEYWORDS - Bio-lubricants, conventional lubricants, Sunflower oil, Nanoparticle, tribological attitude

INVESTIGATION OF THE ECONOMIC ASPECTS OF AIR SOURCE HEAT PUMP USAGE FOR IZMIR PROVINCE

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ABSTRACT

The economy of using air source heat pumps for different heating fluid temperatures between 35 °C and 50 °C for the province of Izmir was investigated in this study. Analyzes were conducted using hourly climate data of İzmir. The effect of the use of one-time and three-time electricity tariffs on the economy was investigated. According to the results of the research, if a user who plans to use an air source heat pump switches to 3-time tariff, heating costs decrease. A 20% cost reduction can be achieved by using the three-time electricity tariff compared to the single-time tariff. In the case of underfloor heating with an air source heat pump for Izmir, a lower energy cost occurs than natural gas. In addition, the economy level of the heat pump system (hybrid systems) combined with natural gas was examined. In the case of a three-time tariff and underfloor heating, a cost reduction of 24% can be achieved compared to natural gas.

KEYWORDS - Air source heat pump, economy, hybrid, Izmir, savings

THERMAL BEHAVIOR OF RADIATOR IN PASSIVE LIQUID COOLING SYSTEMS FOR SPRING SEASON

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ABSTRACT

Comparing the 2021 electric vehicle (EV) sales in Europe and China, it is seen that there is more demand in Europe relative to population than in China. Although these sales figures show that environmental awareness has increased in the society, an electric vehicle offered to the consumer is produced with the same battery thermal management system (BTMS) in all European countries, regardless of geography and climate conditions. However, the right battery thermal management design should be presented to the consumer according to the geographical location and climatic conditions where the vehicle will be used. Therefore, although these legal regulations constitute the necessary condition, they do not carry the sufficient condition. In this study, it is aimed to prevent catastrophic damage caused by overheating of batteries, which has been mentioned numerous times in the literature. In this experimental study, the thermal responses of the radiator, which is a passive liquid cooling system element, which is one of the BTMS, to different ambient temperature changes were investigated. Experiment boundary and acceptance conditions were selected according to the Mediterranean climate spring season. Experiments were made for 4 different scenarios. The scenarios are applied for two different ambient temperatures and two different heat transfer fluid (HTF) temperatures. Ambient temperatures are 17ºC and 20ºC, while HTF inlet temperatures are monitored for 17ºC and 20ºC. The experimental results showed that when the HTF inlet temperature was 20ºC, 17ºC had a 13.64% more positive effect on the HTF ambient temperature when the ambient temperatures were compared.

KEYWORDS - passive liquid cooling system, battery management system, radiator, electric vehicles

DESIGN OF A SINGLE MOTOR BASED BACKDRIVABLE CABLE PULLEY SYSTEM FOR A CURVED RAIL MECHANISM

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ABSTRACT

Robotic systems are used in smart factories where different system units are in constant communication and real-time production is provided with automation. The capacities, working principles and functions of robots vary according to the sector and purpose of use. In addition to the degree of freedom provided by the robotic systems, the robot arm can be moved over a wider working area with the movement of the platform on which the robotic system is fixed. For this purposes, linear and non-linear rail systems are widely used in robotic applications to increase the work spaces. In this study, it is aimed to design a more efficient alternative rail driving system with a new approach. An original curved rail mechanism, of which movement is provided by a cable drive system, is designed for the industrial robotic arm applications. The advantage and superiority of the proposed solution to the driving systems of the curved rail mechanisms available in the market is that the system is driven using only a single actuator. It provides an easy, usable and efficient forward and reverse motions on the curved rail via its backdrivable cable-pulley system.

KEYWORDS - Curved rail, backdrive,cable-pulley,single motor

NUMERICAL ANALYSIS OF RIM DRIVEN MARINE PROPELLER

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ABSTRACT

Rim driven propellers (RDP) are rapidly replacing shaft driven rotor systems in land, sea and air transportation with the developments in electric vehicle technologies parallelly. Thanks to Improvements of physical and flow properties , consumption of fuel and air pollution effects decreases therefore blade geomtry optimiziation is very important with flow conditions. In this study, a propulsion system was designed and analyzed with composite material due to its resistance and strength properties. CFD analysis of the underwater propulsion system, which was originally designed with the 3D design program, was carried out with the Ansys Fluent program. Trials with different mesh numbers were carried out on the created 3D model. Depending on the changing mesh numbers, similar flow forms and pressure distributions were obtained. A CFD analysis were run with different flow velocity and blade geometry based on k-

KEYWORDS - CFD, propeller, rim driven

COMPARISON OF PLACEMENT HEURISTICS IN SIMULATED ANNEALING FOR THE ONE DIMENSIONAL CUTTING STOCK PROBLEM

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ABSTRACT

Placement heuristics are an important part of the solution approach for the solution of the one-dimensional cutting stock problem. We study different placement heuristics for the one-dimensional cutting stock problem in this paper and we use these heuristics in simulated annealing. A novel placement heuristic is proposed and two different placement heuristics are investigated within simulated annealing. The placement heuristics are compared in terms of obtaining better solutions, easy implementation, and computational time. The proposed methods significantly obtained better solutions.

KEYWORDS - cutting problems, packing problems, placement heuristics, simulated annealing

STRUCTURAL ANALYSIS FOR TOPOLOGY OPTIMIZATION OF A JET ENGINE BRACKET

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ABSTRACT

In this study, structural analysis of a bracket used as a fastener in jet engine was performed using ABAQUS software. Required geometry, load conditions and material information were gathered from an online design challenge announced by General Electric in 2013. As requested, Ti-6Al-4V titanium powder material properties were defined for the bracket material. Static analysis has been performed on a bracket with pre-defined load cases and bracket geometry. As a result of the analysis, the load paths inside the jet engine bracket were determined and the bracket was prepared for a topology optimization to minimize mass and maximize rigidity.

KEYWORDS - additive manufacturing, bracket, structural analysis, TiAl6V4 powder, topology optimization.

TOOTH TIP INTERFERENCE AND STRESS ANALYSIS OF HIGH CONTACT RATIO SPUR GEAR PAIRS USING AN OPTIMIZED DESIGN TOOL

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ABSTRACT

Gears are structural elements that function to transmit power in mechanical systems. The power transmission is carried out by the rolling motion of the teeth pair. The average number of teeth that come into contact while the gears are running is called the contact ratio and this value is generally between 1 and 2 for gears with standard profile. As the number of teeth of the gear increases, the contact ratio may exceed 2, and the gears with a contact ratio greater than 2 are called high contact ratio (HCR) gears. For HCR gears, there is a higher risk of tooth tip interference when compared to the standard gears and they require contact point calculation to avoid interference. In this study, a mathematical tool is developed using MATLAB to analyze and avoid tool tip interference in HCR spur gears. The addendum diameter, dedendum diameter, pressure angle and modulus values are optimized using the developed mathematical tool in order to obtain an HCR geometry with minimal volume and no tip interference. In addition, the spur gear stresses are calculated using the AGMA standards. According to the results, it has been analytically proven that the load carrying capacity of the HCR spur gear is higher than that of the standard gear with the same diameter and volume. The developed optimization tool provided accurate and optimized geometries for the analyzed HCR spur gears.

KEYWORDS - High contact ratio gear, tip interference, optimization

MULTI OBJECTIVE OPTIMIZATION OF A THIN WALLED COMPOSITE AIRCRAFT WING BASED ON THE MODAL ANALYSIS

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ABSTRACT

In this research, we focus on the structural design optimization of aircraft wings to maximize stiffness while reducing the weight. The aircraft wing is modeled as an anisotropic thin-walled beam with biconvex cross-section. We first present the formulation of the free vibration analysis of the thin-walled composite beam and following this, we perform the optimization process on ModeFrontier environment using the Multi-objective Genetic Algorithm II Method. A number of parameters selected from the geometrical and material properties of the thin-walled composite beam are determined as optimization variables for two design objectives, i.e., maximum torsional to bending frequency ratio and minimum weight. Several graphical results regarding the performed optimization process are presented to show the optimal design of the aircraft wing.

KEYWORDS - Biconvex Wing, Thin-Walled Beam, Composite Beam, Multi-objective Optimization

INVESTIGATION OF CLASSIC AND NON CLASSIC FUNCTIONALLY GRADED BEAMS MODEL

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ABSTRACT

In the presented study, beams made of functionally graded materials are examined. FGMs is clarified in detail and the general information about features, design, application areas, mathematical models of FGMs and literature studies are presented. In addition, general information about different beam theories are given. The governing equations of Euler-Bernoulli Beam Theory, Timoshenko Beam Theory are shown and discussed respectively. It is indicated that the Euler-Bernoulli beam theory is available to use thin beams due to neglecting of shear deformation and rotary inertia. However, Timoshenko beam theory proposes more accurate results for thick beam analysis.

KEYWORDS - Continuum mechanics, Euler-Bernoulli beam theory, Functionally graded materials, Rayleigh beam theory, Timoshenko beam theory

A STUDY ON NANOBEAM WITH SPRING

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ABSTRACT

Nanobeams are indispensable elements of nano electro-mechanical systems. They are commonly used for connection between two pieces of equipment under a controlled medium. The medium generally has under control by dint of the clean room. In case there are any tiny particles on the air during the manufacturing of nano-size devices in the room, the sensibility and functionality of beams or nano equipment can be broken. From this perspective, there are numerous theoretical studies on nanodevices with different theories for modeling this kind of scenario. One of the fascinating works of nanobeam on natural frequency is present in this study. A spring is settled in the middle position of modeled nanobeam. The linear natural frequencies of nanobeams are obtained theoretically. The effect of the spring's position and the nonlocal coefficient on the naturel frequencies of nanobeam is the biggest motivation for the current work. The results are presented with tables and graphs.

KEYWORDS - Continuum theory, Hamilton's principle, Linear vibration, Nanobeam, Perturbation methods.

EFFECTS OF DIETHYL ETHER ADDITION TO ISOPROPANOL ISOBUTANOL ETHANOL IBE AND DIESEL FUEL BLENDS ON PERFORMANCE AND EMISSIONS UNDER VARYING LOADS AND SPEEDS

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ABSTRACT

The study aims to examine the Diethyl ether additive's impact on improving performance and pollutant emission outputs in a single cylinder CI engine fueled with IBE (Isopropanol-isobutanol-ethanol)-diesel fuel blends. The study was carried out in four stages. First, it was carried out with diesel fuel to determine the engine's basic performance and emission parameters. In the second stage, the effect of the addition of ternary fuel mixtures (IBE) to diesel on performance and emission parameters was observed. IBE was used at 15% by volume in all test conditions. In the third and fourth stages, diethyl ether additives of 2.5% and 5% by volume, respectively, were used to improve the engine performance and emissions of IBE-diesel mixtures. The obtained results were compared with each other. The study was carried out at four different loads and constant engine speed. The results showed that additions of IBE and diethyl ether reduced smoke pollutants.

KEYWORDS - DIESEL ENGINE, DEE, EMISSIONS, FUEL ADDITIVE, PERFORMANCE

EVALUATION OF HEMP SEED IN THE FIELD OF ENERGY BIODIESEL PRODUCTION

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ABSTRACT

Studies on alternative renewable energy sources continue without slowing down due to the fact that petroleum-derived fuels are exhaustible energy sources, they are not included in the clean energy class, and the problems experienced in their supply due to political relations from time to time. The climatic conditions of our country allow many agricultural products to be grown with the desired yield. Therefore, obtaining this clean energy from vegetable raw material sources grown in our country will contribute to the national economy. By reclamation the hemp plant, it is possible to produce species containing low amount of stimulants, high rates of seeds and fiber. Hemp is also used to obtain vegetable oil. Therefore, hemp oil can be considered as a valuable feedstock that should also be evaluated in the field of energy. In this study, biodiesel production was carried out from hemp oil. Fuel analyzes were carried out in order to examine the energy provided by hemp oil and the performance of the fuel. In this context, the density, viscosity, cetane number, calorific value, flash point and cold flow properties of the fuel were determined. According to the results of the analysis, a biofuel with good performance and suitable for use in cold climate conditions was obtained according to ASTM standards. Promising results have guided new study topics to improve fuel performance.

KEYWORDS - Biodiesel, hemp, fuel properties, renewable energy.

DEVELOPMENT OF A SURROGATE MODEL FOR DESIGN OF A PASSIVE VIBRATION ISOLATOR USED FOR AN INERTIAL MEASUREMENT UNIT

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ABSTRACT

Inertial measurement units are electronic devices that can measure acceleration, angular velocity etc. used in various vehicles such as motorcycles, cars, airplanes and missiles. The measurement quality of such devices is quite sensitive to the environmental effects under the operating conditions. One of the most important environmental effect is vibration which could be produced by air friction, turbulence, periodic pressure fluctuations or operating mechanical device within the structure of the vehicle. The passive vibration isolators are commonly used to isolate the inertial measurement units from the unwanted vibrations. Moreover, natural frequency and mode shape of the isolating system is crucial in terms of measurement and isolation efficiency. This chief objective of this study is to construct a surrogate model that will guide design engineers during the geometric design process of a ring type passive vibration isolator used for an inertial measurement unit. Furthermore, the effects of geometric parameter variations, such as changes of gap sizes and angular configurations of the isolator, on natural frequencies of the system are investigated via the response surface method. Finite element models are prepared and parametrized on a commercial FEM solver to determine the natural frequencies of the system. Furthermore, a statistical analysis code is utilized to construct the response surfaces. Consequently, the mathematical relations that can be used during the virtual optimization process of the isolator geometry are determined. Additionally, the geometric parameters that are significantly affecting the mode shapes are determined.

KEYWORDS - Finite element method, IMU Isolator, Response Surface Method, Vibration Isolation.

DETERMINATION OF GEOMETRICAL PROPERTIES OF FORMED SHEET METAL PARTS WITH 3D SCANNING METHOD

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ABSTRACT

Many methods are used to determine the formability of sheet metal parts. For example, measuring the radius of curvature of a bulged part or the corner and die entrance radius of a part produced as a cylindrical cup is necessary. Generally, different gauges or measuring instruments are used for each measurement. However, the 3D scanning process can be used to make many measurements such as thickness distribution, curvature radius, corner and die entrance radiuses, wrinkle heights, and wrinkle widths of sheet metal parts. When the 3D scanning method is used, different measuring instruments are not necessary for measurements, and measurements can be taken easily from every desired area of the sheet metal part. In this study, the curvature radii, bulge heights, and thickness distributions of the samples formed with the hydraulic bulge test were measured by the 3D scanning method. In addition, a cup-shaped part was produced with hydroforming, and the corner and die entrance radiuses of the cup-shaped parts and the die-filling ratio were measured using the 3D scanning method. The thickness distributions measured by 3D scanning were compared with the values measured by magnetic ball thickness gauge, and the accuracy of the values measured by 3D scanning was introduced. A minimal difference of 0.6 % was found between the thickness distributions measured by 3D scanning and magnetic ball.

KEYWORDS - 3D scanning method, die-filling ratio, formed sheet metal, thickness distribution

NUMERICAL ANALYSIS OF LAMINAR HEAT TRANSFER FOR NANOFLUIDS IN A MICROCHANNEL

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ABSTRACT

Nanoparticles having higher thermal conductivity are added to base fluids for specific volume fractions. Then thermal conductivity of nanofluids containing these nanoparticles is better than that of base fluids. Due to their better thermal properties, nanofluids are used in heat transfer enhancement. For this reason, numerical prediction of heat transfer by using nanofluids is important in engineering applications. In a microchannel exposed to uniform wall temperature, heat transfer problem has been solved for steady laminar nanofluid flow in terms of two-dimensional case. In terms of heating, inlet temperature for fluid is assumed to be lower than wall temperature. Flow is hydrodynamically fully developed and thermally developing while axial conduction and viscous dissipation have been neglected for solution. Finite difference method has been implemented to solve convective heat transfer problem for fluid region. Central difference scheme for radial direction and upwind scheme for axial direction have been implemented for discretization. Peclet number is Pe = 10000 corresponding to laminar flow when Prandtl numbers of base fluid and nanofluids are considered. Alumina (Al2O3) as a nanoparticle has been added to base fluid of water for various volume fractions of % $0 \leq vf \leq$ % 4. Nusselt number for laminar flow under uniform wall temperature is constant and this value is considered for comparison. Different thermophysical models including density, specific heat, thermal conductivity and dynamic viscosity for nanofluids have been utilized from open literature and these numerical results have been compared for same nanofluid. As a result, convective heat transfer for increasing volume fractions has been augmented when compared to that of base fluid.

KEYWORDS - Finite Difference Method, Heat Transfer, Microchannel, Nanofluid, Nanoparticle

INVESTIGATION OF THE EFFECTS OF ETHANOL ISOPROPANOL ISOBUTANOL AND DIETHYL ETHER ADDITIVES ADDED TO DIESEL FUEL ON ENGINE VIBRATION AND NOISE IN A SINGLE CYLINDER COMPRESSION IGNITION ENGINE

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ABSTRACT

It is quite common for biofuels produced from renewable energy sources to be mixed with petroleum-derived fuels and used in internal combustion engines. The use of these fuels is very effective in improving performance and emissions, as well as reducing dependence on oil. There are many studies examining the effect of mixing alcohol-derived fuels with diesel fuel on engine performance and emissions. However, there are not many studies examining the effects of these fuels on noise and vibration. In this study; standard diesel fuel (D100), 85% diesel 5% ethanol 5% isopropanol 5% isobutanol (D85E5IP5IB5) fuel blend, 82.5% diesel 5% ethanol 5% isopropanol 5% isobutanol 2.5% diethyl ether (D82.5E5IP5IB5DEE2.5) fuel mixture and 80% diesel 5% ethanol 5% isopropanol 5% isobutanol 5% diethyl ether (D80E5IP5IB5DEE5) fuel mixtures were tested. Vibration and noise values were investigated in tests performed at two different loads (3-6 Nm) and at four different engine speeds (1500, 2000, 2500, 3000 rpm). While the engine vibration was 7.22g with D100 fuel at 3 Nm load and 1500 rpm engine speed, in tests with D80E5IP5IB5DEE5 engine vibration decreased by 30.2% to 5.04g. When the engine noise data were examined, the noise value was determined as 102.9 dBA in the tests performed with D100 fuel at 6 Nm load and 3000 rpm. In the tests performed with D80E5IP5IB5DEE5 fuel at the same test parameters, the noise value decreased by 1.4 dBA and became 101.5 dBA. When all data were evaluated, it was determined that alcohol mixtures were effective in reducing engine vibration and noise.

KEYWORDS - diethyl ether, isobutanol, isopropanol, noise, vibration

ANALYSIS OF POSITION LEVEL FORWARD KINEMATIC SINGULARITIES OF PLANAR RPRPR PARALLEL ROBOTS

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ABSTRACT

Parallel robots have many advantages over their conventional serial counterparts. High accuracy and high payload-to-weight ratio are the main ones of these advantages. The main factor underlying the success of parallel robots is their closed-loop construction. However, this architectural feature also causes a characteristic singularity problem, which constitutes their biggest disadvantage. Being different than serial robots, singularities known as Type II occur in the forward kinematic solution of parallel robots. Unlike Type I singularities encountered in inverse kinematics, these singularities of second kind are located within the workspace and around them the magnitude of the inverse dynamic solution goes to infinity. Therefore, in the vicinity of Type II singularities, the actuators get saturated and lose the control of the robot. Consequently, the entire available workspace is not usable by the robot. Due to these facts, singularity analysis has been one of the most important research topics in parallel robotics. The aim of this paper is to analyze the forward kinematic position singularities of a commonly used parallel robot, namely the RPRPR-type planar parallel robot. The paper examines the degeneracies of the position-level forward kinematic solution of the said parallel robot and explores the relations of these degeneracies with the forward kinematic motion singularities.

KEYWORDS - Forward kinematics, parallel robot, planar parallel robot, singularity, position singularity

COMPUTATIONAL HEMODYNAMIC ANALYSIS OF A PATIENT SPECIFIC ABDOMINAL AORTIC ANEURYSM

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ABSTRACT

Abdominal aortic aneurysm (AAA) is a cardiovascular disease caused by the enlargement of the aorta in the abdomen over time. Unless treated, the growth of AAA continues, resulting in 80% death in the case of rupture. Today, the width of the aneurysm diameter is taken into account in clinical practice to examine the status of AAA. Although there are aneurysms that do not rupture despite reaching a diameter of 9 cm, it is reported that aneurysms with a diameter of 3 cm are ruptured in several cases. Therefore, analyzing only the AAA diameter is not a reliable method, and a deeper investigation is necessary for the rupture risk assessment. In this study, a patient's situation is analyzed using computational fluid dynamics (CFD) simulations, which allows to elucidate the flow dependent parameters such as velocity, vorticity, pressure, and wall shear stress (WSS). First, the patient-specific geometry is obtained and boundary conditions are defined at the inlet and the outlet of the flow domain. The effects of intraluminal thrombus (ILT) formation and patient's effort conditions are also included in the analysis. According to the results, WSS and vorticity are increased with the increasing blood flow velocity. In terms of the rupture risk, it has been found that the effect of patient's effort level is more critical than the amount of ILT in the AAA.

KEYWORDS - Abdomminal Aourt Aneurysm,Cardiovascular Biomechanics,CFD,Hemodynamic Analysis

VIBRATION BEHAVIORS OF ANTISYMMETRIC FIBER METAL LAMINATED COMPOSITE PLATES

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ABSTRACT

In this study, free vibration analysis of Fiber Metal Laminated (FML) composite, which is one of the frequently preferred materials in the automotive, aircraft and aerospace industry due to its light weight, durability, good fatigue and corrosion resistance, was performed numerically. The FMLs are hybrid structures composed of fiber-reinforced polymer composites such as carbon/epoxy (CARALL), glass/epoxy (GLARE), or aramid/epoxy (ARALL) with aluminum sheets. The vibration parameters of the FML composite structures modeled by differential quadrature methods have been determined. The natural frequencies obtained to prove the accuracy of the model are compared with the results obtained by experimental method. The effects of carbon and glass fiber anti symmetric orientation angles on the in-plane vibration characteristics of the FML plate under various boundary condition were examined numerically. Numerical analyzes were carried out parametrically. Finally, the most important layer configurations that are effective in the vibration characteristics of the hybrid structure have been obtained

KEYWORDS - Fiber Metal Laminated Composite, Differential Quadrature Methods, Vibration analysis

A CASE STUDY FOR VALIDATION OF KP505 PROPELLER OPEN WATER CHARACTERISTICS VIA COMPUTATIONAL FLUID DYNAMICS

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ABSTRACT

In this paper, the validation study of open water characteristics (thrust coefficient; KT, torque coefficient; KQ, efficiency; η) of the KP505 propeller for KRISO container ship KCS was presented by using computational fluid dynamics(CFD). The validation aimed at verifying the correctness of results of numerical simulations performed in the model scale were confronted with those measured in the experiment. There are many studies in the literature on this subject, and in this study, considering the effect of the number of mesh elements on the thrust and torque values, the optimum mesh size to be used was determined by performing mesh sensitivity analysis during mesh generation. The computational analysis was carried out for advance coefficients in the range from J=0.1 to J=0.8 and the mean errors was calculated 6,43% for KT and 0,73 % for KQ. So, it was evaluated that CFD results show a good agreement with the experimental results. In future study, self propulsion validation analysis will be performed to identify the self propulsion coefficients KT (thrust coefficient) and KQ (torque coefficient) pressure distribution on the ship hull, nominal and effective wake field around the KP505 propeller disk which are essential for ship and propeller design.

KEYWORDS - CFD, model test, open water, Propeller

SOUND PROBLEM OF SHIP ENGINES AND ITS EFFECT ON SEAFARERS

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ABSTRACT

The capacity of fishing, passenger, yacht and recreational vessels, especially dry cargo ships and tankers, is increasing day by day due to the geographical location of our country. Therefore, it is necessary to optimize the acoustics and vibration, which are dominant in the occupational health of seafarers, whose number reaches almost 2 million all around the world today . The most accurate method to be taken for the improvement of mechanical systems that cause noise, vibration and reverberation is to eliminate the problem at the source as much as possible. For this purpose, since the machine designs cannot be interfered with, it should be solved at the source of the vibro-acoustic with the use of sound absorbing materials in the machine spaces before it spreads to the space. In this study, the negative and positive effects of the materials used so far for the solution proposals for the sound and vibration problem are compared and the optimum solution proposals are listed. The nickel foam panel layer thickness is 5mm and the sound absorption coefficient in the frequency range of 1000–2000 Hz reaches approximately 0.4. The average sound absorption coefficient of the copper foam panel is 12.6% at the same thickness [1]. Therefore, sound absorption performance in the audible low frequency range for a nickel foam panel requires an appropriate structural design [2]. In addition, the occupational health and safety of seafarers were evaluated. The effect of exposure to noise and vibration, which consists of work routines on ships, high risk frequency and high-intensity operations, on work stress has been analyzed. The data were collected through a questionnaire and analyzed statistically through multiple and simple regression analyses.

KEYWORDS - seafarer, vibration, sound, acoustic, reverberation

EVALUATING THE PARAMETERS FOR ELECTRODE WEAR RATE IN ELECTRICAL DISCHARGE MACHINING OF DIN 1 2344 STEEL

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ABSTRACT

In this study, DIN 1.2344 steel, which is widely used in mold making, was processed by electro-erosion method. A copper electrode with a diameter of 12 mm was used in the experiments. Taguchi L18 experiment list was created by using 3 different cutting parameters. At the end of the experiments, electrode wear rates (EWR) were found by controlling the initial and final weights of the electrode. Ampere (A) was the most effective parameter for electrode wear. According to the analysis of variance (ANOVA) results, Amper's contribution rate was 63.99%. At the end of the study, Regression analysis was performed, and a mathematical model was developed for the electrode wear rate.

KEYWORDS - ANOVA, Electro-erosion, EWR, DIN 1.2344, Taguchi.

INVESTIGATION AND OPTIMIZATION OF THE EFFECT OF ANHYDROUS BORAX MINERAL ON THE VICKERS HARDNESS AND INDENTATION MODULUS VALUES OF IRON MATERIAL

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ABSTRACT

In this study, 5% and 10% by weight of anhydrous borax (AHB) was added to the iron (Fe) matrix material by powder metallurgy method and the effects of the additive ratio on the Vickers hardness (HV), Brinell hardness (HB) and Indentation modulus (EIT) values of the composites (Fe/AHB) were investigated. In the productions carried out using Taguchi experimental design method, AHB additive ratio, and sintering temperature parameters were selected as control parameters that were thought to affect the physical and/or mechanical properties of the Fe/AHB composite materials. The productions were carried out according to the Taguchi L4 orthogonal array, which was created depending on the control parameters and levels. Vickers hardness and indentation modulus measurements of pure iron and Fe/AHB composite materials were performed in accordance with BS EN ISO 14577-1 standard and Brinell hardness measurement was performed in accordance with TS EN ISO 6506-1 standard. According to the signal-to-noise ratio (S/N) analysis performed with the experimental data, it was determined that the 10% AHB additive ratio and 950oC sintering temperature optimized all the investigated properties of the Fe/AHB composite material. It was determined that the values for Vickers hardness, Brinell hardness and Indentation modulus increased by 142.03%, 69.32% and 144.11%, respectively, in the levels where the properties of the composite material were optimized compared to pure Fe material. As a result of the qualitative examination of all samples after storage in a comfortable environment without daylight, it was also observed that the anhydrous borax additive delayed the corrosion time of pure iron material.

KEYWORDS - Anhydrous borax, composites, hardness, iron, powder metallurgy

NUMERICAL SIMULATION OF THE SYNTHETIC STRAIN ENERGY AND CRACK CHARACTERIZATION PARAMETERS USING THE FEM METHOD OF A TWO DIMENSIONAL MULTI POSITION MODEL

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ABSTRACT

Fracture mechanics is a science that studies the growth and propagation of cracks, as well as the ability to absorb cracks of a component or material under service conditions (operation, service life, etc.). This paper deals with the numerical modeling of the strain energy evolution (ALLAE), the stress intensity factors and the contour integral (J), of a multi-position initial crack of length a = 1mm. The first part is based on the study of the positions of the cracks of the upper face which contain positive values, and the second part of the study is based on the study of the positions of the cracks of the lower face which contain negative values . The finite element method was used on a two-dimensional model in the first mode I. Additionally, elasto-plastics material was applied. Thus, the CPS8, 8-node biquadratic plane stress quadrilateral elements were used. The crack is then modeled numerically using the ABAQUS finite element calculation code. In addition, the results obtained concerning the numerical modeling were compared, and discussed between the different positions either higher dimensions y=8, 6.4, 4.8, 3.2 and 1.6mm or lower dimensions y=-6.4, -4.8, -3.2 and 1.6mm. A good correspondence was obtained between the different comparison results in all the modeling cases of our work. When there is a crack on the upper face, the real KI varies between 50 and 92 (Mpa√m), the KII varies between -8 and 8.8 (Mpa√m). Thus, the integral J varies between 3 × 10-8 and 1.2 × 10-7 (KJ/m2) and the dissipation energy ALLAE varies between 0 and 3 × 10-11 (J). In addition, when there is a crack on the lower side, the varied KI factor between 45 and 85 (Mpa√m), KII varies between -0.5 and 7 (Mpa√m) Thus, the integral J varies between 3×10-8 and 1×10-7(KJ/m2) and the dissipation energy ALLAE varies between 0 and 2×10-11(J).

KEYWORDS - ALLAE, FEM, FIC, Numerical simulation

THE IMPACT OF GEOMETRICAL PARAMETERS OF STENOSIS ON BLOOD FLOW MODELING

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ABSTRACT

The aim of the study is to investigate the role of stenosis degree and corner rounding on the alteration of pressure, velocity and wall shear stress in intravascular flow. Three-dimensional simulations are performed with the ANSYS Fluent software in the steady-state regime. The flow rate of the blood is kept constant throughout the studies, and the blood is modeled both as Newtonian and non-Newtonian for four stenosis degrees (%20, %40, %60 and %80) and two corner rounding values (r_c⁄r_a =0.0 and 0.5). Non-Newtonian behavior is modeled using the Carreau model. The flow structures, the peak values of the velocity, wall pressure and wall shear stress alterations are scrutinized in the stenotic and post-stenotic areas, and it is found that the peak values increase as the stenosis degree increases and the recirculation lengths in the post-stenotic region are found to be shorter for both sharp corner and rounded corner in the non-Newtonian model.

KEYWORDS - Atherosclerosis, Carreau Model, Corner Rounding, Intravascular Flow, Stenosis Degree

EXPERIMENTS AND SIMULATIONS OF A LIQUID CONTAMINANT PROPAGATION IN A VEGETATED BOTTOM CHANNEL

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ABSTRACT

Over the last decades, the Medjerda river, like most rivers, has seen its quality deteriorated. This water resources degradation was due to the development of urbanization, industrial and agricultural activities throughout the basin. In fact, natural water courses generally receive domestic, industrial and agricultural waste; in some cases, accidental discharges were found in rivers and irrigation networks, such as the Medjerda Cap Bon channel. These discharges were generally punctual, and they can cause various problems for water quality, infrastructure, river morphology. They can also lead to hydraulic and road structures damage, and can also pose a threat to the global environment. This deterioration in water quality is particularly associated to several pollutants input. It is therefore important to know the rivers capacity to mix and transport these contaminants and to determine the pollutant dispersion rate in solution. In this context was leaded this experimental analysis work concerning a pollution propagation in free surface flows, at a laboratory channel over a vegetated or smooth bottom. Then preliminary numerical simulations of these results were carried out. Two experimental scenarios were considered; the first one was leaded with a discontinuous pollution source, and the second one with a continuous pollution source. These experiments were carried out initially over a smooth bed and then over a vegetated bed. The aim is to show the vegetation effect on the pollutant propagation. By comparing the two injection types, we see that discontinuous injection best promotes the pollutant mixing in solution compared to continuous injection, where such a pollutant remains in the medium with greater concentration. It can also be seen that the vegetation presence on the channel bottom causes a decrease in the pollutant concentration in water, this is due to the fact that the vegetation presence increases the bed shear stress and subsequently will delay a solution propagation in water. Indeed, vegetation plays a retarding role of these pollutants' types dispersion.

KEYWORDS - Dispersion, Experiments, Free surface flow, Liquid contaminant, Simulations, Vegetated Bottom.

INVESTIGATION OF ENERGY SUPPLY OF A RESIDENTIAL AREA FROM RENEWABLE ENERGY SOURCES THE CASE OF OUR CITY KONYA PROJECT

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ABSTRACT

Approximately 25% of the total energy consumed in the world is used in residences. Considering that approximately 80% of the total energy consumption is from fossil fuels polluting the environment, it is seen that the energy sources used in settlements have an effect of 20% on environmental pollution and greenhouse effect. In this article it has been investigated whether the entire energy of the settlements can be produced by using renewable energies, mainly solar and wind energy. This research was carried out in an exemplary settlement in Konya within the scope of the "Our City-Konya" project completed in November 2019, which was prepared for the Ministry of Environment Urbanization and Climate Change. Developing designs within the framework of environmentally sensitive and sustainable approaches in urban planning are the goals and basic principles of the strategy plan. Within the framework of these principles, it is important to reduce the deteriorating global climate effects by providing renewable energy production and efficiency in settlements. In this context, measures have been taken in design studies of the field in order to provide energy efficiency in urban design work and to reduce the negative effects of climate change. Within the scope of the study targeting the concepts of ecological (environmental) and sustainable cities it is aimed to set an example for new applications to be made in the project concept. Türkiye has a very good potential in terms of solar and wind energy capacity from renewable energy sources. Especially in Konya, in which the research area is existed, the potential for solar energy is quite high. In the area planned to have a population of 20,000, buildings are designed as detached block of 2, 4 and 6 storey. It has been determined that it may be possible to meet the heating energy of the settlement with soil and solar heat pumps in winter, but the cost will be very high in today's conditions. It has been designed that the electrical energy and hot water needs of all residences, including official and social facilities in the planning area, can be met with solar PV-T and wind energy systems suitable for the settlement.

KEYWORDS - Energy, Ecological design, Urban design, Renewable energy.,Buildings producing their own energy

BIOMASS ENERGY POTENTIAL ITS CURRENT USAGE STATUS AND DEVELOPMENTS IN BIOMASS ENERGY PRODUCTION SYSTEMS IN TURKEY

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ABSTRACT

Among renewable energy sources, biomass energy is the most widespread and has the highest capacity in the world. Even at the poles, which receive the least amount of sunlight in the world, some plants that are a source of biomass can be grown during a short period of the year. In addition, animal and human wastes living in these regions also constitute biomass energy sources. Therefore, it is possible to access biomass energy sources in all regions of the world where people can live. Since Turkey is located in the middle climate zone such as 36-42 latitudes in the northern hemisphere, it has more biomass energy resources than the cold climate countries located further north of Turkey and the desert climate countries located further south of Turkey. In this study, the total biomass potentials of the world and Turkey are given and Turkey's current utilization status is considered. The types of biomass from which energy is produced in Turkey and the installed, licensed and planned power generation values are given. Finally, the systems used in energy production from biomass, the efficiency improvement methods applied on these systems, and domestic biomass energy production practises are included in this current study.

KEYWORDS - Biomas Energy, Biomas Energy Systems, Energy, Türkiye Biomas Energy Potential.

INVESTIGATION OF THE COOLING PERFORMANCE OF THE AIR CONDITIONER OF AN INTERNAL COMBUSTION ENGINE VEHICLE FOR DIFFERENT ENGINE SPEEDS AND REFRIGERANTS

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ABSTRACT

In this paper numerical analysis of an air conditioner system of a gasoline automobile with changing engine speed and evaporator temperatures is presented. During the numerical analysis refrigerants such as R1234yf and R152a that are compliant with new F-gas regulations were tested and the results were compared with the system using R134a as a refrigerant. During the analysis evaporator temperature changed between -15 oC and 10 oC , while engine speed varied between 1500 rpm and 3000 rpm. The system with R152a had the highest coefficient of performance (COP) value, according to the analysis, whereas the system with R1234yf had the lowest COP value. The maximum COP value of 4.8 was obtained under the condition that the engine speed and the evaporator temperature were 1500 rpm and 10 oC, respectively.

KEYWORDS - car air conditioner, coefficient of performance, engine speed, evaporator temperature, refrigerant comparison

ESTIMATION OF WIEBE FUNCTION PARAMETERS IN A SI ENGINE AT DIFFERENT LOADS AND SPEEDS

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ABSTRACT

The combustion period is one of the most important parameters, which affects efficiency and exhaust gas emissions in spark ignition engines. Recently, the combustion period in internal combustion engines has been wanted to be modeled with one-dimensional or multi-dimensional programs because it is cheaper, faster, and more practical then experiment. One of the approach used to modeling of the combustion period is the Wiebe function. The Wiebe equation is a method used in calculating the mass fraction burned and the heat release rates. The selection of Wiebe parameters is the vital factor affecting the accuracy of the mass fraction burned calculation. In this study, the measured cylinder pressure and crank angle data of a spark ignition engine were directly used to calculate the heat released rate. The experiments were conducted at different loads (BMEP's), engine speeds and relative air/fuel ratio conditions. The m parameter used in the Wiebe equation was chosen according to the heat release rates, which was obtained from the experimental results. In these operating conditions, the relationship between determined m values and basic engine parameters was analyzed with a statistical approach. Finally, a linear regression model was obtained which explains 80% of the change in m parameter.

KEYWORDS - Combustion Process, Heat Release Rate, Spark ignition Engine, Wiebe Function

THE ROLE OF THICKNESS AND POSITION OF PARTIAL METAL FOAM IN JET IMPINGEMENT COOLING

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ABSTRACT

- In this study, the effects using partial metal foam in electronics cooling are analyzed numerically. The focus is on the role of thickness and location of the partial metal foam on convective heat transfer, while porosity (ε=0.9005), pore density (ω=20 PPI), permeability (K=0.9× 〖10〗^(-7)) and jet Reynolds number (〖Re〗_J=50) do not change. The jet flow is considered to be two-dimensional and laminar, and the flow and heat transfer in the porous media are modeled using the Brinkman-Darcy-Forchheimer and local thermal non-equilibrium (LTNE) models, respectively. As a result of the study, it is determined that convective heat transfer improves by up to 36.26% in the use of metal foam compared to the case without metal foam.

KEYWORDS - Jet Impingement, Porous Media, Partial Metal Foam, Electronics Cooling.

IMPACT OF AUTONOMOUS VEHICLES ON TRAFFIC EFFICIENCY AND EMISSIONS AT A FREEWAY OFF RAMP

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ABSTRACT

In last years, autonomous vehicle technology has become increasingly popular in both academic and private sectors due to its potential to change the existing transportation networks. The aim of this study is to investigate the impact of autonomous vehicles in terms of traffic efficiency and emissions over a hypothetical freeway network with an off-ramp. To this end, an open source simulation tool Eclipse SUMO is utilized with considering the varying traffic demand levels and penetration rates of AVs. As a result of this study, AVs provide improvement on traffic efficiency. When the volume of traffic reaches the capacity of the road, this beneficial effect becomes more obvious. However, the increase in penetration rate of AVs when traffic volume reaches the capacity of the road, leads to produce more traffic emissions.

KEYWORDS - Intelligent Transportation Systems (ITS), Autonomous Vehicles (AVs), Micro-simulation, Traffic Efficiency, Traffic Emission.

EXAMINATION OF THE VERTICAL EARTHQUAKE FORCE ON A SAMPLE BUILDING WITH DIFFERENT OUTPUTS ACCORDING TO TEC 2018

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ABSTRACT

Abstract - The concept of vertical spectrum started to be implemented in Turkey with the Turkish Building Earthquake Code 2018 (TEC 2018) regulation. Before this regulation, earthquake analysis was carried out under lateral loads with only the lateral spectrum in buildings and it was predicted to stay on the safe side with the axial load limitation made on the columns. In TEC 2018, vertical earthquake analysis is performed depending on the structural defects in the structures. In this study, vertical earthquake analyzes were carried out on building samples with different ratios of cantilever overhangs. During these analyses, the vertical earthquake acceleration assumption made in the earthquake code and the analysis results obtained from the vertical earthquake spectrum were examined. For this purpose, firstly, lateral earthquake forces under equivalent earthquake force, axial load levels on the columns and sectional effects and displacements on the cantilever supports were obtained on the structures. These results were compared with the data obtained from the vertical spectrum analysis with the mode combining method, which is the dynamic analysis. The results obtained show that the assumptions made in the equivalent earthquake load method are on the safe side.

KEYWORDS - Keywords - TEC 2018, equivalent earthquake load, Response spectrum analysis, mode combining method, vertical design spectrum.

MODAL ANALYSIS OF THE STEEL INDUSTRY STRUCTURE BY FINITE ELEMENT METHOD ACCORDING TO TBDY 2018 REGULATION

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ABSTRACT

In this research an exemplary steel industry structure to be designed in the city of Samsun was used. For this purpose the behavior of the steel structure under different loads according to the principles of the TBDY 2018 regulation was examined. It is aimed to investigate the effect of steel wind rod elements on dynamic parameters. For this reason two different model experimental structures with wind rod connection and without rod connection were analyzed. In the analysis the effects of the steel structure on the dynamic behavior of the structure were revealed by using the finite element method (SAP2000) program. These dynamic parameters consist of natural frequency, period and mode shapes. With the comparison of the results obtained it is seen that the effect of the steel test structure of the wind tension rod on the dynamic parameters provides a 32,58 % decrase in the dominant period and a 48,32 % increase in the dominant frequency. When the mode shapes of the model structure in both wind tension rod connected and unconnected cases are examined in general, the wind tension rod in the steel test structure reinforced with wind tension rod have been replaced by the torsional mode shapes compared to the model steel industry test structure. In the mode shapes, on the other hand, with the addition of wind tension rod, more balanced and smaller deformations were observed in other directions instead of the displacement values in the y direction. With this study, the author aimed to reveal the effects of the use of wind tension rod in the system in steel industry structures on the dynamic behavior of the structures (period, frequency, mode shapes). As a result, it has been seen that with the addition of wind tension rod in the steel industry structure, our structure has become more rigid and stable. It has been concluded that the model steel structure is made safer against dynamic effects by using steel wind tension rod element.

KEYWORDS - Steel Industry Structure, Period, TBDY2018, Finite Element Method (FEM), Modal Analysis

A REVIEW OF THE USABILITY OF PHOTOGRAMMETRY TECHNIQUE FOR STUDYING THE STRUCTURAL BEHAVIOR OF HISTORICAL BUILDINGS

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ABSTRACT

The structural integrity and performance of historical buildings are important factors in their survival for generations. There are many research and development in the examination of structural behavior of historical buildings, with technological developments that allow innovative techniques spread very rapidly in design and construction practice. Conventional surveying techniques that still exist in practice are replaced with their enhanced digital counterparts for more accuracy in measuring structural deformation. As one of the novel techniques, photogrammetry provides 3D digital models out of high-quality images which define the level of detail in preservation and documentation projects. Especially in numerical modeling of historical buildings, it is required to ensure a certain level of accuracy in the digitization of complex geometrical and material properties, for which photogrammetry provides easy-to-use, inexpensive and time-saving solutions. In the context of studying cultural heritage, which possess unique architectural and cultural values, it is essential to examine structural and seismic behavior of historical buildings and monuments. Within this context, it is highly important to conceive new methods that integrate the monitoring processes of structural behaviors of historical buildings and innovative technologies. The purpose of this research is to demonstrate the advantages in the use of photogrammetry for studying the structural behavior of historical buildings, which fills an important research gap in the field. The study provides an extensive review of the literature that focuses on the use of photogrammetry by classifying the works according to the headings of "topic," "methodology," "site," and "findings." One of the findings is that there is a limited number of works that attempt to integrate the use of photogrammetry with structural analysis. Despite the confirmed effectiveness of the method, it is found out that there are four studies that focus on photogrammetry to conduct structural analysis. With the increased use of photogrammetry that is computationally inexpensive and time-saving, it will be advantageous for researchers, engineers and surveyors who work on taking important decisions about the preservation of historical buildings. Besides, the research shows the potential of the technology of photogrammetry as a holistic approach for bringing together the disciplines of architecture and engineering that usually require two distinct expertises in terms of analyzing the structural behavior of historical buildings under static and dynamic loads.

KEYWORDS - Structural behavior, historical building, photogrammetry, structural system.

ECONOMIC FEASIBILITY ASSESSMENT IN DESIGN OF SUSTAINABLE PREFABRICATED INDUSTRIAL BUILDINGS AND THE CASE STUDY OF DEMIR EKOSAN

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ABSTRACT

Sustainability is a defining element in the design of the new generation of industrial structures. The increasing need for energy necessitates the use of sustainable energy sources such as solar and wind. The use of new technologies and approaches in the structural and architectural design of the next generation of sustainable industrial structures closely impacts the sales and usage performance of the project. Within the scope of this study, the efficiency of structural design, architectural design and economic feasibility studies of new generation multi-purpose industrial sites that produce their own energy by using sustainable energy sources such as solar and wind energy were evaluated in the case study of DEMIR EKOSAN project. DEMIR EKOSAN industrial site is a multi-purpose industrial site built on an area of 300.000 m2 in Çorlu, Tekirdağ, where agriculture and industry develop together. Details developed in SAFECAST, a European Union project, were used in the design and connection of the structural systems of the buildings. Struc-tural and architectural design studies have been carried out and economic feasibility processes have been assessed, considering the impact of the project's agricultural and environmental impact, which will ensure sustainability by producing its own energy and water. In the economic feasibil-ity study, the difference in structural and architectural design, the use of sustainable energy re-sources, and environmental impacts were examined in comparison. General principles have been proposed for the design of sustainable multi-purpose industrial sites through the case study of the DEMIR EKOSAN.

KEYWORDS - economic feasibility, sustainability, prefabrication, industrial structures, energy

INCREASING THE VERTICAL LOAD CAPACITY OF REINFORCED CONCRETE WAFFLE SLABS WITH VARYING OPEATING LOADS USING CFRP

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ABSTRACT

Retrofit with fiber polymer composites is one of the new generation retrofitting techniques that is rapidly becoming widespread. Fiber polymers, in which glass, aramid and carbon are used as fibers and epoxy is preferred as the polymer, are increasingly used in the construction industry with their advantages such as reduction in construction time, increase in strength and ductility of building elements. Carbon-based fiber polymers (CFRP) provide effective solutions in terms of durability as well as increasing the bending and shearing capacities of reinforced concrete structural elements. It is more suitable than traditional strengthening techniques, especially in buildings where the architectural function must be preserved. The subject of the study is to determine the earthquake performance according to TBDY2018 principles of the existing medicine production facility with a frame system, which was built with conventional reinforced concrete method in Çorlu and to evaluate the suitability of the use of CFRPs for increasing the vertical load capacities of waffle slabs.In practice, the effectiveness of retrofitting with CFRPs was investigated within the scope of the study. After determining the earthquake performance of the building, which was carried out with the nonlinear calculation method, the realization of the additional effects that will occur due to the operating loads expected to increase on the structure, with the retrofit using CFRPs, was designed and applied on the site. Pharmaceutical facilities are areas where the architectural function is specifically determined. In a highly hygienic environment, such as a pharmaceutical facility, retrofitting alternatives have been investigated and structural safety comparison has been made. In the earthquake retrofitting application of the building, the advantages of retrofit with composite materials were utilized and advantages and disadvantages were determined compared to traditional methods.

KEYWORDS - CFRP, reinforced concrete structures, retrofitting, waffle slabs, earthquake

USE OF BIM WITH MODULAR CONSTRUCTION IN FUTURE CONSTRUCTION TECHNIQUES

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ABSTRACT

Modular construction technology and applications are rapidly evolving. Modular construction is a process in which entire rooms or sections of rooms are built in a factory setting along with electrical, mechanical, and plumbing work and then transported to a final site for assembly. With modular construction, a building is built off-site, under controlled facility conditions, with the same materials and to the same codes and standards as conventionally built facilities, but in half the time. The modular construction method is used to build various types of buildings (whether they are apartment houses, office buildings, or hotels). This construction method is used for both permanent and relocatable projects. These projects can be built with two types of modules. These are 2D panels or 3D modules. These can be combined to form a third type, hybrid modular construction. Each has its advantages. 2D panels offer easy logistics and flexibility in building design and are mounted on-site. Factory productivity is increased by using 3D volumetric solutions. They only need to be installed once they are delivered. The hybrid modular structure has the advantages of the previous two. With the recent development of Building Information Modeling (BIM), the use of modular construction methods in conjunction with BIM becomes more common. As with any method, this one has advantages as well as disadvantages. Disadvantages of this method, such as a higher number of complex decisions, front-loaded design, etc., can be solved with BIM. Furthermore, the BIM platform can resolve the disadvantages of traditional construction methods, such as the difficulty of pre-project planning and coordination among members of interdisciplinary professions. With BIM and the modular construction method, physical conflicts between the structural system and its mechanical, electrical, and plumbing systems can be easily identified early in the design process, and resolution can be expedited. This article includes general information about the modular construction method, future application scenarios, use, and advantages of BIM. The document analysis method, one of the qualitative methods, was used, and in the light of the data obtained, comments and scenarios were tried to be created about the future of BIM and modular construction techniques. What distinguishes this study is that the concept of quality is examined in detail by using these two methods together.

KEYWORDS - Modular Construction, Prefabrication, Automation, Construction Techniques, Building Information Modeling (BIM), Quality in Project Management

FUNDAMENTAL PERIODS OF ISOLATED BRIDGES WITH TALL COLUMN BENTS AND SOIL INTERACTION

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ABSTRACT

This study examines the effect of different bent column heights on bridge fundamental period analytically to have an excellent insight into the behavior of isolated bridge structures with substructure flexibility. Also, the influences of integral or rigid and isolated support between bridge superstructure and substructure are investigated. Moreover, soil interaction is taken into account in the calculation of bridge substructure flexibility and the effect of various soil shear modulus are studied. As a result of these studies, it is observed that the flexibility of the bridge substructure causes the bridge fundamental period to increase up to a certain bent column height. Integrated or rigidly connected bridge bent columns reduce the bridge period, but after a certain column height, it reaches to the period of isolated bridges. Thus, it can be stated that the effectiveness of seismic isolators reduces beyond this particular column height. As far as various soil types are considered, it is recognized that the bridge period decreases with increasing shear modulus in relatively short column bridges while there is no significant change for bridges with longer bent columns. In other words, soft soils with small shear modulus have significant impacts on the periods of bridges with slightly tall columns, but none of the soil types has a remarkable effect for bridges with extremely tall column heights.

KEYWORDS - Seismic Isolation, box-girder bridge, lead-rubber bearing, soil interaction.

ANALYSIS OF HISTORICAL CASTLES USING THE FINITE ELEMENT METHODS

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ABSTRACT

Historical buildings which are our cultural identity, are of great importance as they guide us between our past and our future. They have begun to wear out from both human factor and natural effects in time. In order to ensure that historical buildings are transferred to the future, studies are carried out in line with national and international disciplines. Especially since our country is located in an active earthquake zone, the behavior of historical buildings under the influence of earthquakes should be known and necessary precautions should be taken accordingly. These studies should be carried out meticulously by different disciplines in cooperation. Within the scope of this study information is given about the material properties and carrier systems of historical buildings in order to get to know the historical buildings better. The types of damage that may occur in historical buildings and the repair and strengthening methods recommended for these damages are discussed in detail. Information is given about the modeling techniques used in the analysis of masonry structures. Within the scope of the study, general information about the historical castle city walls and bastions is given. Then, it is explained how the historical castles are analyzed with finite element method using the SAP2000 V20 package program. Modeling of historical castles as a SOLID element and static and modal analysis according to TBDY 2018 according to their various loads are mentioned. As a result of the analysis, the maximum stresses and displacements that may occur in the structure are interpreted.

KEYWORDS - Castle, Finite Element Methods, Mansory Buildings, Solid

PERFORMANCE OF AN UPSTREAM COFFERDAM AT DAM CONSTRUCTION SITE DURING A FLOOD EVENT BERDAN DAM CASE STUDY

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ABSTRACT

Due to the limited availability of water resources in nature, development plans are being prepared for sustainable and effective use of water resources. Water structures are constructed in order to develop and control water resources in line with needs. Specialized engineering units work in coordination during the surveying, planning, project design and construction phases of water structure projects. Dam design and construction works depend on several technical, economic, environmental and social factors and dam project implementation is a complex task. The details of project elements regarding hydraulic, geotechnical, structural issues, operation-maintenance works, monitoring, providing dam safety are specified in dam design and construction guidelines. Dams are structures that control large volumes of water and have a long service life. Sustainable water resources management and dam safety effects the performance of the project. The design flood criteria in dam projects depends on safety principles. Flood risk assessments and future projections are essential in flood management. Flood control during dam construction is essential to prevent damages of flood disasters. Upstream cofferdams are built as temporary structures to provide safety, flood protection, diversion and dry environment during construction of permanent structures. It is an important task to find solutions to flood problems in dam construction sites in order to ensure dam safety. Berdan Dam was constructed between 1975 and 1984. The dam is located in Mersin City in the Eastern Mediterranean Basin in the southern of Turkey. In this study, the performance of upstream cofferdam of Berdan Dam during 1980 flood event when the dam was under construction stage, was investigated by using ground measurements and satellite-based remote sensing data. As a result, flood inundated areas up to the Berdan Dam site in 1980 flood, calculated as 271 hectares by using remote sensing data. It is evaluated that the dam structures built at the Berdan dam construction site at the 1980 flood event holded the flood flow and contributed flood control works of downstream areas.

KEYWORDS - Dam safety, Cofferdam, Flood control, Berdan Dam

DESIGNED ACCORDING TO TDY1975 RETROFITTED ACCORDING TO TDY1998 COMPARED EARTHQUAKE PERFORMANCE OF EXISTING PREFABRICATED CONCRETE INDUSTRIAL STRUCTURE ACCORDING TO TDY2007 AND TBDY2018

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ABSTRACT

The subject of the study is designed according to Turkish Earthquake Code (TDY 1975), following the 1999 Kocaeli Earthquake, retrofitting were completed according to TDY 1998, the prefabricated concrete industrial structure in Çorlu, (a third degree earthquake zone) according to TDY2007 and TBDY2018, determined and compared earthquake performance in terms of earthquake regulations. First of all, the shear forces, displacement and relative displacements for both earthquake directions were determined by using earthquake load calculation methods and earthquake zones maps according to TDY1975 principles. Then, the retrofitting elements which were added on the basis of TDY1998 based on the retrofitting project were added to the building model and the rigidity, ductility and strength characteristics of the building and the change of natural vibration modes were examined. The shear forces, displacement, strength, ductility, relative displacement ratios were managed in the location where the structure was activated by the equivalent earthquake load and mode combination method envisaged in TDY2007. It was observed that the retrofitting study performed after the 1999 Kocaeli Earthquake decreased the displacements and natural vibration periods of the structure and increased the strength and ductility properties. It has been determined that it provides Life Safety performance level according to the TDY2007 principles. According to the TBDY2018 earthquake calculation methods, the comparison of the structure according to the new seismicity map and expected earthquake accelerations with the horizontal spectra has also been completed. As a result, the effect of the change of earthquake regulations from TDY1975 to TBDY2018 on the structure earthquake parameters and performance of an existing prefabricated concrete industrial structure was determined.

KEYWORDS - Prefabricated concrete structures, Earthquake, Turkish Earthquake Code, RetrofittingSystems

DETERMINATION OF G0 SHEAR MODULUS OF SANDY PUMICE SOIL

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ABSTRACT

In order to analyze behaviour of soils under static or dynamic loading, the shear strain level has to be considered. The engineering parameters needed for large and small strain regions are obtained by different laboratory tests. The small strain shear modulus, which is important in the analysis of small strains of soil under dynamic loading, can be obtained from resonant column and piezoelectric bender elemen laboratory tests. In this context, a study was carried out on the small deformation behavior of the sandy pumice soil by using the piezoelectric bender elements in unconsolidated undrained triaxial test. The test results showed that as the cell pressure increases, the shear modulus also increases at the very small shear strain levels.

KEYWORDS - Bender elements, shear modulus,shear wave velocity,pumice soil

MICROSTRUCTURE ANALYSIS OF RECYCLED FERROCHROME FILLED POLYMER CONCRETES CONTAINING SWCNT

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ABSTRACT

- In this study, microstructures of a novel polymer concrete samples produced using silica sand and recycled ferrochrome as aggregate, single-walled carbon nanotube (SWCNT) as reinforcement and epoxy resin as the main component material of the mixture were characterized. The morphology and crystal structure effects of the same ratio of SWCNT content on different fillers were evaluated. The use of recycled ferrochrome filler and SWCNT reinforcement component in PC achieved significant results regarding material morphology and structural changes.

KEYWORDS - Microstructure analysis, Polymer concrete, Recycled ferrochrome, SWCNT

EPOCH AVAILABILITY ANALYSIS OF LOW COST GNSS RECEIVER

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ABSTRACT

Global navigation satellite systems (GNSS) has been widely used in many applications over the past decade. However, since high-performance GNSS receivers are expensive, interest in low-cost GNSS receivers has increased in recent years. In this way, low-cost GNSS receivers were released by GNSS manufacturers, first as a single frequency and then as a dual-frequency. The performance of these receivers in absolute and relative positioning applications is being tested by researchers in many ways today. In this study, the RINEX observation file of the dual-frequency low-cost U-blox F9P GNSS receiver was examined in terms of epoch availability. For this purpose, a 13-day data set was used. The obtained results were given with a comparative approach with the nearby geodetic receiver. According to the results, an average of 99.23% epoch availability percentage was obtained with the low-cost GNSS receiver and 99.98% with the geodetic receiver.

KEYWORDS - Low-Cost Receiver, GNSS, RINEX, U-blox

DEEP LEARNING RESEARCH IN DAMAGE DETECTION OF RC STRUCTURES

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ABSTRACT

The concept of artificial intelligence, which has entered our lives with the advancement of technology, is divided into many areas within itself. Deep Learning method is also an artificial intelligence algorithm. This method, which imitates the learning mechanism of people, makes predictions on new data groups with the features learned by learning with data. Convolutional Neural Networks, which are used in the field of computer vision from Deep Learning models, which have found different applications in every conceivable sector in recent years, are especially preferred in image classification processes. In structural engineering, damage assessment studies, the process of grouping the damage level according to the nature of the damage is a classification problem. From this point of view, in this study, the use of this innovative technology in structural damage assessment studies, which is very important in the field of structural engineering, has been investigated. The researchers used the Convolutional Neural Networks algorithm in this field in order to minimize the risks in structural damage detection field studies and to make the right decisions about the structural damage situation. All the studies examined showed that using the Deep Learning method in structural damage detection gave very successful results and was found suitable to be developed as an innovative method

KEYWORDS - Deep learning, convolutional neural networks, structural damage detection, reinforced concrete (RC) structures.

EXPERIMENTAL STUDY AND GREY CORRELATION ANALYSIS OF UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION BEHAVIOR FOR GEOTEXTILE REINFORCED CLAY

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ABSTRACT

Geosynthetics is one of the most frequently used materials in geotechnical engineering by showing rapid change and development. Polymer materials, which have a significant effect on the implementation of geotechnical projects by being produced in factories and used with the ground, offer various advantages over traditional methods by increasing soil performance, having an easy land application, and reducing costs. In this study, nonwoven geotextile was used to investigate the unconsolidated-undrained triaxial behavior of clayey soil. The experimental results showed that the strength of the soil was improved by geotextile reinforcements. The maximum deviator stress of unreinforced soil increases as a result of geotextile reinforcements. The reinforced samples had better strength at higher strain. The degree of correlation between the failure strength and other factors, such as confining pressure and the number of geotextile layers, was also evaluated using the Gray correlation analysis. According to Gray correlation analysis, the influence of the number of layers of geotextile and confining pressure on the failure strength was revealed.

KEYWORDS - Clay soil, Unconsolidated-Undrained Triaxial test, Number of geotextile layers, Gray correlation analysis

AHP AND GIS BASED SITE SELECTION FOR MEDICAL WASTE DISPOSAL FACILITY KAHRAMANMARAS TURKOGLU DISTRICT

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ABSTRACT

The selection of medical waste disposal (MWD) facilities is crucial for public health and the environment. In this study Multi-Criteria Decision Making (MCDM) is used as integrated with Analytic Hierarchy Process (AHP) to find optimum sites for the MWD facility in Turkoglu district. Six factors were selected and weighted with AHP for suitability criteria. The Geographical Information System (GIS) was used for the spatial analyses and visualization of results. According to the final suitability map, the most suitable, suitable, less suitable, and protected areas were found. As a result of the study, three alternative sites were proposed for the MWD facility in the Turkoglu district, Kahramanmaras (Turkey).

KEYWORDS - AHP,GIS,MCDM,Site selection

REAL ESTATE VALUATION WITH REGRESSION ANALYSIS THE CASE OF MERAM DISTRICT OF KONYA PROVINCE

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ABSTRACT

Real estate valuation is the estimation of the value of a real estate by taking into account the factors affecting the value and market conditions. Real estate valuation procedures should be carried out in an impartial and scientific manner using accurate data. In this study, Meram district of Konya province was determined as the study area. The data of one hundred real estates in the study area were obtained with the help of online real estate sites. The factors affecting the value of the real estate were determined as area, number of rooms, age of the building, floor location, number of floors, building type and bathroom. Multiple linear regression analysis was used to determine the real estate value. The performance analysis of the method used was tested with the R2 value and this value was calculated as 0.85.

KEYWORDS - Real estate valuation,factors affecting real estate value,multiple linear regression

DEVELOPING A NOVEL PHOTOGRAMMETRY METHODOLOGY IN CULTURAL HERITAGE DOCUMENTATION MARDIN MELIK MAHMUT MOSQUE

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ABSTRACT

Preservation, documentation and dissemination of historical buildings as the tangible examples of cultural heritage has never been more significant than today in the Information Age. Yet, historical buildings are under the constant threat of damage and destruction due to many factors, such as deterioration of materials and structure, natural disasters, misuse, and vandalism. To reduce the risk of the loss of historical buildings, it is highly essential and required to develop robust research methodology about the effective documentation of tangible heritage. The design of practical documentation processes, which are cost-effective and time-saving, is one of the challenges of the most recent research in the field in which the use of photogrammetry increases. Although photogrammetry has been in use for a long time, there has been recent advancements and improvements in the methods and the tools deployed to digitally record 3D data from physical environments, such as historical sites. The recent advancements solve the issues of computationally expensive processes of photogrammetry while preserving the level of accuracy and detail. This research applies one of the recent photogrammetry techniques available in the field in the context of the documentation of a historical building in Mardin, which is the Melik Mahmut Mosque constructed in the Artuqid period in the 14th century. One of the objectives is to disseminate the use of the novel photogrammetry methods integrated into the studies of the preservation, documentation and conservation of historical buildings as cultural heritage. The methodology is built on the use of mobile recording techniques that guarantee the required level of accuracy with visual and geographical data based on high-definition images. The research shows how effective the used photogrammetry technique is in surveying on site to record necessary data in limited time. The paper demonstrates how the representation of the 3D models are processed in the photogrammetric modeling software of Agisoft's Metashape following the steps of recording on site. The results present how the used photogrammetry technique generates computational inexpensive, practical, fast and comprehensible digital data for the 3D representation and visualization in the context of cultural heritage documentation. With the use of an effective and contemporary method that produces satisfactory accurate results, the research contributes to the knowledge production about the understanding of the conditions that impact the preservation of historical buildings.

KEYWORDS - Cultural heritage, documentation, historical building, photogrammetry,Artuqid

STRUCTURAL BEHAVIOR OF STEEL BOLTED CONNECTIONS HAVING DIFFERENT TYPES OF CORROSION DAMAGE

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ABSTRACT

Today, the use of steel structural systems is increasing rapidly due to its features such as high strength, fast manufacturing and ductility. Despite to the superlative properties of steel material, there are also some disadvantages. One of the most important of these disadvantages is the formation of corrosion. Corrosion is the physical and chemical deterioration of metals or metal alloys under environmental effects. Corrosion damage in steel structural systems, especially in the connection regions, is of great importance. A major damage to the structural members or fasteners in the connection regions can cause serious harms to the structure. In this study, the structural behavior of 6 mm thick bolted joint plates having different corrosion damages which were made of S235 grade steel was investigated experimentally under the effect of axial tensile force. For the bolted connection test specimens three types of corrosion formation methods including accelerated corrosion only on the bolt, accelerated corrosion on both the plate and the bolt, and artificial corrosion damage only on the bolt were applied. The amount of corrosion was formed as uniform or artificial corrosion with a loss of material of 10% by mass. At the end of the experiments, structural behavior differences, changes in bearing capacity and ductility of bolted connected test specimens having different types of corrosion damages were investigated and the most ductile behavior were obtained in test specimens with corrosion on both plate and bolt.

KEYWORDS - steel, bolted connection, corrosion, tensile strength, ductility

CONSTRUCTION KNOWHOW AND CONDITIONS DUE TO STRUCTURAL AND ARCHITECTURAL RESTORATION OF A HISTORICAL TOWN CENTER INN

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ABSTRACT

The structural and architectural functions of historical buildings are disrupted due to natural and man-made hazards. Even at their severely ruined state, these buildings still keep their cultural and historical values. Complex structural system and load transmission mechanism of masonry historical assets becomes more unpredictable, when the building is in a ruined or partially collapsed state. In such cases, delayed or inappropriate structural strengthening decisions may change the structural behavior of the building, causing further damage or total collapse. Alacahan is a stone masonry building, located in the center of the commercial district of Trabzon. The building, dated around 18th century, was originally functioning as an inner city inn. Building was severely neglected and totally abandoned for decades. Various means of commercial activities and spatial needs caused major changes in the structural system of the building. These interventions gathering with negligence and damage, effected the structural performance of the masonry system in a very negative manner. Eventually Alacahan collapsed partially in February 2012 without any seismic impact. This study examines how the special construction techniques applied within the scope of the structural and architectural restoration projects of Alacahan building improve the deteriorated structural integrity. The expected failures, corresponding preventive and controlling repairs, and strengthening measures are also be discussed in the article. Guidelines for construction knowhow and conditions due to structural and architectural restoration works are also included to provide an example to the assessment works that aim to improve the structural performance of Alacahan.

KEYWORDS - Historical Buildings, Masonry, Structural Repair, Structural Intervention, Architectural Conservation.

AN ASSESSMENT ON THE FACTORS AFFECTING THE CONSTRUCTION SECTOR IN THE LIGHT OF CURRENT DEVELOPMENTS

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ABSTRACT

The construction sector has made great progress on a global scale thanks to the growing economy and developing technology in the past decades. As the sector naturally affects other business lines, this situation also had positive effects on the general economy. However, especially in the last year, various epidemics, wars, terrorist environments have caused deterioration in energy and raw material supply, and this has led to problems that should be taken seriously in the construction sector. Within the scope of this study, a survey was conducted with 221 participants selected by random sampling from the project, company, field managers, who are known as the decision makers in the construction sector, and the participants were asked to evaluate the impact of current developments on the construction sector. Evaluations were analyzed with various statistical tools and remarkable results were obtained. With the results obtained, various suggestions were presented and it was discussed how this difficult process of the construction industry could be overcome with the least damage.

KEYWORDS - Construction sector, Statistical Data, Factor Analysis

ANALYTICAL AND NUMERICAL STUDY OF THE BEHAVIOR OF PILES SUBJECTED TO STATIC AND DYNAMIC LOADING

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ABSTRACT

This research is devoted to a parametric study on a pile made of different materials, and subjected to static and dynamic loading resulting from the weight of the structure and the shear force acting on the head of the pile. It is worth specifying that the pile is anchored in the ground on a Winkler-Pasternak elastic foundation that is made up of five different layers. In this study, the equilibrium equations were treated using the high-order theory with a new shear deformation shape function of a cylindrical pile made of an isotropic material and a sandwich functionally graded material. A numerical study based on the minimization of energies by the Rayleigh-Ritz method was carried out in order to highlight the influence of the geometric ratio, the volume fraction of the functionally graded material, and the type of loading on the vibration frequencies and the admissible stresses in order to determine the most appropriate material for the pile so that extreme stresses can be absorbed. The results obtained in the present work, which is based on different parametric studies, were then compared with those reported in previous work available in the literature. It turned out that these results are in good agreement with each other, for the different materials used and for all boundary conditions considered.

KEYWORDS - Pile,shear force,Winkler-Pasternak elastic foundation,Rayleigh-Ritz method,numerical study,vibration frequencies.

STRUCTURAL AND FIRE PERFORMANCE OF COMPOSITE SLAB SYSTEMS PROTECTED BY INTUMESCENT COATING

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ABSTRACT

Composite flooring systems, which have become increasingly common in recent years, are favored due to their ability to accommodate high volumes, especially in multi-story office buildings. In addition, composite flooring is commonly used in the rehabilitation or reinforcement of historic structures, as well as in the construction of new buildings, because it is far lighter than ordinary concrete floors. Due to the structural benefits it provides, including fire protection and thermal insulation, it is frequently used in structures with high building importance coefficients (schools, hospitals, etc.). In this study, the potential parameters that affect the performance of composite flooring in a fire were determined to be span length (short or long) and whether or not the sections are fire protected. It has been investigated to what extent these characteristics influence the behavior of a composite floor under Standard (ISO 834) fire conditions. Using Eurocode design equations and the Excel application to conduct analyses, a new mathematical model was constructed. A passive fire protection material was placed on the steel beam under the composite floor, and beam temperature analyses were conducted at different beam sections. As a result of these analyses, both their original strength (S255) and elasticity (200 GPA) modules had dropped to 4%. Tensile membrane action has taken place in long-span slabs as the amount of displacement (vertical displacement) in these slabs will be substantially greater than in short-span slabs. This scenario significantly increases the load-carrying capacity. Short-span slabs were not found to establish a membrane function.

KEYWORDS - Composite floor, Fire performance ,Standard (ISO 834) fire

ARCHITECTURAL RESEARCH OF THE INTERACTION BETWEEN THE STRUCTURAL SYSTEM OF BUILDINGS AND CURTAIN WALL AN ANALYSIS ON SELECTED BUILDINGS IN ANKARA

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ABSTRACT

In recent years, with the engineering technology developing day by day, the building typology which is a form of expression of prestige and power is high-rise buildings. In these structures, curtain walls, which act as a shell, are used to separate the building from the outside atmosphere. Curtain walls are self-supporting systems, which can be opaque or transparent depending on their location and function, can be composed of different materials, but mostly glass is used and formed by the combination of building elements. The height of the building, its location, the purpose of use and the structural system of the building are the factors affecting the design of façades in high-rise buildings. The most important of these factors in high-rise buildings is the type of the structural system. In this study, the structural systems of high-rise buildings were examined and the façade-structure interaction was discussed on some buildings in Ankara, taking into account the structural system-curtain wall diversity. As in the examples in the world, the evaluation has been made by considering the compatibility of a curtain wall with the texture of the city, its safety, ease of use, its technological form, its efficiency, interaction with the environment, and insulation status. This study will strengthen the façade-structure perception of the designers by considering the high-rise buildings with different load-bearing systems together with the curtain wall and their diversity.

KEYWORDS - Structural analysis, High-rise buildings, Façade, Curtain wall,Structural system

DREDGING WORKS OF THE MEDJERDA RIVER TUNISIA FLOOD ANALYSIS AND SIMULATIONS

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ABSTRACT

The city of Boussalem, located in the north of Tunisia, is among several Mediterranean regions most confronted with flood phenomena. These floods are sudden onset and often difficult to predict because this area is crossed by the Medjerda river, which is the longest river in Tunisia. The Tunisian government is currently deploying means to anticipate and tackle this phenomenon. Dredging work on the Medjerda river and some of its tributaries began in 2015 in order to limit this damage, and to protect the bordering cities from flooding. In this work, 1D-2D coupling methodology was developed using the HEC Ras software for different scenarios before and after dredging works. This was done from two topographic missions recorded before and after dredging works, and for different return periods to assess the flooding risk and the dredging works impact. Three scenarios were developed corresponding respectively to return periods of 10, 50 and 100 years. Using the statistical adjustments made by Gumbel's law from the rainfall series of the city of Bousselem, the 2003 flood hydrograph was assigned to the 10-year return period, a reconstructed chosen maximum flow hydrograph corresponding to the 50-year event, and the 1973 flood hydrograph to the 100-year event. Subsequently, a comparison was made between the flooded areas observed in 2003, and those simulated for the same event, but with the current state, i.e. after completion dredging works. According to the results, a significant reduction in the area flooded in the city of Boussalem was observed after the dredging work for the 10-year return period. This clearly showed the improvements made following this work, and their important role in flood management. In addition, the flood risk maps produced after the dredging works, provided indications about the areas that could be flooded for a return period of 10, 50 and 100 years, and that respectively covered 1025 ha, 3282 ha and 4289 ha. These areas present a low hazard for the first two events, where more than 50% of their area will be submerged in water depths of less than 1 m. The results also indicated that the most vulnerable areas to floods of the 10-, 50- and 100-year return periods were agricultural land even after the dredging works.

KEYWORDS - Flooding, 1D/2D Coupling, Simulations, Dredging work, Medjerda river

INVESTIGATION OF THE EFFECTS OF LIME SILICA FUME AND FLY ASH ADDITIVES ON THE ATTERBERG LIMITS OF HIGH PLASTICITY CLAY

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ABSTRACT

Improving the swelling and shrinkage properties of problematic soils in various parts of the world is an important research topic in engineering applications. In recent years, industrial side products have been frequently used to improve the engineering properties of problematic clay soils and both environmental and economic benefits have been obtained. In this study, the effect of different additives on the Atterberg limits of high plasticity clay soil was investigated. Different ratios of lime (L), fly ash (FA) and silica fume (SF) were added to the clay soil. Liquid limit and plastic limit tests were carried out according to ASTM D4318 standard on the samples prepared with and without additives. As a result, it was determined that while the liquid limit value of clay soil decreased with the addition of lime, fly ash and silica fume, the plastic limit value increased. Among the additives used, it was determined that the most effective additive material on the Atterberg limits was lime.

KEYWORDS - High plasticity clay, Lime, Fly ash, Silica fume

NONLINEAR SLOSHING RESPONSE OF LIQUID FILLED REINFORCED CONCRETE RC ELEVATED WATER TANK UNDER SEISMIC EXCITATION

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ABSTRACT

The current study is mainly focused on the nonlinear sloshing analysis of reinforced concrete (RC) elevated water tanks subjected to earthquake ground motions. The Smoothed Particle Hydrodynamics (SPH) method is used to obtain water pressures on the tank wall. By using this numerical method, nonlinear modeling of the water in the tank can be made. Thus, the hydrodynamic water pressures occurring on the reservoir wall of the RC elevated water tank were calculated depending on time. Numerical analyses were performed for both half-filled and full tank. As a result of the study, the hydrodynamic water pressures formed on the reservoir wall with the effect of ground motion were compared.

KEYWORDS - Sloshing, Smoothed Particle Hydrodynamics(SPH) Method, Elevated Water Tank

MODELING AND ASSESSMENT OF GROUNDWATER POTENTIAL AND QUALITY OF SANLIURFA BASIN MODELING AND EVALUATION WITH GIS AID AHP METHOD

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ABSTRACT

General information on the use of geophysics for the determination of groundwater potential and quality within the provincial borders of sanlİurfa is given. Analytical Hierarchy Process (AHP) method, which is one of the GIS supported Multi-Criteria Decision Making Methods, is the method that provides the most information in groundwater researches and therefore is the most used method. Ten parameters such as precipitation, slope, aquifer (hydrogeology), soil type, land use, geology, geomorphology, drainage density, fault density, and land structure will be used in the study. First, thematic maps of these 10 parameters will be created and then their reclassification will be obtained. Then, methods and groundwater potential region map will be produced and evaluated in the study.

KEYWORDS - Groundwater potential and quality, GIS, MCDM, AHP method

EVALUATION OF DIFFERENT MESH TYPES OF STEEL ROOF TRUSSES ACCORDING TO AISC360 16 CODE

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ABSTRACT

Steel roof trusses are a frequently used element for carrying roof cover in industrial type structures. Roof trusses are generally preferred for long spans that cannot be designed with standard sections. These load bearing members can be created using many different types of mesh. In recent years, it has been observed that there are damages in the steel roof trusses due to heavy snowfall, especially in industrial buildings. Therefore, it is important to design these members safely and economically. In this study, roof trusses with 24 m span, 0.8 m side and 3.2 m ridge height were investigated for 5 different mesh types. A total of 20 analyses were performed for 4 different purlin distance using the SAP2000 program. The American Steel Structures Regulation (AISC360-16) was used for the member design of these 20 roof trusses, whose external geometric dimensions are the same. As a result, the most economical roof truss type and purlin distance were determined by comparing the roof truss weights obtained from the design. Minimum cross sections and minimum total weight were obtained for warren truss mesh type with 2.4m purlin distance.

KEYWORDS - Steel structure, industrial building, roof truss, AISC 360-16, LRFD

COMPARISON OF JASON 3 TEC WITH GLOBAL IONOSPHERE MAP GIM

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ABSTRACT

Besides the GNSS technique, alternative data sources are used in studies related to the ionosphere. One of them is altimeter missions. Altimeter missions started with TOPEX/Poseidon and continued with Jason-1, Jason-2, and Jason-3. These satellites provide many parameters including Vertical Total Electron Content (VTEC) values in ocean regions. In this study, Jason-3 VTEC data were compared with Global Ionosphere Maps (GIMs) in different ionospheric conditions. In the comparison, GDR, IGDR, and OGDR products of Jason-3 were taken into consideration. The results showed that the VTEC values obtained from the GDR, IGDR, and OGDR products were close to each other, and the differences with the GIM varied according to the conditions in the ionosphere.

KEYWORDS - GIM,JASON,GDR,IGDR,OGDR,VTEC

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