SELCUK UNIVERSITY
FACULTY OF TECHNOLOGY

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INTERNATIONAL CONFERENCE ON ENGINEERING TECHNOLOGIES

November 18-20, 2021

Konya/TURKEY

ABSTRACTS BOOK

Editor
Prof. Dr Sakir TASDEMIR

E-ISBN: 978-625-44427-6-6

International Conference on Engineering Technologies

5th International Conference, ICENTE
Konya, Turkey, November 18-20, 2021

Abstracts

Editor
Sakir TASDEMIR

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PREFACE

International Conference on Engineering Technologies (ICENTE'21) was organized in Konya, Turkey on 18-20 November 2021.

The main objective of ICENTE'21 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 face to face 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)
- Open Journal of Nano (OJN)
- Selcuk University Journal of Engineering Sciences (SUJES)

At this conference, there are 267 paper submissions. Each paper proposal was evaluated by two reviewers. and finally, 205 papers were presented at the conference from 13 different countries (Albania, Cyprus, United Kingdom, Georgia, Morocco, Macedonia, Mauritania, Mexico, New Zealand, Pakistan, Poland, Tunisia, Turkey) with 134 local and foreign universities and organizations participating,

In particular, to Selcuk University Rector Prof. Dr. Metin AKSOY; we would like to thank the 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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CONTENTS

EVALUATION OF ARTIFICIAL HEART PUMPS FROM AN ENGINEERING PERSPECTIVE

NAZLIHAN KILICASLAN[1] , KADIR GOK[2] , AKIL BIRKAN SELCUK[3]

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ABSTRACT

Today, circulatory system diseases are a very big problem. When circulatory system problems cause heart failure, the heart becomes unable to pump the blood needed by the body, and the cells begin to not receive enough nutrients and oxygen. In such cases, heart-supporting devices or total artificial hearts are used, depending on the functioning of the heart. Different types of designs of artificial heart pumps that perform this process are encountered. In few designs in practice, the structure of the blood may deteriorate as a result of few reactions in the blood in the hemodynamics that occurs with the mechanical effect while pumping the blood and at some points, the blood may enter turbulence and cause flow problems. In addition, undesirable turbulence can cause erosion corrosion in the blades of the artificial heart pump. Choosing the appropriate blood pump in the artificial heart is important for the smooth flow of blood. In the pump we will use, it is very important to be able to choose the pump type correctly, as the mechanical properties of the pump will affect the form of the flow. Considering the studies done for this, we will analyze the pump types that are used and can be used by using Computational Fluid Dynamics (CFD) and finite volumes/elements methods. In this way, we will be able to choose the most suitable pump type. When choosing a blood pump, in addition to its mechanical properties, considering the shear stresses caused by the blood flow and other forces that may act on the pump, the inlet-outlet pressures of the blood to the pump and the pressures it will exert on the vessel walls, the effect of the pump dynamics on the blood cells, whether it will cause any toxic effects (biocompatibility) are ver important in terms of regular and stable operation of the pump and maintaining the health balance of the human body.

KEYWORDS - artificial heart pump,blood circulation,CFD,finite elements,finite volume method

CLASSIFICATION OF NONALCOHOLIC FATTY LIVER DISEASE FROM ULTRASONOGRAPHY IMAGES

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ABSTRACT

Fatty liver is a condition that describes the accumulation of triglycerides within hepatocytes. The fact that Non-alcholic steatohepatit (NASH) can progress to more severe pictures such as steatohepatitis, cirrhosis and hepatocellular cancer, in addition to the simple form of steatosis, increases the importance of early diagnosis. Today, the basic standard for the diagnosis of NASH and the determination of the amount of fat is liver biopsy. Liver biopsy represents approximately 1 in 50,000 of the liver. It is obvious that this situation may cause incorrect evaluation of the amount of lubrication, especially in cases where heterogeneous lubrication can occur. It is known that even the difference in the angle, sample length and number of liver biopsy can affect the evaluation. In addition to these, the procedure includes many potentially invasive minor and even major complications including death. Such reasons have brought forward imaging methods in the diagnosis and follow-up of the disease. These include ultrasonography, computed tomography and magnetic resonance imaging methods. This study was designed to be used as a medical decision support system for medical authorities, mostly internal medicine, radiology, gastroenterology specialists, who are doing clinical studies on fatty liver disease. In addition to the advantages of using artificial intelligence techniques in determining the degree of fatty liver in terms of time, cost and avoidance of invasive methods, it is aimed to make an important contribution to physicians who have little experience in this disease. The study was conducted with liver ultrasound images of 410 patients, 18-70 years old, male and female, and healthy people. In the created model, 82.5% accuracy was obtained as a result of the classification of images using deep learning.

KEYWORDS - Deep Learning,Nonalcholic Fatty Liver Disease,Classification,Artificial Intelligence

EFFECTS OF DIFFERENT PULSED ELECTRIC FIELD PEF PULSES ON CONTROLLED RELEASE BEHAVIOUR OF ALGINATE HYDROGELS

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ABSTRACT

Hydrogels are three-dimensional polymeric networks to be used as delivery vehicles for therapeutic agents, bioactive components in both biomedical and food applications. Although use of food grade polymers have so many advantages such as production of non-toxic, biodegradable and biocompatible designs, they have some limitations due to their low loading capacity, poor release behaviour or insufficient physicochemical properties when compared to synthetic ones. Thus, there are several ways to improve their functionalities. Enhancement of gel composition with multiple polymers or alteration of individual polymer structures (via ultrasonication, chemical modifications, etc.) could be given as examples to manipulate natural polymer based gel features. Despite of conventional techniques, there is still need for new techniques to improve release behaviour and physicochemical properties of hydrogels. Pulsed Electric Field (PEF), application of pulses of high voltage to foods/polymers, is among the novel technologies but there is lack of studies for modification of food hydrocolloids by PEF. Alginate is one of the commonly used natural polymer in hydrogel design. The objective of this study was to see the effect of PEF treatment with varying pulses on physical and release properties of alginate hydrogels. Aqueous alginate solutions (1%) were PEF-treated (Elea, PilotTM equipment) at various specific energy values of 50, 200 and 600 kj/kg. Each solution was then loaded by pomegranate concentrate (PC) (5 %) as a bioactive agent and crosslinked with calcium ions for gel formation. PC release from PEF un/treated cylindrical hydrogels were investigated at distilled water (pH 7) at predetermined time intervals (15, 30, 45, 60, 90, 120, 360 min) under room conditions. Viscosity and pH of each gel solutions were also recorded. According to the results, lower specific energy applied (50 kj/kg) displayed a remarkable high PC release as compared to untreated gel, while extremely high intensity PEF treatment (600 kj/kg) impaired new interactions within alginate gel matrix and caused to loose action of PEF ($p < 0.05$). This study revealed that PEF treatment could be used to manipulate hydrogel release systems by optimising process parameters depending on target release medium condition such as pH, target agent and hydrogel formulation.

KEYWORDS - Hydrogel, Pulsed Electric Field, natural polymer, controlled release

DEVELOPMENT OF VOLATILE BIOSENSORS BASED ON NANO LIPOSOMES AND NANO DISCS

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ABSTRACT

Herein we present a novel concept of biosensors based on odorant receptor proteins (ORs) for detecting volatiles. As OR proteins are small in size and contain functional groups, they can easily be implemented into nano-vehicles. These vehicles aim to 1) increase the stability of the protein and 2) provide sufficient support to ease the surface immobilization. In this study, Or proteins were inserted into nano-liposomes and nano-discs. Then, obtained nano-vehicles were immobilised on surfaces such as gold (Au) electrodes. Sensors were challenged over high and low responding target molecules where electrochemical impedance spectroscopy (EIS) was utilised for electrical transduction of sensing events. We have then developed a prototype that we can employ disposable Au chips for miniaturisation and enable multiplexing for the detection of multiple targets at the same time. Our studies have demonstrated that both femto-molar level detection of odorant molecules, high selectivity and miniaturisation of developed sensors which herald on-field applications in future.

KEYWORDS - Biosensors, Microchip fabrication,Nanodiscs, Liposomes

INFLUENCE OF HYPERICUM PERFORATUM L OIL ON A PROTEIN BASED BIOMATERIAL

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ABSTRACT

Hypericum perforatum L. (HPL) is a plant extract which has diverse range of applications from food industry to biomedical research. In this study, HPL oil, which can also be used for minor wounds treatments, is incorporated in plasticized gelatin based films for biomedical applications. Therefore, the aim of this study is to investigate morphological, structural and thermal properties of plasticized gelatin films containing different amounts of HPL oil. Moreover, water uptake and water aging of the material were also determined for potential biomedical applications such as a wound dressing material. Homogenous films were obtained when 1-3% Tween 80 was used in less than 10% HPL oil containing gelatin films. FTIR analysis showed presence of ester bonds and bonding between protein and oil content. Thermal analyses by DSC showed the change of thermal properties of gelatin films when HPL oil was incorporated. Water uptake of the plasticized gelatin films were influenced by 80% when contained increasing amount of HPL oil. Water aging of the gelatin based films decreased ~10% due to presence of HP oil.

KEYWORDS - Hypericum perforatum oil, biomedical ,gelatin

NANOFIBER BASED TISSUE SCAFFOLDS

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ABSTRACT

Tissue scaffolds are the medical materials that support the formation of new cellular structures rather than cells damaged by any disease, injury, or innate damage. The global tissue scaffolds market stood at around USD 610.00 million in 2015 and USD 969.00 million in 2019 is projected to grow at a CAGR of 9.05% from 2020 to 2027. Tissue scaffold technology, which has become a new and rapidly developing sector, has been affected by the continuous and rapid development of tissue engineering and applications in recent years and a new product is released every day. With this technology, it is possible to investigate the response of the tissues to a certain drug, as well as the replacement, renewal and restoration of diseased and defective organs or tissues. Thus, pharmacodynamic and toxicology studies can be performed more easily in order to optimize the drug development and research process. There are many different types of biomaterials that can be used as tissue scaffolding as hydrogels, polymer scaffolds and micropatterned surface microplates and nanofiber based scaffolds. The high surface area to volume ratio of the nanofibers favors cell proliferation, and the formation of three-dimensional cellular colonies. Nanofiber scaffolds are excellent materials for mimicking the extracellular matrix. In this study, production methods and application areas of tissue scaffolds produced from nanofibrous surfaces were examined and their usability for therapeutic purposes was evaluated.

KEYWORDS - tissue, scaffold, nanofiber, medical, biomaterial

AIR PERMEABILITY PROPERTIES OF COMMERCIAL DISPOSABLE MASKS

SERIFE SAFAK[1]

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ABSTRACT

Nowadays, the Coronavirus Disease 2019 (COVID-19) has become a highly contagious global public health problem causing serious and deadly health problems. With the coughing, sneezing, or speaking COVID-19 can spread through droplets and aerosols. Thus self-protection has become very important to avoid contracting the disease. During the Covid-19 pandemic, disposable face masks have been recognized as the most important personal protective equipment for the prevention of the COVID-19 virus. Disposable face masks are produced from generally polypropylene, polyethylene or polyester polymers with different non-woven fabric structures. We can define a face mask as a composite nonwoven structure. Composite nonwoven structures produced by mixing different fibers or combinations of different non-woven structures. Combination of different nonwoven structures, improve the functionalities of nonwovens. Spun- bond (S) and melt blown (M) nonwoven structures are mostly used for creating new composite nonwoven structures. Disposable face mask is a 3-ply SMS non-woven composite structure. But many different non-woven ply varieties such as 2, 4 and 5 are found in the market. For effective protection, masks must meet the criteria specified in the standards as bacterial and particle filtration efficiency, air permeability, fluid resistance and flammability. This study focuses on the air permeability properties of commercial face masks with different plies. In addition, texture, fiber composition and water absorption properties are evaluated.

KEYWORDS - disposable, face mask, air permeability,COVİD-19,non-woven

THE PHYSIOLOGICAL EFFECTS OF NOISE IN UNDERGROUND MINING ON WORKER HEALTH

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ABSTRACT

In our country, due to the labor force capacity of mining has a large scale and the time and economic values are at the forefront also their usage areas have been very large, have brought about high-level usage of machinery and equipment too. In today's mining sector, due to the use of mining machinery, excessive noise pollution is encountered during the operation and it is not possible to work in a noise-free environment. This study, it was aimed to determine the instantaneous noise exposure of workers exposed to noise in the underground mining sector and the physiological effects on worker health during noise exposure. Studies evaluating the noise level that workers in underground mines are under the influence of, its effects on quality of life, and the compliance of noise exposure level according to standards are almost non-existent for our country. In this context, blood pressure and oxygen saturation (saturation), pulses, respiratory rates, electrical activities of the brain, and electrical activities of the heart were measured at periodic intervals under the noise of 100 people who work or will work in the underground mining sector. As a result of these measurements, the noises that workers working in underground mining are exposed to in different working areas have been determined. In addition, the physiological effects of noise on the worker were determined by comparing the values collected in noiseless and noisy environments.

KEYWORDS - Mining Industry, Physiological Effects, Noise Analysis, Worker Health

MEASUREMENT ACCURACY OF THIN FILM PRESSURE SENSORS AT DIFFERENT SIZES

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ABSTRACT

Thin-film pressure sensors where many different types and sizes are available are frequently used to measure the plantar pressure of the foot. Although the sensing diameters of these sensors have been determined, the accuracy of the contact area and pressure measurements has not been tested under the same load applied to the sensors of different sizes. This study is proposed to determine the accuracy of sensors for different sizes and types under the same standard conditions. Measurements were made on a hard polyethylene ground using 3 different sizes (6 mm, 18.3 mm, 26.5 mm) sensors, with hard (3 mm plastazote) and soft material (3 mm polyethylene) coating using a 2 kg weight. Arduino board was used to collect the resistance value and calculate the reciprocal resistance. 15 measurements were made on each floor with each sensor. Our results showed that there was a difference between the measurements of thin-film pressure sensors after covering the sensors for different sizes with hard and soft materials ($p<0.05$). In particular, it was observed that the 18.3 mm sensor did not measure as a result of coating it with polyethylene. It is concluded that, measurements should be made with a softer floor covering, not a hard floor for 18.3 mm thin-film pressure sensor. In addition, the measurement of the sensors at the same loading level after hard and soft material coating also differ and higher values are obtained covered with soft material. This shows us that the accuracy of the measurement increases. Although both material coatings responded to loading, higher values were obtained for plastazote using 6 mm and 26.5 mm sensors. As a result, it is observed that the size of the sensor and the type of the material used between the sensor and the load are important in the measurements of the thin film pressure sensors.

KEYWORDS - Thin Film Pressure sensor, accuracy, calibration, foot plantar pressure.

MEASUREMENT ACCURACY OF THIN FILM PRESSURE SENSORS AT DIFFERENT SURFACES

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ABSTRACT

Pressure sensors are rapidly used in different areas such as compression garments as well as plantar foot pressure measurement with the rapid introduction of them into the field of health. For this reason, tests related to the measurement of sensors in different ground and conditions are important. In this study, it is aimed to test the measurements of the pressure sensor under loading conditions with different coating materials and different contact surfaces. The subfloor of the experimental setup was formed with 3 mm polyethylene hard material. Measurements were made by long-legged, circular, flexible, thin-film pressure sensors with a diameter of 18.3 mm (RP-C18.3-LT) without any material and with 5 different materials (3 mm plastazote, 7 mm plastazote, 4 mm wood, 3 mm polyethylene, 0.1 mm velostat) on it. Plastazot is a low temperature thermoplastic, polyethylene is a high temperature thermoplastic and velostat is a pressure sensitive foil. Three same type of sensors were used to test the measurement accuracy of the sensors and to increase the re-measurement rate. Measurements were made for each material 5 times. 2 kg metal weight which has a convex and circular contact area and a pinchmeter device with a flat contact area was used for the measurement standardization on different coating surfaces. The pinchmeter device was adjusted to the kg measurement unit and a 2 kg load was applied with the help of a finger. Pressure was applied to the sensor and Arduino board was used to collect the resistance value and calculate the reciprocal resistance. No pressure change occurred when any material coating or pinchmeter device was placed on the sensor. Our results show that when the sensors are covered with a hard material such as polyethylene or wood under loading conditions with different contact area at equivalent load, the measurement accuracy fails with flat and hard loading. On the other hand, pressure distribution is better loading with an oval contact surface. This highlights that thin-film pressure sensors can be used in the human body, especially with variable loads on the contact surface such as feet, and it is appropriate to use sensors by coating them with softer materials such as plastazote.

KEYWORDS - - Thin Film Pressure sensor, accuracy, calibration, foot plantar pressure.

DEEP LEARNING MODEL BASED CLASSIFICATION OF BREAST CANCER USING HISTOPATHOLOGICAL IMAGES

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ABSTRACT

Breast cancer is one of the most common cancer types and it begins to grow out of control in the cells of breasts. The early stage diagnosis and treatment of breast cancer can significantly reduce the mortality rate. Therefore, automatic computer-aided histopathological image classification plays an important role in accelerating diagnosis and improving its quality. In this study, publicly available BreaKHis dataset, that includes 7,909 microscopic images (2,480 images for benign and 5,429 images for malignant breast tumors) using four different magnifying factors (40X, 100X, 200X and 400X), was investigated. Five different pre-trained deep learning models (AlexNet, InceptionV3, NasNet Mobile, ResNet50 and Xception) were used for the classification of breast cancer. BreaKHis dataset is divided into three different datasets as 70% train, 15% test and 15% validation. Batch size was set to 16 and 30 epochs were implemented in training of all models. According to all results obtained, NasNet Mobile model achieved higher classification performance compared to AlexNet (89.13%), ResNet50 (96.71%), InceptionV3 (97.38%) and Xception (97.64%) models, respectively with an accuracy of 98.14%. The application of automatic deep learning tools, which can be highly accurate in predicting breast cancer disease, will help diagnose the disease in its early stages and thereby increase the chance of successful treatment and survival.

KEYWORDS - Breast Cancer, BreaKHis, Histopathological Images, Deep Learning, AlexNet, InceptionV3, NasNet Mobile, ResNet50,XCeption

DESIGNING A SYSTEM THAT RECORDS THE SLEEPING POSITION DATA OF SLEEP APNEA PATIENTS

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ABSTRACT

Sleeping positions have a significant impact on exposure of apnea patients to sleep apnea. In this study, the sleeping position of the patient was read with the STM microcontroller by using the body position sensor (SleepSense 1/8" Plug DC Body Position Sensor Kit) produced by the sleep sense company. This sensor produces results with analog signals between 0-2V. This analog signal was read using the ADC feature of the microcontroller. This signal read by the microcontroller was sent to the computer via the USB port. The C# software prepared on the computer reads the data from the microcontroller and saves this data and the arrival time of the data to the bit TXT file. The data in this TXT file is ready to be evaluated by signal processing methods. These data, together with other data obtained from the polysomnography device, can be used to learn the body position of the patient at the time of apnea.

KEYWORDS - Sleep apnea, body position sensor, STM microcontroller, ADC, USB

EEG BASED AUTOMATIC SLEEP STAGING VIA SIMPLE 2D CONVOLUTIONAL NEURAL NETWORK

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ABSTRACT

Sleep disorders has high prevalence and cause various health problems. For the diagnostics of these disorders and assessment of the sleep quality many physiological data are collected using polysomnogram (PSG) method. The most important PSG data is the EEG recorded from the brain during sleep. Rechtschaffen and Kales (R&K) categorized sleep into six distinct stages and a long night sleep consists of repetitions of these stages. Analysis of the hours of sleep EEG data by experts is an onerous task which requires high attention. Recently, many automatic sleep staging classifiers using EEG are developed in order to prevent human error, and to provide a quick objective analysis. They use machine learning techniques and predict the sleep stage of each EEG epoch. Compared to traditional machine learning, deep learning which requires no hand-crafted feature extraction was able to classify sleep stages better. For time series data 1-dimensional CNN structures are investigated for automatic sleep stage classification. In an alternative method, 2D images are generated from time series which are converted into spectrogram by short time fourier transform (STFT) or into scalogram by continuous wave transform (CWT) methods. These images are classified by 2D CNN structures of many layers. In this study time series data is directly reshaped into a 2D structure and it is exploited in a 2D CNN based deep learning method with a low number of layers. It is trained and tested on data from physionet sleep-edfx dataset. An accuracy of 82.48% and a Cohen's Kappa value of 0.74 are obtained. These are comparable to the values in the literature. Therefore, this is a unique approach utilizing a simple 2D CNN with a small number of layers and possible advantages.

KEYWORDS - EEG, SLEEP STAGING,DEEP LEARNING,CNN

COMPARISON OF BULK AND ALTERNATIVE POROUS FIXATION PLATE USED IN FRACTURE FIXATION IN TERMS OF FAILURE PROBABILITY

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ABSTRACT

Conventional fixation plates that are permanently placed on the body may cause some adverse effects such as stress shielding and aseptic loosening due to their contact with the bone. As a result of the contact of the bulk fixation plates with the bone surface, blood flow is prevented and necrosis formation is observed on the contact surface. In recent years, porous implants have been used to minimize these mechanical and biological negative features brought about by conventional implants. In the deterministic approaches that are generally used for the design of porous implants; Since variations in material properties due to uncertainties in the design parameters, the loadings on the plate, and the additive manufacturing process are not taken into account, the actual conditions that the plate will be exposed to are not modeled correctly. Therefore, in this study, both deterministic and probabilistic analyzes of a porous implant with a gyroid lattice structure placed on the humeral bone were performed. The results obtained were compared with the probability of failure of the conventional fixation plate. As a result of the study, it has been revealed that the uncertainties in the design parameters significantly affect the failure probability of the plate compared to the deterministic analysis, and probability-based analyzes play an important role for a reliable plate design.

KEYWORDS - Fixation Plate ,Failure Probability ,Finite Element Analysis

DESIGNING A HUMERUS PLATE WITH RELIABILITY BASED TOPPLOGY OPTIMIZATION

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ABSTRACT

Conventional fixation plates are used to accelerate the biological healing process in the injury by providing mechanical stabilization of broken bones. However, these plates may cause mechanical complications such as aseptic loosening and stress shielding during the healing process. Therefore, optimum plates have been used in clinical applications. However, since the uncertainties in the plate material and the loading to the plate are not taken into account in the design of such plates, damages also occur. Therefore, the reliability-based design method was used in this study to reduce the possibility of damage due to mechanical uncertainties in the bone-implant system. In addition, the topology optimization method was combined with reliability analyzes in order to design a fixation plate closer to the mechanical properties of the bone by reducing its stiffness compared to the conventional models. As a result, the design of the porous fixation plate and finite element analysis were performed with the Reliability Based Topology Optimization (RBTO) technique and the failure probabilities were compared with the conventional fixation plate.

KEYWORDS - Reliability-based Topplogy Optimization; ,Finite Element Analysis,Fixation Plate

CERVICAL CANCER DIAGNOSIS BASED ON CONVOLUTIONAL NEURAL NETWORKS

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ABSTRACT

Cervical cancer is the fourth most common type of cancer in women worldwide. According to the GLOBOCAN 2020 data produced by the International Agency for Research on Cancer (IARC) of the World Health Organization, 604127 women suffer from this disease annually and 341831 women die from this disease. Cancer occurs when cells in organs develop abnormally. Cervical cancer is cancer that develops in the cells of the cervix of women. Early diagnosis is the most important factor in the treatment of cervical cancer. The Pap-smear test is the most widely used test for diagnosing cervical cancer. In this study, Herlev data set formed with 917 images(242 images for normal cells and 675 images for abnormal cells) taken from the pap-smear test is used. With this data set, %70 learning data set and %30 test data set are used to perform the classification process using convolutional neural networks method. The accuracy obtained is 50% with 7 classes using CNN method and python keras library. In future, it is aimed to develop a computer-assisted cervical cancer diagnosis method.

KEYWORDS - Deep Learning, Convolutional Neural Networks, Pap Smear Images, Cervical Cancer.

THE MOBILE APPLICATION OF SELCUK UNIVERSITY WEATHER TRACKING SYSTEM

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ABSTRACT

In this paper, a mobile application was developed by using the meteorological data measured by the weather tracking system established in Selçuk University Alaeddin Keykubat Campus. With the application, the users can access daily and historical weather information of Selçuk University, information about the moon and sun. The application has been designed and made available for users on every mobile platform. With the Selçuk University weather tracking system, high accuracy measurements are obtained within the campus. Based on the data received in the weather tracking system, the users are provided with a simple interface, ease of use, and the opportunity to quickly access the desired information. A mobile application with a clear, user-friendly interface has been developed in order to easily deliver the collected data to the end-users.

KEYWORDS - Mobile application, Weather tracking system, Selçuk University, Hybrid mobile development

PREDICTION OF ENERGY GENERATED FROM SOLAR PANELS USING MACHINE LEARNING

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ABSTRACT

Increasing demand for energy has caused a search for dependable, cheap, and clean energy production methods. Photovoltaic systems (PV) have been a prevalent one among these energy resources in recent years. In the estimation of generated solar energy using machine learning methods, meteorological data like solar radiation, pressure, and temperature are influential elements. In this study, some of the machine learning algorithms and the electrical energy produced from solar panels were estimated. 17 features obtained from solar panels and meteorological data were reduced to 7 with the help of feature selection algorithms. These data, whose number of features were reduced, were analyzed with machine learning algorithms and R-Squared (R2) values were determined by Random forest (RF) 0.9883, K-Nearest Neighbors (K-NN) 0.9263, Multilayer Perpection (MLP) 0.8845, Support Vector Regression (SVR) 0.8392, Bayesian Ridge (BR) 0.8305 and Adaboost regressor (AB) was found to be 0.8319. In the analyzes performed, improvements were obtained in Root Mean Square Error (RMSE), R-squared (R2) and Mean Sequared Error (MAE).

KEYWORDS - Machine Learning, Solar Energy Prediction, Renewable Energy, Photovoltaic Module

A REVIEW ON PREDICTING EVOLUTION OF COMMUNITIES

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ABSTRACT

In recent years, research on dynamic networks has increased as the availability of data has grown tremendously. Understanding the dynamic behavior of networks can be studied at the mezzo-scale (e.g., at the community level), as communities are the most informative structure in nonrandom networks and also evolve over time. Tracking the evolution of communities can provide evolution patterns to predict their future development. For example, a community may either grow into a larger community, remain stable, shrink into a smaller community, split into several smaller communities, or merge with another community. Predicting these evolutions is one of the most difficult problems in social networks. Better predictions of community evolution can provide useful information for decision support systems, especially for group-level tasks. So far, this problem has been studied by some researchers. However, there is a lack of a survey/review of existing work. This has prompted us to conduct this study. In this paper, we first categorize the existing works according to their methodological principles. Then, we focus on the works that use machine learning classifiers for prediction in this decade as they are in majority. We then highlight open problems for future research. In this way, this paper provides an up-to-date overview and a quick start for researchers and developers in the field of community evolution prediction.

KEYWORDS - Community, Evolving Communities, Predicting Evolution of Communities

CLASSIFICATION OF ELECTROLUMINESCENCE IMAGES OF SOLAR CELLS USING MOBILENET

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ABSTRACT

Solar energy is an alternative energy source. Solar cells, forming the basis of a solar energy system, are made of crystalline silicon. Detection of many defects using traditional imaging systems is rather challenging. In this study, defect detection was conducted using electroluminescence (EL) images of solar panel cells by the deep learning method. Deep learning algorithm were used in image classification to achieve fast and excellent results. Images are divided into categories like good, broken, and inactive and trained with deep learning algorithm. of the pre-trained networks, MobileNet was used and %75.58 classification accuracy was obtained.

KEYWORDS - Deep Learning, Electroluminescence Image, MobileNet, Photovoltaic Module

MELANOMA DETECTION WITH EFFICIENTNET

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ABSTRACT

In this study, the performance levels of solution candidates from the EfficientNet family, which is today's most up-to-date and leading CNN architecture, in detecting Melanoma skin cancer were analyzed. Starting with B0, the basic model of the EfficientNet family, the CNN model was effectively scaled up to reach B7 to achieve higher accuracy values. When scaling up a model from the EfficientNet family, fewer parameter increments than expected are the most fundamental gains. EfficientNet models were trained using color lesion images provided by the International Association for Skin Imaging (ISIC). The ISIC archive is the world's largest repository of pathologically verified images from skin cancer patients. For the validation of CNN models, 5-fold cross validation was preferred. In addition, the optimum values of hyper-parameters were tried to be caught for performance improvement of CNN models. During the training phase, f1-score was chosen as the performance measurement metric and ROC curves were drawn for the test data and AUC values were revealed.

KEYWORDS - EfficientNET Models, Dermoscopic Images, Skin Diseases Diagnosis, Melanoma Detection

ANALYZING THE EFFECTS OF RANDOM NUMBER GENERATORS ON ARTIFICIAL GORILLA TROOPS OPTIMIZER IN SOLVING GEAR TRAIN DESIGN PROBLEM

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ABSTRACT

Artificial gorilla troops optimizer (AGTO) is a recently developed metaheuristic optimizer for solving continuous unconstrained optimization problems. Random numbers are the backbone of metaheuristic optimization algorithms. Generally, most metaheuristic optimization algorithms are used uniformly distributed random numbers. The population is created with these uniformly distributed random numbers. Every random number is generated via random number generator algorithms. In this work, 6 different random number generator algorithms (Mersenne Twister, SIMD-oriented Fast Mersenne Twister, Combined multiple recursive, Multiplicative Lagged Fibonacci, Philox 4x32 generator with 10 rounds, and Threefry 4x64 generator with 20 rounds) are analyzed on AGTO. In the experiments, the gear train design problem was solved by variants of AGTO. Experimental results show that the default RNG of MATLAB produces the worst and slow random numbers. The Multiplicative Lagged Fibonacci RNG produces the best and fast random numbers for solving gear train design problems in AGTO.

KEYWORDS - artificial gorilla troops optimizer, gear train design, random number generator, metaheuristic, uniformly distributed random number

SECURITY ISSUES IN THE RESTFUL API SERVICE USING OAUTH 2 0 FOR AUTHENTICATION AND AUTHORIZATION

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ABSTRACT

Security-related to the RESTful API (service) is discussed in this paper. Security implementation using OAuth is an essential part of strengthening security, which enables protecting the access to the service resources. The different authentication methods surveyed in this paper provide opportunities for authentication and authorization of resources and services by enabling their security at the same time. Web services are getting more and more advanced every day, so it is important to enable more sophisticated control of them and their resources to strengthen security. The interconnection between authentication and authorization has enabled proper control of services and resources either through rules applied by the organization, but also those set by the system administrators. OAuth presents an authorization framework and in combination with the appropriate authentication method provides security and efficiency in access control of the RESTful APIs (services). Except for discussing the benefits and flaws that can be identified in OAuth 2.0, in this paper, the OAuth implementation issues in web services and appropriate solutions for its proper use in favor of increasing the security level in modern web services are actualized. The purpose of this paper is to portray concrete cases of dismounting authentication and authorization issues, with particular emphasis on OAuth 2.0 security during its execution in the REST API services. The paper concludes by presenting the important recommendations for the RESTful APIs (services) protection from the different OAuth 2.0 attackers and the elimination of system flaws, thus contributing to increasing the level of overall security.

KEYWORDS - RESTful API (service), OAuth 2.0, security, authentication, authorization

THE ALGORITHM FOR NEW SECRET SHARING SCHEME I

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ABSTRACT

Visual Cryptography is a cryptographic technique by which we hide a secret within images. These images are encrypted into n parts, known as shares, and then decrypted without computer calculations. In this work, we give an algorithm for a new proposed (n,n) Secret Sharing Scheme for grayscale/color images. This algorithm modifies a well-known algorithm of Cheng et al. Throughout our work we use XOR operation sharing images, algebraic function for creating a secret image for authentication, while the size of the original image and shadows are the same. In addition, to generate respective codes for participants, we will use the Cantor function.

KEYWORDS - Visual Cryptography, Secret Image Sharing, XOR operation, Cantor function

PERFORMANCE ANALYSIS OF IMAGE PROCESSING TECHNIQUES FOR MEMORY USAGE AND CPU EXECUTION TIME

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ABSTRACT

In recent years, many applications that use algorithms like artificial neural networks, deep learning, and fuzzy logic have been developed in order to improve tasks such as image classification, object perception, image enhancement, and image processing. These applications are technology products of image enhancement that are utilized in the military, industry, robotic, advertising, astronomy, medicine, geography, traffic, and many areas of daily life. Today, having every process done by autonomous systems instead of human beings has increased the significance of image processing. Processing a large number of images in one computer varies by processor and memory type. The image processing of a slower processor may last longer than a faster one does. The study consists of two phases. In the first phase, image data has been processed by an ideal technique. In the second phase, the performances of image process, on CPU and processor with respect to their calculation speed have been compared.

KEYWORDS - Image Processing, Image Processing Algorithms, Performance Analysis

A HYBRID PHISHING DETECTION MODEL BASED ON TRANSFORMER CHARACTERBERT FROM URLS

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ABSTRACT

The security concerns in the cybersecurity area are increasing and, the fundamental purpose of such crimes is to obtain the benefits by achieving confidential data. Phishing is one of the easiest ways to accomplish the private information of the target users. Such attacks exist triggered by multiple methods such as emails, messages, phone calls, etc. Therefore, many machine learning techniques have been proposed to detect phishing URLs before affecting the target users. Lately, the popularity of deep learning techniques has also gained attention in the cybersecurity area. This paper proposes a hybrid deep learning model for the classification task between legitimate and phishing URLs. The proposed model consists of CharacterBERT and DNN based techniques. The CharacterBERT is a modification of the baseline BERT model that learns features from the characters of the given URL instead of complete words. Moreover, deep neural networks are applied to train the model. The PhishTank dataset is used for evaluation purposes, and the obtained results indicate that the proposed model outperforms the previous baseline models in the literature.

KEYWORDS - Phishing, Machine Learning, Deep Learning, Deep Neural Networks, CharacterBERT

COVID 19 DETECTION WITH DEEP LEARNING METHODS FROM X RAY IMAGES

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ABSTRACT

The Covid-19 virus, which emerged in Wuhan, China in December 2019, has caused great losses in our country as well as all over the world. As we approach the end of 2021, no effective treatment has yet been found, and the effectiveness of vaccines is under discussion. The disease spread very quickly and put the health system in trouble in almost all countries. PCR tests are used to detect Covid-19 patients all over the world. However, PCR tests can give erroneous results. In addition, it is worrying that the result can be negative in the part of the disease called the window period. The unreliability of PCR tests has prompted healthcare professionals to seek other methods for diagnosing the disease. In this study, x-ray images were examined with deep learning methods and successful results were obtained for the detection of Covid-19. of these methods, AlexNet, GoogleNet and ResNet-50 were used and presented comparatively.

KEYWORDS - Covid-19, Deep learning methods, AlexNet, GoogleNet, ResNet

PREVENTING IMAGE DUPLICATION USING SIMILARITY METHODS

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ABSTRACT

Enuygun.com works with different hotel providers to realize the sales of hotels. Different hotel names, meta-information and hotel images are retrieved for the same hotel from these providers using APIs and having different data for the same hotel causes a problem named "hotel duplication". In this study, it is aimed to find out whether the relevant images belong to the same hotel by evaluating the images from the providers. To make evaluations 100 images belonging to 36 hotels from different vendors were collected. Then a ground truth dataset to evaluate the performance of approaches was constructed and validated by 3 domain experts. Two different methods are experimentally tested. Color histograms were used to calculate the similarity of two images as the first method (Method1.HistogramBased). Although it is one of the important methods in the literature, false positive or false negative samples are frequently encountered because it makes a comparison-based on histogram distribution. In the second method (Method2.DeepLearningBased) VGG-19 architecture was used to expand dimensions of images in matrix form and then pre-processed its input and made predictions of images to get their feature-based representations. Histogram-based and DeepLearning-based methods were evaluated using the collected dataset. The mean accuracy value of the methods are 80% and 88% respectively. When the literature is considered, it is seen that there are many different simple and complex methods to compare images. To the best of our knowledge, this study is one of the first studies that apply early pre-processing steps of a VGG-19 model to obtain dense matrices and calculate the similarity score using the correlation of these matrices.

KEYWORDS - image similarity, hotel deduplication,deep learning,image segmentation,classification

COMPARISON OF CLASSIFICATION ALGORITHMS FOR COVID 19 DETECTION USING COUGH ACOUSTIC SIGNALS

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ABSTRACT

The epidemic disease, called the new coronavirus (COVID19), first appeared in Wuhan, China in December 2019. In January 2020, this disease was defined as what it is. COVID19 was declared a pandemic by the World Health Organization soon after. Some of the symptoms of this disease are; fever, cough, shortness of breath and difficulty in breathing. In more severe cases, death may occur as a result of infection. The most important issue in combating the epidemic and controlling the epidemic is the early diagnosis of COVID19(+) patients and the follow-up of these patients. Therefore, various diagnostic mechanisms are used. In particular, medical imaging methods are used in addition to RT-PCR test in the detection of COVID19(+) patients. In this study, an alternative approach was proposed by using cough data, which is one of the most prominent symptoms of COVID19(+) patients. The cough acoustic public dataset on the Virufy website was used. All data were normalized using the z-normalization process. The performance of the attributes obtained by the 5-level empirical mode decomposition method and the performances of different classifiers has been compared. As the classifier algorithm, 5 different algorithms were used. The highest accuracy and F1-score performances were obtained by using the Ensemble-Bagged-Trees algorithm as 90.6% and 90.5%, respectively. On the other hand, other classification algorithms used in the study are SVM Linear, Logistic Regression, Linear Discriminant Analysis and Medium KNN, respectively. According to the results obtained, choosing the right classifier algorithm provides high results. Thus, it is clear that using cough acoustic data, those with COVID19(+) can be detected easily and effectively.

KEYWORDS - COVID19, Cough, Empirical Mode Decomposition, Prediction, Classification.

TEXT INDEPENDENT SPEAKER RECOGNITION BASED ON MFCC AND MACHINE LEARNING

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ABSTRACT

Speaker recognition is a challenging task. In this paper, a text-independent speaker recognition model was developed for the problem with 60 different speakers. The classification performance of the proposed model and commonly used 11 different machine learning methods has been evaluated on Audio-MNIST dataset, and the results were shown comparatively. As a result, 97.1% classification rate was achieved with SVM classifier, and the model produced successful results for all classes.

KEYWORDS - Speaker Recognition, Text-Independent,Machine Learning

COMPARATIVE ANALYSIS OF GENETIC CROSSOVER OPERATORS FOR THE P MEDIAN FACILITY LOCATION PROBLEM

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ABSTRACT

The p-median problem is a well-known combinatorial optimization problem with various formulations and many real-life applications. In this study, performance of genetic algorithm (GA) with different crossover operators is studied. Well-known test problems in the literature are used to test the performance of crossover operators. The comparative experimental results show that the two-point crossover operator and the operator that randomly uses the one-point and two-point crossover operators can effectively solve problems represented by direct value coding, such as the p-median facility location problem.

KEYWORDS - Genetic algorithm, p-median, facility location, crossover

DATA HIDING TO THE IMAGE WITH BIT PLANE SLICING AND DOUBLE XOR

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ABSTRACT

Data hiding is done on different environments and with different techniques, and applications in this area attract a lot of attention. In data hiding, the method of securing the data in the image by hiding data to the image is one of the steganography methods. Bit Plane Slicing, one of the techniques applied in image steganography, is a reliable technique applied on images such as data hiding or compression, which allows us to operate on some special bits by separating each pixel that makes up the image into planes. With this technique, it is aimed to provide high image quality and data security. In this study, two encryption layers and a concealment stage are proposed. Here, the bit planes of the three channels of the color image were first extracted using the BPS technique. The message to be hidden later was encrypted using a double XOR operation using binary representation and a secret key (extracted from the MSB). Then, the stream of encrypted bits is hidden in the cover image using the least significant bit plane. Well-known evaluation criteria such as MSE, PSNR and histogram distribution were calculated to ensure the quality of the proposed method. Experimental results show that the proposed method has acceptable results and maintains the security of confidential text messages.

KEYWORDS - Bit Plane Slicing (BPS), Steganography, Cryptology, Least Significant Bit (LSB) Metod, Most Significant Bit (MSB) Metod, PSNR, MSE.

A DEEP LEARNING BASED APPROACH FOR EFFECTIVE DIAGNOSIS OF CORONAVIRUS DISEASE USING CLINICAL DATA

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ABSTRACT

With the first case seen in December 2019, the novel coronavirus disease (COVID-19) has rapidly affected millions of people all over the world. Due to the high fatality risk, this outbreak has generated a global crisis shaking all the areas of human life. Hence, it is exceptionally significant to perform a reliable and effective diagnostic system in terms of achieving timely and accurate patient care and combating the outbreak spread. This study aims to achieve a promising solution by proposing a data-driven approach based on deep learning for the diagnosis of COVID-19 disease. In the proposed approach, convolutional neural network (CNN), gated recurrent unit (GRU), and fully-connected layers are utilized to provide an artificial intelligence-based diagnostic model. Besides, a dropout technique is employed to avoid overfitting, which is a potential issue. The performance of the proposed model is performed on a dataset including 18 different laboratory findings in blood samples of 600 patients (520 negative findings and 80 positive findings). As a result of the experiments carried out, it is seen that the proposed approach can provide remarkable results compared with state-of-the-art methods.

KEYWORDS - Deep learning, Covid-19 disease, Diagnosis, Convolutional neural network (CNN), Gated recurrent unit (GRU)

HYBRID FEATURE SELECTION FOR MEDICAL DATASETS USING WHALE OPTIMIZATION ALGORITHM AND PARTICLE SWARM OPTIMIZATION

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ABSTRACT

Swarm-based optimization methods are frequently preferred in many areas such as feature selection. One of them, Whale Optimization Algorithm, has been very popular recently. In this study, a binary hybrid feature selection method named BWPFS, consisting of Whale optimization algorithm (WOA) and Particle Swarm Optimization (PSO), was developed. The purpose of this method is to select the most important features in the diagnosis of diseases. In this way, it is aimed to increase the diagnostic success by processing less data and to reduce the size of the dataset. After feature selection, Linear Discriminant Analysis (LDA) was used as a classifier. To measure the success of the proposed BWPFS method in medical data, Breastcancer, HeartEW and Lymphography datasets from the UCI database were used and compared with the literature. The mean classification success was 97% for Breastcancer, 87% for HeartEW, and 90% for Lymphography, respectively. According to the results, it seems that the proposed method provides for the diagnosis of medical data.

KEYWORDS - WOA, Feature selection, PSO, Classification

A HYBRID FACE RECOGNITION APPROACH USING OPEN SOURCE MODELS

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ABSTRACT

Data is so valuable today that all preferences of people are gathered and processed to obtain knowledge about their behaviour. This data is important for understanding the customers, predicting their future trends and also providing customer satisfaction and loyalty by presenting them special offers. Collecting data from digital environments is easy however it is hard to get and process data from physical environments. One of the ways to gather data from physical environments is image processing and recognition. By using these techniques faces of people are transformed into a mathematical model. When the same face data is encountered again it is recognized by the model. In this way, people's behaviour in physical environments can be envisioned. For this reason, there are some open source solutions as well as other commercial solutions of large companies such as Amazon and Google. In this study, we have developed a hybrid face detection approach. Experimental results show that our approach performs better than other open-source algorithms in the range of 4% and 8% both on well-known open-source datasets and corporate datasets. We have also discussed the capabilities and performance of cloud-based systems in this study and experiments show that we get promising results when compared to other studies as far as we know.

KEYWORDS - image processing,hybrid face detection,image recognition

SELCUK UNIVERSITY WEATHER TRACKING SYSTEM AND SELCUK METEOROLOGY WEBSITE

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ABSTRACT

In this paper, a system for reading meteorological data like temperature, humidity, air pressure, wind speed, wind direction and rainfall at regular intervals, deployed in Selçuk University Alaeddin Keykubat Campus. System also provides real-time images and video timelapses of the campus sky. These data made available to university people via a website. Website provides a clear experience for the users, also explaining the icons and terms used on the website. Users can access system archive on graphical ways.

KEYWORDS - Weather Tracking, Sensor Data, Meteorology

INTERNATIONAL CYBERWARS

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ABSTRACT

With the emergence and spread of the Internet, the use of digital technologies has increased significantly. Governments and private organizations are moving many of their activities to electronic media to a large extent, and digitalization is becoming a necessity. These developments make many processes in our lives easier. As the volume of information generated in digital media increases, the appetite of malicious people or groups in virtual environments increases. In this context, the internet has mediated the formation of a new theater of war by bringing along some problems as well as the benefits it provides. In this field, the concepts of cyber attack, cyber war, and cyber security have emerged in the literature at national and international level, and countries have started to develop defense strategies. In this study, the effect of cyber warfare was investigated by examining the economic, political, social and media dimensions of attacks on countries and international organizations and on a national scale. In addition, the defense strategies of countries such as America, Russia, China and Turkey were mentioned separately.

KEYWORDS - siber savaş, uluslararası siber savaş, siber güvenlik, siber saldırı

QUANTUM TELEPORTATION BY USING SUPERDENSE CODING AND TELEPORTATION ALGORITHMS IN QISKIT AND IBM CIRCUIT COMPOSER

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ABSTRACT

Quantum teleportation is a technique of sending a state vector from one place to another place. The distance between these two points can be even hundreds of thousands of light years. For quantum teleportation, there is no need for a channel between two points when sending the state vector from one place to another. Since classical information sharing is possible, it is also possible to send a state vector from one place to another place. Teleportation is the transfer of a quantum state from one place to another through classical channels. Superdense coding, a dual to teleportation, uses a single quantum bit to transmit two bits of classical information. Superdense coding, one of the quantum algorithms, uses a qubit to transfer 2 classical bits, while another algorithm so-called Teleportation performs 1 qubit transfer using 2 classical bits. In this article, teleportation and dense coding processes are carried out on both Qiskit and IBM quantum circuit composer, and the results obtained in Qiskit and real quantum computers are compared and presented in detail. The results revealed that whether faster-than-light signal transfer is possible using quantum mechanics depends on whether a copy of a quantum state is created or not.

KEYWORDS - Superdense Coding,Teleportation,Quantum Computing,Qiskit,IBM Circuit Composer

A DEEP LEARNING TOPOLOGY TO DIAGNOSE OF ASSISTANCE REQUEST BASED LIP READING

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ABSTRACT

Lip-reading is an important research subject for autonomous help systems in Human-Computer Interaction recently. Therefore many different decision models are recommended in literature and they have been continued to be developed. In this context, we propose a 2D-CNN model to classify of words with transfer learning technique. To train of the model MIRACL-VC1, Avletters2 and HLipWords-V1 datasets are used in training process. Moreover, we compare networks obtained from different network parameters and criteria. The results show that the proposed CNN topology has performed better for MIRACL-VC1 (84.2%), HLipWords-V1 (98.9%) and Avletters2 dataset(62%), respectively.

KEYWORDS - Deep Learning, Lip-reading, Convolution Neural Network (CNN), Help Detection, Real-Time Object Recognition and Detection

LIFE EXPECTANCY PREDICTION AFTER HEART ATTACK BY USING ENSEMBLE LEARNING METHODS

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ABSTRACT

- Cardiovascular diseases (CVD) are one of the leading causes of death in the world. Deaths due to CVD diseases continue to increase every year. Heart attack is a condition in which blood flow to the heart muscle is interrupted, which occurs with cardiovascular diseases. This study aims to predict whether patients survive at least one year after a heart attack by using Echocardiography (ECHO) data. For this purpose, standardization and filling missing values with the Fully Conditional Specification (FCS) method was applied to the ECHO dataset which consists of the data of patients who had a heart attack. Then, classification was carried out with various machine learning algorithms. Classification performances were evaluated comparatively as ensemble learning-based classifier algorithms and popularly used classical classifier algorithms. As a result of the studies, the highest accuracy rate was obtained with Adaboost as 94.87%. It is concluded that the most effective model is produced by ensemble learning-based classifiers in the study of detection of whether patients survived at least one year after a heart attack.

KEYWORDS - Machine Learning, ECHO, Standardization, Fully Conditional Specification, Ensemble Learning

FORECASTING TRAFFIC DENSITY BASED ON A HYBRID ARTIFICIAL NEURAL NETWORK MODEL

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ABSTRACT

Traffic density, the number of vehicles per unit length of the road, is one of the basic properties of a traffic stream. One way to detect traffic congestion before it happens is to predict near future traffic density. Traffic density data is a time series by nature, and as it is known, various statistical methods or machine learning methods can be used in the forecasting of time series. In this study, for traffic density forecasting, a forecasting model is generated based on a hybrid artificial neural network approach, which was proposed in one of our previous studies. In this approach, the parameters of the artificial neural network are optimized using a biased random key genetic algorithm. To test the proposed forecasting model, the hourly traffic density data of Istanbul is used. In addition, the proposed approach is compared with the forecasting models based on the most used machine learning models.

KEYWORDS - Forecasting, artificial neural networks, metaheuristics, genetic algorithms, support vector regression.

INVESTIGATION OF THE EFFECT OF VIRTUAL REALITY APPLICATIONS ON OCCUPATIONAL HEALTH AND SAFETY TRAINING

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ABSTRACT

Today, rapid developments in industry and technology have increased welfare in societies and contributed to the development of civilizations. However, these developments have brought with them negativities in business life. Especially the production in industrial areas has caused an increase in work accidents and occupational diseases. According to the data of the International Labor Organization (ILO) and the World Health Organization (WHO); An occupational accident occurs every 15 seconds around the world. There are approximately 270 million occupational accidents in 1 year, and 350 thousand people lose their lives due to occupational accidents. If we consider it from an economic point of view according to WHO, the cost of accidents and occupational diseases is 4-5% of the world's gross product. According to the International Labor Organization (ILO); Every year around the world, 1.25 trillion dollars are lost due to occupational health and safety (OHS). In this way, it will be possible to make working environments healthier and safer. In order to carry out occupational health and safety effectively, it is of great importance that the OHS trainings to be given to the employees are effective and efficient. One of the effective tools to be used in these trainings is virtual reality technology. virtual reality: It can be used for experiential training in many areas such as firefighting, use of high-cost and risky devices, long-distance logistics training, and within the scope of occupational health and safety. In the study, the development process of virtual reality applications in occupational health and safety education is discussed by using computer technologies.

KEYWORDS - Virtual Reality, Virtual Reality Education, Occupational Health and Safety in Virtual Reality, Safety Training

BEZIER AND B SPLINE CURVE DEFINITION OF OUTER BOUNDARY OF AN OBJECT TEMPLATE USING SEQUENTIAL EDGE POINTS

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ABSTRACT

Bézier and B-spline curves, which are defined parametrically, initially provided great convenience and precision in the design of automobile bodies. Today, these curves are also used in the fields of image processing and computer vision. Segmentation of an object in an image can be made using these parametric curves, including their different scales and orientations. For this, Bézier and B-spline curves can be generated using a cloud of points representing the outer boundariy of a representative template of this object. The prerequisite for this process is that the points in the point cloud must be obtained sequentially. In this study, an algorithm has been developed that sequentially obtains the points constituting the outer boundary of the template belongs to the object to be searched in the image. This algorithm, unlike the other contour tracing algorithms in the literature, was implemented using a filter containing weights. It produces a unique numerical value that determines the next tracking direction thanks to the filter weights located at a certain position in the image whose edges are determined in binary format. After obtaining the ordered points, the control points determining the curve shape were obtained by reducing the number of ordered points. Thus, using these control points, the Bézier and B-spline curve equations, which define the outer boundary curve of the template, are obtained. It has been shown that by changing the positions of the control points, the template can be created in different translation, scaling and orientation, and also thanks to these curves, the missing part of the object can be completed. As a result, a template with outer boundary defined by Bézier and B-spline curves was created to be used in object recognition and segmentation processes especially in computer vision.

KEYWORDS - Bezier curve,B-spline curve,Contour tracing algorithm,Template matching,Object recognition

SOUND ANALYSIS TO RECOGNIZE CATTLE VOCALIZATION IN THE BARN

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ABSTRACT

In precision livestock, there has been a growing demand for innovative tools that collect and analyze information about individual animals. For this purpose, various variables of precision livestock such as monitoring the general condition of animals, activity and health status, food intake, or estrous activity are measured by using information technology. In recent years, the requirement for sound analysis to be used in these systems has increased. Because collecting sound signals do not require animal intervention. Dairy cattle make different sounds in cases of illness, pregnancy, feeding, etc., and by using sound signals, the diagnosis and status determination of the animal can be made. The aim of this study is to record the vocalization data of a dairy cattle in the barn and to investigate its differences from other barn sounds. It has been revealed that the frequency ranges of cattle, environment, bird, and machine sounds, which are analyzed by time domain, frequency domain, and spectrogram, are different and these differences can be used in a cattle identification system.

KEYWORDS - cattle vocalization, sound analysis, spectrogram

MEDICAL IMAGE STEGANALYSIS USING DEEP CONVOLUTIONAL NEURAL NETWORK

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ABSTRACT

Image steganography ensures that secret data is hidden in a cover image and aims to transmit the resulting stego image through a communication channel without being noticed by a third party. On the other hand, image steganalysis detects the hidden data in the stego images. Traditional steganalysis techniques focus on obtaining hidden data. However, the presence of secret data must be revealed before obtaining it. Machine Learning (ML) classifiers are used for this purpose with promising high-performance values. ML techniques other than deep learning (DL) require complex and costly feature analysis performed in spatial or transform space. In recent years, DL models have been used to detect the presence of secret messages in the BOSSBase dataset, but there is no study for medical image steganalysis. Therefore, this study aimed to perform medical image steganalysis using a DL model that performs feature analysis on its convolutional layers. An original medical image dataset containing brain MR images was obtained from epileptic patients and healthy volunteers. Two deep convolutional neural networks (CNN) were used. One of them was trained without transfer learning while the feature layers and weights of DenseNet, ResNet, Inception, and Efficient models were transferred to the other one. The training data was obtained by hiding the secret data to the brain images, with different capacity ratios between 0.1 and 1.0 bit per pixel (bpp) using the WOW technique. The results can be summarized in two aspects. First, as expected, the higher the capacity ratio was, the higher classification performance it was obtained. Second, using transfer learning increased the classification performance of the DL model.

KEYWORDS - Medical Image Steganalysis, Deep Learning, Convolutional Neural Network, Transfer Learning

ENERGY DEMAND PROJECTION OF TURKEY BASED ON COOT BIRD METAHEURISTIC OPTIMIZER

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ABSTRACT

The energy demand projection forms the basis of realistic energy planning. In this study, from 1979 to 2011, a 33-year data set including gross domestic product (GDP), population, import and export was used for energy demand forecasting in Turkey. Using this data set, two different energy estimation models, linear (COOT_L) and quadratic (COOT_Q), were developed with the Coot bird metaheuristic optimizer. These models were compared with different optimization algorithms in the literature. When the experimental results were examined, the COOT_L model produced a more successful result than the results of other algorithms. Furthermore, COOT Q was seen to become more successful than PSO and ACO. In addition to these, the COOT L and COOT Q models forecasted the future energy demand between 2012 and 2030 in Turkey and their results were compared with those of DE methods. When the results were examined, while DE and COOT_L produced similar results in linear form, certain differences were observed among the results of COOT_Q and DE.

KEYWORDS - Coot Bird Metaheuristic Optimizer, Swarm Intelligence, Forecasting, Energy Demand

PERFORMANCE EVALUATION OF SWISH BASED ACTIVATION FUNCTIONS FOR MULTI LAYER NETWORKS

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ABSTRACT

Artificial Neural Networks (ANNs) are computational modeling implements that are universally endured in many disciplines and utilized to model complicated real-world problems such as regression, classification, function approximation, identification, control, pattern recognition, and forecasting. The importance of the ANN originates from the information processing properties of biological systems like nonlinear, fault tolerance, parallelism, and learning. Activation function (AF) is a crucial characteristic of an ANN since it gains nonlinearity to the networks. One of the most well-known AF used in the literature is Swish AF which is generally used in deep networks. In this study, in addition to Swish AF we use three different AFs based on Swish AF which are mish, e-swish, and exponential swish (exp-swish) AFs for multi-layer perceptron. In order to compare the ANN models using different AFs for multi-layer networks, we use four different benchmark datasets from the University of California Irvine (UCI) Machine Learning Repository and get the result that exp-swish AF has the best performance.

KEYWORDS - ANN, activation function, exp-swish AF, swish AF, multi-layer perceptron

PERFORMANCE COMPARISON OF MODEL STORAGE FORMATS FOR DEPLOYING DATA MINING MODELS

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ABSTRACT

Electronics and computer technology are rapidly changing. This trend has both changed the habits of the end-users and initiated a transformation in the industry. In addition, data collection, storage, and processing studies have gained importance with Industry 4.0 (I4.0). Nowadays, data has become an indispensable resource for information extraction. Recently, predictive models produced by machine learning and data mining have been frequently used in our daily life. The wide variety of environments in which these models can be developed is easy for developers while integrating models into existing systems is equally difficult and costly. In this study, two approaches are compared in terms of their performance in publishing model files serialized with predictive model markup language, which is accepted by frequently used software tools such as Knime, Weka, IBM SPSS Modeler. Python programming language and tools are used in interpreting predictive model markup language files and creating web services. The first approach was chosen to store predictive model markup language file contents in a database, and the second approach was to store these files in the file system, and these two methods were measured and reported on the parameters of response time, throughput (speed of processing requests) and latency in generating responses. As a result of the measurements made, it has been seen that the web service performance is higher when the model is kept as a file in the file system compared to the other method.

KEYWORDS - Machine Learning,Data Mining,Web Service,PMML,Software Development

FEATURE SELECTION FOR DETECTION OF CYBER ATTACKS USING MACHINE LEARNING METHODS

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ABSTRACT

Information and communication technologies are growing rapidly to process increasing amount of data. While processing this data, security and privacy becomes more and more important in cyberspace. Cyber-attacks are more dangerous than ever for industry, government and public. Intrusion detection and classification systems have become more important to protect computer systems. In this study, we examine the effects of the using feature selection methods on the classification performances. We conducted experiments on two publicly available benchmark datasets: NSL-KDD99 and UNSW-NB15. We apply Chi-squared, ReliefF, and Gain Ratio feature selection methods to select more important features and classify these features using Logistic Regression. The results show that selecting features improves the classification performances and reduces the computation time.

KEYWORDS - Artificial intelligence, Cybersecurity, Feature selection, Machine learning, NSL-KDD99, UNSWNB15.

HIGH PERFORMANCE COMPUTING ON GRAPHS

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ABSTRACT

Graphs are widely adopted to model the interactions within real-life data such as social networks, purchasing networks, web data, etc. For instance, using machine learning (ML) tasks such as link prediction, node classification, and anomaly detection on graphs became a popular area with several applications in the industry and research. The first part of the talk will cover graphs, graph-based approaches and applications in various domains. Although the sizes of the graphs at hand increased significantly in the last decade, the raw connectivity information of a graph, i.e., adjacency lists, does not easily lend itself to high-performance computing and parallelization on modern architectures. In the second part of the talk, we will talk about our recent research and state-of-the-art on high-performance graph algorithms for various optimization and machine learning problems.

KEYWORDS - high-performance computing,graphs

EDGE DETECTION OF AERIAL IMAGES USING ARTIFICIAL BEE COLONY ALGORITHM

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ABSTRACT

Edge detection techniques are the one of the best popular and significant implementation areas of the image processing. Moreover, image processing is very widely used in so many fields. Therefore, lots of methods are used in the development and the developed studies provide a variety of solutions to problems of computer vision systems. In many studies, metaheuristic algorithms have been used for obtaining better results. In this paper, aerial images are used for edge information extraction by using Artificial Bee Colony (ABC) Optimization Algorithm. Procedures were performed on gray scale aerial images which are taken from RADIUS/DARPA-IU Fort Hood database. Initially bee colony size was specified according to sizes of images. Then a threshold value was set for each image, which related with images' standard deviation of gray scale values. After the bees were distributed, fitness values and probability values were computed according to gray scale value. While appropriate pixels were specified, the other ones were being abandoned and labeled as banned pixels therefore bees never located on these pixels again. So the edges were found without the need to examine all pixels in the image. Our improved method's results are compared with other results found in the literature according to detection error and similarity calculations'. All the experimental results show that ABC can be used for obtaining edge information from images.

KEYWORDS - Image processing, Edge detection, Artificial Bee Colony Optimization, Aerial Images

A NOVEL HISTOLOGICAL DATASET AND APPLICATION TO DEEP LEARNING

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ABSTRACT

Histology is of critical importance in the medical field. Accurate identification and analysis of tissues formed by the combination of cells are essential to understand the mechanisms of diseases and make a diagnosis. At this point of view, the effective performance of deep learning methods has provided the solution to various state-of-the-arts problems. Convolutional Neural Network (CNN), a kind of deep learning method, is widely used in various computer vision applications such as classification, detection, localization, and semantic segmentation. In the study, histological data classification application was carried out using student preparations prepared for the laboratory courses of the Department of Histology and Embryology, Faculty of Medicine, Selcuk University. The blood, connective, epithelium, muscle, and nerve tissue preparations were taken at different times from human tissues or from various mammalian animals whose tissues were similar to humans. The proposed artificial intelligence framework can be useful educational material for undergraduate and graduate students in medical school and health sciences, especially in the pandemic period. Moreover, it can also be used as a computer-aided medical decision support system for medical professionals to minimize time-consuming and job performance losses.

KEYWORDS - Classification, Convolutional Neural Network, Deep Learning,Histological Image

A JOINPOINT REGRESSION ANALYSIS OF TRENDS IN MORTALITY DUE TO COVID 19 PANDEMIC IN TURKEY

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ABSTRACT

The Covid-19 pandemic, which emerged in December 2019, continues to spread rapidly in our country as well as all over the world. The number of patients and deaths due to many factors is changing the course of the epidemic day by day. In this study, we analyzed the trends of Covid-19 pandemic in Turkey. A joinpoint regression analysis is performed to analyze trends and significant changes on trends. The data used in the study was obtained from the Covid-19 database of the Ministry of Health. The developed statistical model identifies significant changes in a pattern over a period of time by assuming a trend between joinpoints. One of the advantages of this method is the ability to identify the number and location of changes in the trend, and to estimate the average percentage change for each defined period between inflection points. The results of the analysis are discussed especially on mortality with the information of changes in restrictions and virus mutations.

KEYWORDS - Covid19, Joinpoint regression,trend analysis

CLAHE BASED ENHANCEMENT APPROACH TO TRANSFER LEARNING FOR COVID 19 DETECTION

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ABSTRACT

Early diagnosis of COVID-19 disease becomes possible with the enhancements on feature learning and advanced pre-processing stages for classification of chest X-ray images using deep learning. Besides, high-performance models have been developed by many researchers due to the popularity of Deep Learning. In this study, chest X-ray images were pre-processed using Contrast Limited Adaptive Histogram Equalization (CLAHE) before the classification with particular popular transfer learning approaches with deep learning architectures including AlexNet, MobileNet, VGG16, and DarkNet19. The originality of the paper is pre-processing the images using CLAHE to obtain more significant representations of airways and pathologies before training chest X-ray images. Whereas determining the CLAHE parameters, the best five parameters obtained as a result of various trials were selected. The other superior contribution of the proposal is using a large-scale dataset for both training and testing, which is comprised of 3500 healthy and 3615 chest x-rays with COVID-19. The CLAHE-based transfer learning proposal achieved an accuracy rate of 95.878% as the most successful binary classification result for COVID-19 and Healthy using VGG16 model and CLAHE parameters including disk value of 56, clip-limit of 0.2.

KEYWORDS - Deep Learning, Convolutional neural networks, chest x-ray, Adaptive Histogram Equalization, medical image analysis

UNDERWATER FISH RECOGNITION USING DEEP LEARNING

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ABSTRACT

Image processing techniques enable generating robust representations. However, it is still method-dependent and is computationally intensive due to high dimensionality in feature extraction. Generative models have been popular approaches in the last decades with the advantages of Deep Learning. The deep Belief Networks (DBN) classifier has a common use for various types of biomedical signal and images generates different presentations of the input data for each latent layer. Restricted Boltzmann machine algorithm supports the representations using energy and probability distributions of the input data and transfers the distributions to the joint layers. The DBN with detailed representational learning has more efficient and robust for underwater fish images on supervised learning-based classifiers.

KEYWORDS - Deep Learning, representational learning, Deep Belief networks, fish recognition

IMPACT OF MISSING DATA IMPUTATION ON CLASSIFICATION ALGORITHMS IN MEDICAL PREDICTIVE MODELS

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ABSTRACT

In medical predictive models, data missingness is a significant issue. The typical approach is imputing missing data before training a predictive model. However, the impact of imputation methods on the predictive model performance is generally ignored. This study aims to examine which prediction algorithm gives better results with which imputation method on medical datasets. We applied six missing data imputation methods and three classifiers on five medical datasets taken from ICU machine learning repositories for this aim. These datasets include missing data with different ratios from 13.34% to 99.94%. We used the imputation methods: K Nearest Neighbors (KNN), mean imputation, class-mean imputation, multiple imputation chain rule (MICE), Soft-Impute, and zero imputation. In addition, we used the classifiers: K Nearest Neighbors, Support Vector Machine (SVM), Logistic Regression (LR). Experimental results show that the KNN classifier reaches the best prediction success with mostly zero imputation, the LR classifier reaches the best prediction success with mostly KNN imputation and MICE, and the SVM classifier reaches the best prediction success with mostly KNN imputation.

KEYWORDS - missing data,classification,medical datasets

DETECTION OF MALARIA WITH SUPPORT VECTOR MACHINES ALGORITHM

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ABSTRACT

Today, with the rapid progress of technology, the application areas of artificial intelligence are expanding rapidly. One of the important areas of use of artificial intelligence is the field of health. A total of 27558 microscopic images taken from people with and without malaria virus from an open access website were used in the study. 22046 images, 80% of the microscopic image, were randomly allocated for training data, and 5512 images, 20%, were randomly allocated for the test data. Images reserved for training and testing are labeled as present and non-malarial. The images reserved for training and testing were reduced to 28x28 image size. In the next step, the images converted to 28x28 size were converted into a one-dimensional array for training with the support vector machine algorithm. Support Vector Machines algorithm is trained using kernel=rbf, degree=7 and C=1 hyper parameters. The model obtained after training with support vector machines was tested on 5512 test data. As a result of the test process, it was determined that the model detected 4370 images correctly and detected 1142 images incorrectly. It has been determined that the model created with Support Vector machines according to the determined hyper parameters determines whether there is malaria disease with an accuracy rate of 78.28%.

KEYWORDS - Artificial Intelligence; Support Vector Machine; Malaria Disease

MOVING PEOPLE EFFECT ON INDOOR MOBILE NODE LOCATION ESTIMATION BASED ON WI FI SIGNALS

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ABSTRACT

The presented work focuses on an approach related to minimization of moving people effects for indoor mobile node location estimation (MNLE) methods and navigation solutions. It is of high importance considering the widespread deployment of localization techniques utilizing received signal strength indicator (RSSI) values especially in mobile application integrated web systems. Based on a proposed model for accurate RSSI reading and its simulation study explored in this paper, the preliminary results show that it is possible to reduce the negative impacts of moving people with mobile devices and to improve location estimation performance, especially with the effective utilization of available mobile device built-in hardware features such as gyroscope for specifying a user's heading direction.

KEYWORDS - Indoor Mobile Nodes, Location Estimation, Moving People, Mobile Device Features.

DETECTING THE MODE OF WRITTEN DISCOURSE IN TURKISH NEWS TEXTS USING DEEP LEARNING

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ABSTRACT

This research aims to explore the natural language used in daily news websites with respect to the modes of discourse. Discourse analysis is the subtask of Natural Language Processing as well as a crucial research area in Linguistics. This study bridges these two important tasks by classifying modes of discourse and then, constructing the language models using deep learning approaches which are called word embeddings. Word embeddings is a vectorial representation of text where the words that have similar meanings appear together. We have built four language models for Turkish language using continuous-bag-of-words algorithm in order to obtain word embeddings. We used Support Vector Machines classifier to see whether our models can perform better and reach a point that linguistically differentiated discourse modes can be predicted by an SVM classifier. Acknowledgement: The authors thank to Bartın University for its support (BAP No: 2020-FEN-A-018).

KEYWORDS - Discourse detection, word embeddings, continuous bag-of-words, modes of discourse, discourse in news texts.

THE IMPLEMENTION OF THE NEW ENCRYPTION MATEMATICAL MODEL FOR CRYPTOSYSTEMS

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ABSTRACT

Data that is constantly on the move in today's digital communications can be "surveyed" easily and are typical cases where encryption can be applied. The development of computer systems in terms of interconnections in today's networks has increased the dependence of companies and individuals on the information that is stored or transmitted. At the same time, awareness has been raised about protecting data and communications against various intrusions, guaranteeing the authenticity of messages, and protecting systems against network attacks. In the following paper, we will present two operators as mathematical models, which can be used in many other ideas and approaches. We will see the power of these mathematical operators in creating a new cryptosystem for authentication for online users to make transactions through the use of a new cryptosystem.

KEYWORDS - cyrptography; encryption; authentication; security;

AN EFFECTIVE AND ROBUST MACHINE LEARNING APPROACH FOR AUTOMATED HUMAN POSTURE DETECTION FROM IOTS MODULE

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ABSTRACT

People often do not notice their posture disorders. However, over time, poor posture can cause arm, head, waist, and back pain, nerve compression, muscle fatigue, and weakness. IoTs and machine learning based-applications that instantly detect posture disorders and provide information to the user can prevent such disturbances from occurring over time. In this study, healthy and unhealthy posture was automatically detected from posture position information obtained from an IoTs-based sensor module. Axis information obtained from the human knee and chest was used as the feature set. The size of the feature set was decreased with Chi-square and Decision Tree algorithms. Sleeping, sitting, and standing postures were classified as healthy and unhealthy with Support Vector Machine (SVM), k-Nearest Neighbor (KNN), and Naïve Bayes algorithms. The best accuracies were 100% for all situations.

KEYWORDS - human posture, IoTs, feature selection, classification

CYBERSECURITY CHALLENGES FOR ORGANIZATIONS

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ABSTRACT

Internet security plays a vital role in an information technology ecosystem. Providing information has become so far the best challenge nowadays. When we think of cybersecurity, the first thing that comes in mind is cyber-crime, which is growing by the day. Governments and enterprises are taking many measures to prevent these cyber-crimes. In addition to various measures, internet security is still a big concern for many people . This paper focuses on explaining the challenges facing organizations in the event of a cyber-attack. Lately, we describe also the techniques, ethics and cyber defense including trends that change the credibility of the organizations online. The summary and discussion of the paper presented the results of the study which shows that the challenges of organizations nowadays in a cybernetic case are organized and need to sophisticate their walls to protect themselves with the security issues.

KEYWORDS - cybersecurity, internet crime, ethics, social media, cloud security.

ARTIFICIAL INTELLIGENCE BASED ESTIMATION OF BODY MUSCLE PERCENTAGE

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ABSTRACT

Abstract Background and Objective: Measuring and monitoring the body's muscle mass is crucial throughout maintaining a healthy life. Especially, specifying and monitoring the loss of body muscle in elderly persons have importance so that the life quality is boosted. Methods that have been already used to measure the body's muscle mass have some disadvantages, such as cost and the difficulty of measurement. Because of these reasons, new approaches that are practical, reliable, and include high-level technological equipments and softwares are required to measure the body's muscle mass. This work aims to specify the body's muscle mass reliably with an Electrocardiography signal (ECG) based on Artificial Intelligence. Materiel and Method: In this study, ECG signals were obtained from 300 persons approximately, and data of body muscle quantity measured with TANITA have been used. ECG records which are about 3 min have been obtained. In the study, the ECG signal of each person has been cleaned by using digital filters. Twenty-five attributes for each signal have been received. Attributes that are related to body muscle mass have been chosen with the help of attribute choice algorithms. In the study, the Artificial Intelligence algorithm has been used more than once. Results: When obtained model performances are examined, R is in between 0,748-0,707, and MSE is in between 46,507-53,099. Conclusion: According to acquired results, It is evaluated that developed models can be used in daily life practice. Acknowledgement: Ethics committee and data usage permissions required for the study were obtained. Ethics Committee Approval: Sakarya University Faculty of Medicine - 03/05/2019 - 71522473/050.01.04/112. Data Colletion and Use Permission: Sakarya University Rectorate - 27/08/2019 - 35955870/604.02.

KEYWORDS - Body Composition,Body Muscle Percentage, Electrocardiography, Artificial Intelligence, Signal Processing,Vücut Kompozisyonu, Vücut Kas Yüzdesi, Elektrokardiyografi, Yapay Zekâ, Sinyal İşleme

NUMERICAL SIMULATION OF DIFFRACTION PATTERNS WITH DIFFERENT ILLUMINATION LASER WAVELENGTH

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ABSTRACT

In this study, a computer simulation program generating Fresnel diffraction patterns from the apertures by using the different illumination wavelength sources has been studied. Changing the aperture-screen distance and the illumination wavelength provides a clear transition of diffraction patterns from the Fresnel to the Fraunhofer region. The diffraction patterns obtained by the Fresnel integral method have been compared with those simulated by the Fraunhofer calculation. There is a good agreement between the results. Certain conditions have been investigated that Fresnel diffraction patterns approach the Fraunhofer diffraction patterns. The simulations have been performed using a personal computer with Matlab software.

KEYWORDS - Diffraction, Optics, Numerical simulation, Micron/nano structures

DETECTION OF ERRORS IN GLASS PRODUCTS IN STUDIO ENVIRONMENT WITH IMAGE PROCESSING AND DEEP LEARNING METHODS

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ABSTRACT

It is difficult to detect defects on the surfaces of glass products due to its transparent structure, sensitivity to reflections and being affected by dust and dirt. In this study, surface defects, which are bubbles and wrinkle, were investigated for glass packaging products with curved surfaces (glass bottles, glass jars, etc.). In the first stage, suitable lighting conditions were examined for faulty/defect-free glass products supplied from the manufacturer. The images taken with a professional camera were analyzed with Faster R-CNN by changing the background of the studio environment and the apex angle. In the analyzes made, the highest accuracy rate was obtained as 82,817%, with the apex angle of -60° and white matte background. After determining the appropriate lighting environment, the color space conversion methods HSV and CIE-Lab Luv were applied to the obtained images, and the overall accuracy rate was obtained as 89,577% for the V channel of CIE-Lab Luv. In order to improve the system performance, the results were analyzed by applying adaptive histogram equalization to the color space transformations and the overall accuracy was 90,423%.

KEYWORDS - Quality Control on Glass Surface, İmage Processing, Deep Learning, Pixel Based İmage Segmentation

PROPAGATION OF GAUSSIAN BEAM IN ATMOSPHERIC TURBULENCE

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ABSTRACT

The effect of system parameters on the intensity profile of Gaussian beams propagating in atmospheric turbulence is analyzed utilizing a random phase screen model. The intensity profile properties are assessed against the changes of operating wavelength, receiver aperture side length, and source size parameters. The results show that Gaussian beams with a bigger source size are able to keep their original profile and spreading less while propagating in a turbulent atmosphere. Increasing the receiver aperture side length does not have a noticeable effect on Gaussian beams. The beams operating at higher wavelengths suffer from more beam spreading.

KEYWORDS - Gaussian Beam, Turbulence, Random Phase Screen, Laser Beam Propagation, Optical Communication

ARDUINO BASED SYSTEM DESIGN FOR MEASURING HEART RATE AND BODY TEMPERATURE

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ABSTRACT

In this study, a multi-sensor and low-cost biosensor system has been developed using the Arduino microcontroller board. With the established system, it is aimed to digitally measure the heart rate and body temperature of people. In this way, vital body values of people with health problems will be monitored regularly and sudden changes in values will be determined. In the development of the system; Arduino uno electronic control card, heart rate sensor and temperature sensor are used together. With these tools, a software that is sensitive to detecting heart rate and changes in body temperature has been developed and a general working diagram has been created. The system created has a structure open to future additions and improvements. It has been determined that the data obtained with the help of the sensors on the system can be transferred to the computer environment via wifi and followed on the internet. More sensors can be placed in the biosensor tracking system in accordance with the intended use. As a result of the tests, it was seen that the system successfully transmitted the information received from the sensors visually to the user within the desired time period and warned with an audible warning at the critical values determined. It is considered that the developed biosensor system can be used to access information consisting of heart rate and body temperature, which are vital for humans, remotely and instantaneously, and will contribute to the field of medicine in this context.

KEYWORDS - Arduino, Sensor, Biosensor, Heart Rate, Body Temperature

APPLYING PART JRIP AND ONER ALGORITHMS ON DIABETES BREAST CANCER AND IRIS DATASETS FOR COMPARATIVE ANALYSIS

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ABSTRACT

Classification is the operation of predicting class of the given data by preparing a model that makes use of data whose categories already predicted. Data mining techniques are regularly used to form a classifier that predicts belonging class of a new data among the previous given classes. This paper intends to provide comparative analysis of the rule based classifiers used in data mining applications. Analyzing the performance of rule based classifiers namely PART, JRIP, OneR. The goal of this paper is to specify the best technique from classification rules techniques under the chosen datasets and also provide a comparison result each classifier. The rule based classifiers applied to diabetes, breast cancer and iris datasets due to the purpose of determining better technique for classification. Comparison results are made with accuracy, precision, sensitivity and confusion matrixes.

KEYWORDS - Data Mining, Rule Based Algorithms, PART, JRIP, OneR.

SIMULATION AND THEORETICAL ANALYSIS OF A DIGITAL CAPACITANCE MEASUREMENT CIRCUIT

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ABSTRACT

This paper presents theoretical analysis and simulation of a digital capacitance measurement circuit. The capacitance measurement circuit setup consists of a digital signal processing unit and a transimpedance amplifier. An unknown capacitance is excited by an input signal generated by a digital signal processing unit. Transimpedance amplifier converts the current flowing on the unknown capacitance into a voltage value. This modulated voltage is sampled by an analog-to-digital converter. The digital lock-in amplifier can be built on the digital signal processing unit, and it outputs a voltage value proportional to the unknown capacitance. The effects of the transimpedance amplifier's analog noise and analog-to-digital converter's quantization errors are examined. Total noise, sensitivity, resolution, signal-to-noise ratio, settling time, response time and relative measurement error are the simulated performance metrics of the measurement circuit. 4.7 pF and 15 pF are chosen as the values of the unknown capacitance. The simulations are run for 50 kHz and 100 kHz excitation frequencies.

KEYWORDS - capacitance, digital lock-in amplifier, measurement, transimpedance amplifier.

DEVELOPMENT OF EDUCATIONAL ROBOT AND USER INTERFACES FOR ROBOTIC APPLICATIONS

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ABSTRACT

There is a limited number of current resources that can be found on the internet or in books about Robot Operating System (ROS) and robotic programming. People trying to learn these platforms cope with various problems due to limited resources. In this study, we introduce a low cost modular education robot, called the Halikarnas Modular Education Robot (HAMER). The platform is equipped with some basic sensors and a visual camera. We designed experiments involving many ROS packages to introduce robotic programming concepts to users. These experiments have been arranged starting from basic level concepts to more complex robotic programming applications. In addition to the hardware design, a graphical user interface (GUI) for HAMER that can be executed on a personal computer has been developed to manage the learning outcomes in the study. The students can easily perform the experiments on the student screen of this interface and the teachers can follow and test the students' experiments on the teacher's screen to observe the outputs. This design not only contributes to the learning outcome, but also ensures that the learning process is effectively controlled and maintained. In this article, we present the hardware and software designs of the Halikarnas modular education robot. The main motivation of this study is to facilitate the learning of ROS applications through the designed educational robot and thus to inspire readers to create various mobile robot designs to fulfill specific tasks.

KEYWORDS - Education, Mobile robot, Robot operating system, Graphical user interface.

DESIGN OF A DIGITAL LOCK IN AMPLIFIER USING XILINX SYSTEM GENERATOR

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ABSTRACT

In this paper, a digital lock-in amplifier is designed using Xilinx System Generator. The designed digital lock-in amplifier is used to simulate values of the following nominal capacitances: 2.2 pF, 4.7 pF, 5.6 pF, 6.8 pF and 10 pF. The digital lock-in amplifier consists of an internal signal generator, two multipliers, 2 FIR low-pass filters and an ARCTAN block. The internal signal generator uses Direct Digital Synthesis to produce 50 kHz sine and cosine reference signals. The low-pass filters are designed using FIR Compiler blocks. The outputs of the low-pass filters are in-phase and quadrature components. CORDIC ATAN block converts in-phase and quadrature components into amplitude and phase values which are in proportional to the value of the measured capacitance. Analog noise and quantization error of analog-to-digital converter are added to obtain more realistic simulations. The digital lock-in amplifier in SIMULINK environment is compiled, and hardware description language bitstream is generated for Xilinx ZedBoard FPGA. The bitstream is downloaded into the FPGA and hardware-software co-simulation is performed. Relative errors are calculated for the nominal value and the measured value.

KEYWORDS - capacitance measurement, digital lock-in amplifier, FPGA, Xilinx System Generator

ENERGY MANAGEMENT INTELLIGENT STREET LIGHTING SYSTEM IN AHAR CITY WITH THE INTERNET OF THINGS A CASE STUDY

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ABSTRACT

In an advanced world where every city strives for progress and intelligence, using the existing infrastructure in cities and upgrading them is the most cost effective way to develop them and make them intelligent. One of the features of the smart city is the use of new urban lighting and illuminants such as smart street lighting. There are more than 300 million streetlights in the world, but most have not yet been upgraded to LED lights, even though they offer clear technological and economic benefits. Traditional light bulbs are gradually being replaced by more efficient and controllable LED light bulbs. The design proposed in this article for smarter lighting of downtown arcades includes various components such as intelligent LED control loops, gateways, sensors, and a centralized management operating system. In this paper, the lighting of a two-lane expressway is designed and modeled, then the energy consumption of both traditional lighting and intelligent lighting with motion sensor is studied. A case study in this regard is one of the highways of Ahar city.

KEYWORDS - smart city, smart street lighting, energy efficiency, Illumination

DISABLED PERSON S PARKING AREA RECOGNITION SYSTEM WITH IMAGE PROCESSING ALGORITM

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ABSTRACT

The aim of this Project is to create a prototype that prevent illegal using of the disabled person only parking areas by non disabled people. A camera that can see clearly the disabled only parking area in parking lot captures live image from the disabled only parking area. This image transfered to computer for object/shape recognition algorithm image processing step. In this step system checks the image and make a decision to if it is disabled or non disabled person. After this, if system decide it is disabled person's car opens barrier that blocks entrance of the disabled only parking area. Otherwise system will not opens the barrier and non disabled people can not enter the disabled only parking area. With this Project only disabled people can park their cars to the disabled only parking area.

KEYWORDS - Image detection, disabled vehicle, intelligent parking system.

RULE BASED DETECTION OF DEATH RISK IN HEART FAILURE PATIENTS

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ABSTRACT

Abstract Background and Objective: Heart failure is a chronic condition caused by the inability of heart to adequately pump the blood needed for the body. Since body cells cannot receive enough nutrients and oxygen, heart failure brings about several serious illnesses such as cardiovascular diseases, which entail over 17.9 million death cases every year according to WHO statistics. Although the disease is mostly seen at the age of 65 and above, it is seen with equal frequency in men and women. Treatment of heart failure varies depending on early diagnosis. The life-threatening risk of the disease can be reduced thanks to the early detection of heart failure symptoms. However, in the later stages, the development of heart failure reaches unavoidable dimensions if it cannot be diagnosed. Thus, the patient may face challenging operations such as heart transplant or open-heart surgery. Methods such as artificial intelligence are needed to make more accurate predictions regarding the patient condition and to shorten the diagnosis time. This study aims to determine the survival status of patients with heart failure in a short time with a highly accurate and artificial intelligence-based prediction system. Thereby, the actions that should be taken regarding the patient (such as drug therapy, bypass, heart transplantation) could be managed significantly earlier. Material and Method: Clinical, body, and lifestyle information of 299 people (96 of whom were deceased) were used in this study. Data were retrieved from UCI Machine Learning Repository. The proposed model is developed as follows: Information taken from each patient, which consists of 13 categories, was sorted by a feature sorting algorithm. Rule-based models were created by using decision trees after reducing the features extracted by the feature sorting algorithm. Results: When the performance of rule-based models is examined, the accuracy rate varied between 85-95%. Since the analyzes that need to be conducted regarding the patient are reduced and the artificial intelligence model will respond within seconds, the necessary decision would be made in a short time. Conclusion: Conclusively, it is observable that the created model has high accuracy and is time-saving. Therefore, it is considered that the created model can be used as a decision support system (assisted diagnosis method) that can help cardiologists in the clinic to take control of signs and symptoms of heart failure.

KEYWORDS - Heart Failure, Artificial Intelligence, Survival, Machine Learning, Decision Trees

METAHEURISTIC ALGORITHMS APPLIED IN PERMANENT MAGNET MOTORS OPTIMAL DESIGN

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ABSTRACT

The purpose of this presentation is to highlight some of the possibilities of application metaheuristic optimization algorithms in the optimal design process of electromagnetic devices such as permanent magnet motors. An example of algorithms that are effective to solve constrained optimization problems are: a) Generic Algorithms (GA), b) Particle Swarm Optimization (PSO), c) Bat Algorithm (BA), d) Gray Wolf Optimization (GWO), and d) Cuckoo Search (CS). These algorithms were applied in the author's research. At present, complex models of the various phenomena in the designed device are used in the design process. These models consist of: (a) an equation describing the electromagnetic field, (b) supply circuit equations, (c) an equation describing rotational equilibrium, and also (d) an equation describing the thermal phenomena. All of these phenomena are usually taken into account when the finite element method (FEM) is used. FEM models are very complex, therefore, the optimization processes which incorporate them are very time-consuming. In international literature, intensive development of new optimization algorithms has been observed. Currently, heuristic (non-deterministic, metaheuristic) algorithms are being most dynamically developed. These types of optimization algorithms are especially effective in solving the design challenge connected with electromagnetic devices. In the last two decades, an increased number of papers devoted to the application of different probabilistic algorithms elaborated on the basis of the natural environment (nature-inspired algorithm) has been observed in relation to the design of PM motors. Among PM motors, brushless direct-current motors (BLDC) and permanent magnet synchronous motors (PMSM) are currently developing most dynamically. The Genetic Algorithm (GA) and Particle Swarm Optimization (PSO) algorithms are often used to optimize these two types of motors and other technical problems. According to the author of the presentation, two methods developed before 2000 (GA and PSO) should be assigned as classical methods. Many scientific demonstrated their effectiveness and good performances. In order to achieve better convergence of optimization processes, scientists are continuously applying new optimization algorithms. New optimization algorithms are being used more and more often. This group of algorithms consists of: the Slap Swarm Algorithm (SSA) algorithm, the Cuckoo Search (CS) algorithm, the Bat Algorithm (BA), and the Gray Wolf Optimizer (GWO) algorithm.

KEYWORDS - METAHEURISTIC ALGORITHMS,PMSM

EXPERIMENTAL INVESTIGATION OF OPTIMUM TILT AND ORIENTATION ANGLE IN THE PHOTOVOLTAIC PANELS

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ABSTRACT

Photovoltaic (PV) systems are at the forefront of solar energy applications today, where energy scarcity is increasingly becoming a problem. The decrease in the costs of solar technology materials and equipment has increased the use of Photovoltaic (PV) technology for electrical power generation at a remarkable rate in recent years. The number of PV applications is increasing, both in grid-connected and stand-alone applications, especially in areas with high local solar potential. The recent interest in PVs around the world necessitates the search for optimum operating conditions for such systems. Turkey is one of the countries with high solar energy potential. Konya province has an important geographical position for PV applications with an annual sunshine duration of 7.94 hours and an annual average energy potential of 4.407kWh/m2. The performance of a photovoltaic panel depends on the angle of an inclination concerning the horizontal surface, the azimuth angle, and the amount of radiation falling on the panel. Therefore, to obtain high efficiency from a photovoltaic panel, it must be placed at the correct slope and azimuth. Because the tilt and azimuth angles determine the amount of solar energy received by the surface of the PV panels. Adjusting the tilt angle and azimuth angle according to various factors such as time, season and location is an effective solution to reduce the power generation cost. Measured data from panels can give a realistic performance of PV systems under real operating environments for product selection and system design. For this purpose, an experimental grid-connected PV system study is currently underway in Konya province to evaluate the performance of different PV panel tilt angles throughout the year. Technical data, including available solar radiation and output energy generated, are systematically recorded. According to the experimental results obtained, the 30-degree angle can be suggested as the optimum tilt angle for almost the whole year. This proposed angle value is theoretically verified through the solar geometry equations established in the light of the measured data.

KEYWORDS - PV Panel, Tilt Angle, Azimut Angle, Optimum Position

A 6 BIT TWO CHANNEL TI ADC IN SI GE HBT BICMOS TECHNOLOGY

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ABSTRACT

This paper presents design steps of a 6-bit two-channel time-interleaved (TI) ADC in 0.25µm Si-Ge HBT BiCMOS technology. Two 6-bit flash ADC cores are used in both time-interleaved channels. In digital parts of the design, standard CMOS logic gates are preferred since a low power consumption value is one of the main targets of this work. Transistor sizes are selected carefully to be able to obtain as high as possible speed performance, which is another main goal of this study. The main core design blocks of the complete TI ADC are sample/hold circuit, 6-Bit Flash ADC, a 6-bit 2x1 digital multiplexer, and a control pulse generator. BiCMOS analog comparator architecture is preferred in the analog part of flash ADC since BiCMOS technology combines the advantages of CMOS and Bipolar technologies. The power consumption value is 653 mW under a single DC power supply voltage of 3.3V. The simulation results include 7Gs/s sampling rate, 0,174 LSB of INL and 0,113 LSB of DNL values. The simulation results are compared to similar works in the literature. For the time being, the complete design is realized using Cadence IC design platform in schematic level only. However, the physical layout design and post-layout simulation steps are ongoing research of us.

KEYWORDS - TI ADC, Si-Ge HBT BICMOS, Flash ADC, VLSI

RADAR RANGE PROFILE PROCESSING BY USING ONE DIMENSIONAL TIME DOMAIN GREEN S FUNCTION

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ABSTRACT

This study proposes a method for detection and determination of the range profiles with a single transceiver for UWB radars operating in short range and indoor sensing. To achieve this, a formulation that is employing one-dimensional Green's functions has been employed. It has been exploited that Green's functions have ability to model the response of the electromagnetic wave to the propagation medium. Impulse-like properties of the Green's functions have been tested and focusing properties on the delay values of the range of the targets have been determined and can be advanced to the multidimensional problems such as imaging. Related Green's function has been modularly adapted into the mathematical expression of the method. An implementation has been made on the raw data and successful results for the range profile synthesis have been presented.

KEYWORDS - Radar signal processing, Green's function, range profiles, ultra-wideband, synthetic aperture radar (SAR),radar imaging

A NEW APPROACH TO INCREASING THE EFFICIENCY OF SOLAR PANELS

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ABSTRACT

Obtaining electricity from solar panels, which is one of the renewable energy sources, is very important today. Obtaining the highest level of energy from solar panels is one of the main issues that researchers focus on. One of the methods that helps to increase the efficiency of solar panels is panel cleaning. This paper presents a new approach to increase the efficiency of solar panels. In the study carried out on three solar panels of 10W, one of the panels is covered with stretch film, another panel is covered with rain-slip solution and the other panel does not have any coating. These three panels were exposed to the same ambient conditions and efficiency values and operating parameters were compared

KEYWORDS - Solar panel, efficiency, photo voltaic system, cleaning PV

A STUDY FOR THE IMPROVEMENT OF OPERATING CAPACITY IN MARINE GENERATORS

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ABSTRACT

Most ships need diesel generators to meet their electrical energy requirements. Therefore, each improvement to be made in marine generators will increase energy efficiency in ship's power system. In this study, three scenarios for meeting the electrical energy requirement of a ship from diesel generators are examined. The switching ratio is set as 30%, 60%, and 90% of the generator's nominal capacities for Scenario I, Scenario II, and Scenario III, respectively. In each scenario, the operating conditions of the first, second, and third generators have been analyzed according to the determined switching ratios. Then the total fuel consumptions have been estimated for 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, and 100% load demand of the total power capacity on board. The results show that maximum and minimum fuel consumption is occurred when the switching ratio is set to 30% and 90% of the generators' nominal capacities, respectively. The results also show that taking care to operate generators close to optimum load will increase the energy efficiency in the ship's electrical system to a certain rate.

KEYWORDS - Ship, Electrical energy, Marine generator

COMPARISON OF OPTICAL OFDM TECHNIQUES IN VISIBLE LIGHT COMMUNICATION

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ABSTRACT

Already crowded radio frequency spectrum struggles to cope with the uncontrollable increase in wireless data traffic. A promising candidate for high speed data transmission is Visible Light Communication (VLC), whose widespread use is relatively easy because it uses currently exist illumination setup for communication. Orthogonal Frequency Division Multiplexing (OFDM) is a powerful technique used in VLC systems, as in other wireless communication systems, because of its resilience to inter symbol interference. But the conventional OFDM, which outputs complex valued time domain samples, should be adopted to be used in optic communication, because intensity modulation requires real positive signals. In this paper, we examine three optical OFDM techniques given in the literature, namely Direct Current Biased Optical OFDM, Asymmetrically Clipped Optical OFDM and Unipolar OFDM. These techniques all use hermitian symmetry to obtain real signals, but bipolar to unipolar conversion is done with various approaches: The signals are made positive by adding simply a dc bias or by asymmetrically clipping or positive and negative values are send separately. In this paper, these techniques are questioned with respect to their performance, spectral efficiency and complexity.

KEYWORDS - Orthogonal Frequency Division Multiplexing, Asymmetrically Clipped Optical OFDM, Direct Current Biased Optical OFDM, Unipolar OFDM, Visible Light Communication

BABY HEALTH MONITORING AND PRE DIAGNOSTIC SUPPORT SYSTEM

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ABSTRACT

Within the scope of the study, it has been developed as a smart health monitoring system that continuously monitors the body functions of infants such as body temperature and pulse, remotely, for a long time and in real time, and informs the parents in any negative situation. For this, a biomedical system in the form of a baby thermometer was designed by using the relevant sensors. The most common diseases in childhood; acute upper respiratory tract infections, gastroenteritis, otitis media and allergic diseases, malnutrition, intestinal parasites, pneumonia, rickets and reproductive system infections. High fever is seen in most of these diseases. Convulsions caused by high fever in infants, etc. important effects were monitored thanks to this system and possible negative situations were prevented by early diagnosis. This study has resulted in success as a result of the tests carried out, and there is a potential to emerge as an industrial product that can be put into mass production for the purpose of protecting babies.
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KEYWORDS - Thermometer, sensor, non-invasive, baby thermometer, baby health, early diagnosis.

SENSOR BASED DAIRY ANIMAL HEALTH MONITORING AND USER NOTIFICATION SYSTEM

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ABSTRACT

Within the scope of the study, an animal health monitoring system was promoted and the terms of efficiency and quality has been made measurable by monitoring some activities especially health in animals; heat, giving birth, nourishment, rumination etc. A smart system has been designed that can follow up disease and rutting by comparing the data gathered from a neck collar which is tied to the animals' neck with reference value in the computers by virtue of the formed algorithms. The neck collar with communication system will be on the animal. There is a station setting designed for data processing and user information and an enhanced system for data reporting and conveying to users. Problems will be occurred with this system will be conveyed to users and instant solutions will be provided.

KEYWORDS - Animal monitoring system, disease detection, sensor, smart system

DESIGN OF A SYNCHRONOUS FOUR SWITCH BUCK BOOST CONVERTER FOR PORTABLE COMMUNICATION SYSTEMS

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ABSTRACT

In portable industrial and military communication devices such as mobile phones, hand radios, satellite radios etc. batteries are used as power source. Digital, RF and other electronic circuits in these systems work with a fixed regulated DC voltage. Due to the variable voltage of the batteries (12 V – 35 V DC) a power electronic buck-boost converter is necessary to convert this variable input voltage to a fixed regulated output voltage. With the increasing power demand in all around the world, electronic systems should be energy efficient especially in power electronic converters. In traditional two-switch buck-boost converter topology, the stresses and losses are higher therefore the efficiency becomes lower. In order to reduce these high stresses and losses four-switch synchronous buck-boost topologies are proposed. The buck-boost converters are operated in buck, buck-boost and boost modes with respect to the output voltage is higher or lower than or substantially equal to the input voltage. In this study, a four-switch synchronous buck-boost converter was designed with 28 V DC fixed output voltage, 250 W rated power and high efficiency and power density to be used in portable communication systems. Within the scope of the study, a fixed regulated 28 V DC output voltage was obtained for 12V – 35 V DC variable input voltage. The output voltage ripple is lower than 5% in buck, buck-boost and boost modes at full load. Also, in mode transitions and 10% to 90% of full load transitions voltage ripple is lower than 5% of the regulated output voltage. Besides, the effect of the change in switching frequency was also studied since it has major effect on circuit size, losses, efficiency and voltage ripple. Design steps, the effect of operational quantities on determining the circuit elements are all given in the paper and dynamic behavior of the circuit was thoroughly analysed.

KEYWORDS - DC-DC converter, buck-boost converter, efficiency, ripple, switching frequency

ARTIFICIAL INTELLIGENCE BASED CONCRETE COMPRESSIVE STRENGTH DETECTION

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ABSTRACT

Abstract Background and Objective: Concrete, obtained by combining the aggregate with water, binder, and various additives, is a composite construction material with high compressive strength. Concrete, which can be used to construct many structures such as dams, buildings, roads, bridges, tunnels, is one of the most used construction materials due to its high compressive strength, easy workability, durable structure, and more economical than other construction materials. To determine the compressive strength of the concrete, samples are taken from the fresh concrete and kept during setting, and when the concrete reaches a certain age, its strength is determined with the help of a press. This process is called the concrete compressive strength test. This test creates a cost due to the use of materials and takes a certain amount of time depending on the age of the concrete. For this reason, new high technologies are needed to replace pressure tests. This study aims to develop an artificial intelligence-based system that can be used instead of a concrete compressive strength test without performing a substantial compressive strength test. Material and Method: The results of 1030 different concrete compressive strength tests were used in the study. Data were obtained from the UCI Machine Learning Repository (archive.ics.uci.edu). In the data set, there are eight properties based on the number of materials used in the production of concrete and the age of concrete. Decision tree methods were preferred as machine learning algorithms in the study because they have many advantages, such as high performance and easy implementation in embedded systems. Results: When the performance of the developed system is examined, the success rate varies between 76-89%. In addition to this success, the system's response to each new data occurs within seconds. Conclusion: It is considered that the proposed system can be used as a system that can help engineers determine the compressive strength of concrete in concrete plants due to its high accuracy and fast operation.

KEYWORDS - Concrete, Concrete Compressive Strength, Artificial Intelligence, Regression,Beton, Beton Basınç Dayanımı, Yapay Zekâ, Regresyon

OPTIMAL REACTIVE POWER DISPATCH USING OBPSO ALGORITHM

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ABSTRACT

In this study, OBPSO is proposed to find the optimal solution for optimal reactive power dispatch (ORPD) problems in power system. The proposed approach is used to find optimal control parameter values for ORPD. OBPSO is used to minimize power system losses and load bus voltage deviations. While the objective functions are minimized, they are run at the same time and in the same cycle with three frequently used optimization algorithms and the results are obtained. The performance of the proposed method has been tested on one of the standard test systems, IEEE 14 bus test system. In the study, cases with singular goal functions are discussed. Simulation results obtained from the proposed OBPSO approach indicate that OBPSO provides effective and give better results than other optimization techniques compared in the study.

KEYWORDS - OBPSO, Reactive power optimization, Real power loss minimization ,Voltage deviation

PROPAGATION CHARACTERISTICS OF LOW TERAHERTZ BAND CHANNELS

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ABSTRACT

In recent years, due to the increasing need for high speed data transfer, wireless communication systems face difficulties in handling the demand. One of the suggested solutions to overcome these difficulties includes using the terahertz (THz) frequency band in the electromagnetic spectrum. THz band communication is among the promising technologies in reaching high data rates because of its wide bandwidth. Unfortunately, THz band is frequency selective with high path loss and molecular absorption. As known, transmission channel should be known for fast and reliable communication, but models used in low-frequency systems are not suitable for THz waves. In this study, after giving a brief information about the THz band, the free space path loss and molecular absorption loss that affect the propagation characteristics of the channel are examined for low THz band.

KEYWORDS - Channel characteristics, free space path loss, molecular absorption loss, path loss, terahertz communication.

APPLICATION EXAMPLE OF DEEP ECHO STATE NEURAL NETWORKS CASE STUDY PREDICTION OF MOBILE HYDRAULIC CRANE S PRESSURE AND ECU TEMPERATURES

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ABSTRACT

Abstract - Real data taken from the field can be used as design parameters in engineering studies. Alternatively, the calculated and analyzed values should be verified by field tests. However, waiting for data from the field for design parameters can sometimes take a very long time. This makes engineering solutions too long or impossible. In the same way, there may be tests that are difficult to test in design verifications, require cost, and create security problems. This study sought solutions to the problems described using the DESN model in two different data sets. In the study, deep Echo State neural network analysis was performed on two different data sets. As data, the pressures formed in the cylinder during the lifting and lowering of 6 different loads by a truck-mounted mobile crane and the 4-month device temperature of the electronic control unit in an overhead crane were recorded. Echo State Network application was made on these records with deep learning. After training with 80% of the data, the DeepESN model was tested with 20%, and these results were evaluated.

KEYWORDS - Deep ESN, ECU Temperature Prediction, Mobile Crane Lifting Pressure Prediction.

HARMONIC ANALYSIS OF INPUT CURRENT OF 6 PULSE AND 12 PULSE RECTIFIERS

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ABSTRACT

In parallel with the advancing technology, power electronics circuits have been widely used in daily life, municipal services and industrial applications. Rectifiers are one of the most used structures of such circuits to satisfy ac-to-dc conversion. Due to the natural characteristics of switching semiconductor devices used in rectifiers, the ac supply current absorbed from the grid contains higher order harmonics. These harmonics may cause serious failures and damages in the power system equipment so there has been a great deal of attention at harmonic control in electric power systems. Therefore it is required to estimate the harmonic content produced by these rectifiers. This work presents the magnitudes and phase angles of harmonic components in the input current of 6 pulse uncontrolled, half-controlled and, of 6 and 12-pulse fully-controlled rectifiers with R and RL load at several firing angles via computer simulations. Harmonic levels of the rectifiers are discussed.

KEYWORDS - Harmonics, rectifier, total harmonic distortion

PARALLEL OPERATION OF SINGLE PHASE INVERTERS IN ISLANDED MICROGRIDS

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ABSTRACT

In this study, a droop control method based active and reactive power sharing for parallel connected single-phase inverters in islanded microgrids is presented. The droop control is the optimal choice for wireless control of parallel connected inverter based distributed generators (DGs). However, conventional droop control is poor power sharing in islanded microgrids as the distribution lines impedance is largely resistive. Therefore, in this paper, P-E and Q-ω droop control method is selected for the parallel operated single-phase inverters. In addition, the control technique of these inverters contains a current control loop and a voltage control loop to follow the reference voltage. Finally, PSIM simulation results are presented to show the active and reactive power sharing performance among parallel connected two 1 kVA single-phase inverters.

KEYWORDS - Islanded microgrid, droop control, distributed generators (DGs), active and reactive power sharing,single-phase inverter

DESIGN AND PERFORMANCE ANALYSIS OF A LORAWAN PROTOCOL BASED NETWORK FOR DATA COMMUNICATION WITH SMART WATER METER DEVICES BURSA CASE STUDY

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ABSTRACT

The internet of things (IoT) subject became widespread during the last decade while 25 billion connected devices will dominate the life by 2030 due to statistical expectation reports. In smart cities, sensors mostly use wireless communication facilities involving huge energy consumption risk. Long range wide area network technology is one of the main solutions inside the low power consumption wide technologies era that are called LoRa and LoRaWAN. In this case study, 56 LoRaWAN supporting water-meters selected from a three-blocks-apartment living area in Bursa that are selected from 232 water-meters paying attention to select at least one from every floor. Network design and performance analysis are studied focusing on received signal strength indicator (RSSI), signal-to-noise ratio (SNR), spreading factor (SF) and message transmission number by debugging the LoRa gateway logs. Best RSSI values are created by the Block B water-meters which are nearest end-devices (EDs) to gateways (GWs) while Block A and C values are already better than the theoretical limits. Also, in comparison to SNR values, Block B has better results. In conclusion, it is detected that Block A uses SF12, Block B uses SF7 and Block C uses SF12 values mostly.

KEYWORDS - LoRa,LoRaWAN,Smart metering,Smart City,LPWAN,IoT

DECISION TREES RULE BASED ELECTROENCEPHALOGRAPHY SIGNALING WITH FOUR AXIS CONTROL

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ABSTRACT

Today, some health problems restrict the physical movement of individuals with that disease. Examples of these health problems are Amyotrophic Lateral Sclerosis (ALS) and stroke. ALS is a neurological disease that results from damage to nerve cells responsible for controlling voluntary muscle movement. Stroke, on the other hand, occurs when brain damage occurs as a result of a sudden interruption or decrease in blood flow to the brain. This damage causes loss of function in some muscle groups in our body. While some of the individuals with ALS and similar diseases cannot move at all, some have limited mobility, so the basic daily movements of these individuals such as walking, speaking, holding, lifting, and similar are also limited. Although the person cannot control voluntary muscles in ALS and stroke-like diseases, most of the time, there is no problem in their brains' imagination and thinking functions. The basic movements that individuals with the disease imagine or think can be realized by using Electroencephalography (EEG) signals and artificial intelligence together to facilitate their daily lives. By processing EEG signals from the thinking region of the brain, these people can be provided with opportunities such as movement, orientation, and selection. The aim of this study is to process the received EEG signals and classify them as basic direction movements (right, left, down, up) and to speed up the classification process of thought as the primary direction. If the classification processes are realized, the person's action with the help of thought will be provided in a quality and fast manner. Within the scope of the study, the processing of brain signals received from humans and their classification with essential direction criteria are discussed. The limiting factor in this study is that the signal formed due to the inability of the individuals to focus while receiving brain signals from the study group negatively affects the classification. There are many studies involving EEG signals. Most of these studies have been performed by processing EEG signals. Considering individuals with limited physical movement, studies have been carried out on controlling their minds' basic directional movements on a wheelchair. The algorithms in the studies have been designed and implemented specifically for the individual. Unlike the sources examined, the algorithm developed for one individual was used for a different individual in this study. In many studies in the literature, EEG signals were obtained from many points of the head, while in this study, signals were obtained from only 2 points. Like many studies in the literature, this study includes the control of basic directional movements with the help of classification by processing the EEG signal. Mobility is of great importance for patients with ALS and similar diseases, and advanced technological products are needed for its realization. This study aims to perceive patients' thoughts and facilitate their daily movements thanks to artificial intelligence-based programs. Thus, patients can perform their basic activities without being dependent on another person.

KEYWORDS - Amyotrophic Lateral Sclerosis, Electroencephalography, Decision Trees, Artificial Intelligence, Signal Processing

ORGAN TRANSPORTATION THERMOELECTRIC COOLING SYSTEM DESIGN AND APPLICATION

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ABSTRACT

Thermoelectric modules are used in medical devices, air conditioners, refrigeration cabinets, measuring devices, etc. widely used in the fields. Application areas of thermoelectric modules and efforts to increase efficiency are in continuous development. In this study, an organ transport device with the thermoelectric cooling feature, which can be used in the medical field, was designed and performed and performance analyzes were made. An animal kidney measuring 5x6x10 cm was placed in the designed and realized system, and performance analyzes of the system were made at ambient temperatures of 25ºC, 30ºC, 35ºC, 40ºC. Each experiment was repeated five times and the average was taken. It was seen that the system, whose performance analyzes were carried out at different temperatures, was usable. The system's small size, less weight and low cost compared to conventional cooling systems are among the important advantages of the system. It is possible to say that with the further development of the implemented system, larger organs can be cooled and transported and further studies can be carried out in this direction.

KEYWORDS - ORGAN TRANSPORTATION ,THERMOELECTRIC COOLING SYSTEM,Thermoelectric modules

DESIGN OF A MINIATURIZED FREQUENCY SELECTIVE SURFACE BASED RASORBER

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ABSTRACT

This study presents a single layer FSS based rasorber by using FR-4 substrate with 1.2mm thickness. The presented design has an absorber with a copper hexagon loop shape on the front surface and a Frequency Selective Surface on the back surface of the designed structure. The given rasorber has one reflection band. This reflection band has 0.25 dB insertion loss between 3.85 GHz and 4.23 GHz. In the process of the optimizing the parameters of the rasorber, the absorption frequency of the FSS is adjusted so that it may act as a metallic surface. One of the aims of this study is to reduce the unit cell's thickness compared to other studies in the literature. In order to minimize the overall dimension of the unit cell, optimization is made and the size of the designed structure is determined as 22 mm x 22 mm. Also proposed rasorber structure has stable transmission characteristic for both TE and TM polarizations under oblique incidence from 0° to 30°.

KEYWORDS - Frequency Selective Surface, Frequency Selective Rasorber, Insertion Loss, Transmission, Absorber

RENEWABLE ENERGY GUARANTEES OF ORIGIN SYSTEM IN TURKEY A PRELIMINARY ASSESSMENT

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ABSTRACT

Renewable energy certificates (RECs) are market-based mechanisms that are awarded to certify the generation of 1 MWh of electricity from renewable energy sources (RESs-E). Participation in the RECs system is provided entirely on a voluntary basis and RECs support renewable energy generation. Turkey launched its national renewable energy certification system, the Renewable Energy Guarantees of Origin (YEK-G or RES-G), on June 01, 2021. In this study, the performance analysis of YEK-G has been carried out using determined performance indicators. The maximum YEK-G issuance was performed from hydro plants during the analysis period. There is no YEK-G issuance originating from solar plants. The lack of solar YEK-G issuance was caused by unlicensed power plants not being included in the YEK-G system. Despite the high amounts in the issuances, the redemption amounts for all plants were quite low. The most YEK-G redemption realized from geothermal plants. The overall consumption of electricity from renewable plants by using YEK-G reached 36,660 MWh at the end of the analysis period. During the analysis period; the quantities of matches in the organized YEK-G market and bilateral agreements in the over-the-counter YEK-G market increased. In order for the YEK-G system to succeed, unlicensed power plants must be included in the YEK-G system. The YEK-G system that has been established in line with the Association of Issuing Bodies' (AIB) standardized system of energy certification should be joined with AIB. Large-scale energy consumers should be obliged to consume RES-E in order to activate the YEK-G demand and ensure continuity.

KEYWORDS - Renewable Energy, Renewable Energy Guarantees of Origin System (YEK-G), Renewable Energy Certificate, Organized YEK-G Market

IMPLEMENTATION OF 802 11S MESH NETWORK ATTACKS ON AN 802 11AC BASED WIRELESS TESTBED ENVIRONMENT

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ABSTRACT

Abstract – Today, IEEE 802.11 wireless network technology has reached the point where it can provide a considerable amount of wide bandwidth at the physical layer. It has a wide range of usage to cover personal, industrial and military applications. At this level reached in wireless technologies has also made other 802.11 standards become more usable and popular. IEEE 802.11s Wireless Mesh Networking, one of those standards, has stood out with the flexibility and scalability that brings to wireless networks. 802.11s presents ease of use and deployment, distributed wireless network architecture, dynamic and intelligent routing ability which is essential to sustainability of Wireless Mesh Networks (WMN) via using Hybrid Wireless Mesh Protocols (HWMP) and Mesh Peering Management (MPM). Based on these concepts, this paper presents an implementation of Mesh Authentication, Path Diversion, Blackhole attacks on 802.11s wireless mesh networks and reports results obtained on an 802.11ac based wireless testbed.

KEYWORDS - 802.11s, 802.11ac, HWMP, Wireless Security, Wireless Attacks, Wireless Mesh Networks,campus networks

INVESTIGATION OF MECHANICAL PROPERTIES OF SWAGED WIRE ROPES VIA CONSTRUCTION CHANGES

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ABSTRACT

Steel wire ropes consist of several strands of metal wire twisted into a helical form. Swaged wire ropes, which have special importance among steel wire ropes, are used in many areas such as forestry, mining, special crane designs and port industry, owing to their superior strength and abrasion resistance. Swaged wire ropes are manufactured as a result of the deformation impacted on the surface of the standard wire ropes by swaging process. The applied deformation process causes a significant increase in the mechanical properties of the wire rope. Conventional production process consist of manufacturing process of the wires, and then strand the wires to create the final wire rope. In this production process steel core and steel wire rope produces in different time and machines. In the current study, steel core and wire rope closing process was carried out with a new production one-step method using a special design and parallel wire rope closing on 12 cradle rope closing machines. It is observed approximately 3% improvement in the production process with the one-step production method. Wire rope strength tests showed increasement by up to 15% in minimum breaking load of the parallel swaged wire rope. In metallic cross sectional area %5 enhancement was observed. Results are carried out under laboratory conditions and compared to literature.

KEYWORDS - steel wire rope, swaged wire rope, parallel swaged wire rope

HIGH PRESSURE RESISTANT GLASS FIBER REINFORCED POLYAMIDE MATRIX COMPOSITE PIPE DESIGN

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ABSTRACT

In this study, a total of 6 different composites were obtained by adding 10%, 20% and 30% short glass fiber in 6 mm dimensions to each of the polyamide 12 and polyamide 6 matrix elements under the same production method and same conditions. Unlike the studies in the literature, in this study, a more reliable comparison was made between composite materials produced under the same production method and under the same conditions. The reinforcement and matrix materials were mixed using the extrusion method and then formed into plates by the press molding technique. Tensile and 3-point bending tests of these composites were performed and their mechanical properties were examined. As a result of the study, it was observed that the mechanical properties of the materials increased with increasing fiber ratios, but the mechanical effect on the material decreased as the fiber ratio increased. S/N ratios were calculated for the mechanical properties of the composites and the effect of matrix, fiber and additive ratios on mechanical properties was determined using analysis of variance (ANOVA). According to the Signal/Noise (S/N) ratios and ANOVA results, it was observed that the composites had different effects on the mechanical properties. Looking at the test results, it was seen that the increased fiber ratio improved the mechanical properties of the materials. Therefore, pipes are designed considering the mechanical properties of composite materials with 30% glass fiber added to each matrix element. The composite pipe design to be pressure tested was designed in Solidworks program with a length of 500 mm according to ISO 1167 standards. Pipe dimensions with an outer diameter of 125mm, which are used as a standard in natural gas infrastructure works, are taken as reference.

KEYWORDS - Short fibers, Polymer–matrix composites, Mechanical properties, ANOVA, Modelling

SYNTHESIS OF TIO2 NANOTUBES IN NEUTRAL SOLUTION FOR HYDROGEN SENSORS

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ABSTRACT

Titanium dioxide is a common metal oxide semiconductor utilized in a variety of electrical applications, the most well-known of which are gas sensors. The three stages of titanium dioxide crystallization are brookite, anatase, and rutile. Rutile is the most stable primary phase among these several crystal phases. Because the surface energy of anatase and brookite is lower than that of rutile, they are usually more stable than rutile. As a result, the applications of anatase TiO2 and rutile TiO2 sensing have been thoroughly investigated. Surface reactions with oxidizing or reducing gases were used to generate TiO2 characterizations, which affects the conductivity of the film. When compared to other metal oxides, titanium dioxide gas sensors offer better stability and sensitivity at high temperatures [1]–[5]. The sensitivity of titanium dioxide (TiO2) nanotubes-based sensors to hydrogen (H2) gas has been investigated in this study. The high purity titanium foils (99.7%, Sigma-Aldrich) with an area of 10x20 mm2 and a thickness of 0.25 mm are used to fabricate TiO2 nanotubes. Titanium sheets were degreased with ultrasonic treatments in ethanol, acetone, and deionized (DI) water at 15 minutes respectively, prior to electrochemical anodization. Electrolyte solutions were prepared from 99.5% wt glycerol and 0.5 % wt NH4F at 20 oC. The electrolytes were stirred with a magnetic stirrer at room temperature and then the temperature of the electrolyte was fixed to 20 oC with a thermostat bath. At the anodization process, a two-electrode system (2-cm separation) by a DC power supply and a platinum gauze as the cathode was used. The anodization voltage and time changed between 20 V to 50 V and 60 min to 120 min, respectively. After the anodization process, the samples were rinsed with DI water, dried with a high purity nitrogen gas. The fabricated TiO2 nanotubes were characterized by using SEM and XRD. The detection measurements were conducted in a chamber with a volume of 1.5 l. A thickness of 50 nm palladium is coated on TiO2 nanotubes and served as the electrodes for sensor testing. The measurements were performed in static 10 % hydrogen gas flow which is controlled by a flowmeter. For the I-V characterization under 10 % H2, the gas flow was changed and the electrical resistance of the nanotubes was measured by a Keithley source meter 2612A. In conclusion, the inner diameter of nanotubes is changed from about 70 nm to 170 nm. For the hydrogen sensor applications, by applying the same voltage under 10 % H2 condition, three times more current was obtained compared to the atmospheric environment. Under the atmospheric condition, when applying 0.1 V to the coated TiO2 nanotubes, 2.97 μA current is obtained and it was linearly increased with increasing voltage. In the 10% hydrogen gas environment, when 0.1 V voltage was applied, approximately 7.5 μA current was obtained at constant gas flow at room temperature.

KEYWORDS - Titanium dioxide; Nanotubes; Hydrogen sensor; Anodization

DETERMINATION OF EFFECTIVE THERMAL CONDUCTIVITY OF COMPOSITES BY LITERATURE MODELS

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ABSTRACT

In this work, literature was surveyed in order to find convenient models of effective thermal conductivity for composites. Five different common models were compared with each other in terms of their consistency by using the same model inputs. Three levels of matrix thermal conductivities, three levels of filler thermal conductivities, and three levels of volume fraction ratios were used as inputs. Obtained trends were graphically plotted against each other. It is seen that models including effects solid-solid interface thermal resistance are giving results distinguishing from models excluding the effects of the interface thermal resistance. It is also understood that models dealing with the thermal conductivity of composites are becoming more complex by considering filler geometries, surface properties, and other interface interactions.

KEYWORDS - Composite,effective thermal conductivity,mathematical modelling,filler geometry

SOUR CHERRY KERNEL REINFORCED BIOCOMPOSITE FILMS AND INVESTIGATION OF SOME PROPERTIES

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ABSTRACT

Most of the polymers and polymer composites produced in the industrial field are of petroleum origin.The fact that these depleting petroleum-based resources are both expensive and bring environmental problems such as climate change and waste problems lead scientists to search for cheaper and renewable resources instead of petroleum-based resources. Therefore, in recent years, many research groups have been working on the synthesis of bio-based polymeric composites from different renewable resources such as oil-based resources [1][2]. On the other hand, evaluating waste and by-products in the food industry is an increasingly important issue today. The reason for this is that a large amount of solid and liquid waste materials are formed during the production, processing and consumption stages of foods. Especially since the wastes of the fruit and vegetable industry contain a high amount of water, microbial deteriorations that occur when they are thrown into the nature or toxic substances that occur during their disposal create environmental pollution[3]. For this purpose, in this study, sour cherry kernel (SCK), which is generated as waste from the fruit juice industry, was used as a filler for the preparation of composite film materials in biobased acrylated epoxidized soybean oil (AESO) resin matrix. Composite films were formed by adding different ratios of sour cherry kernel powder (0%, 10%, 20%, 30%, 40%, 50% by weight). and, the antibacterial, pH, swelling-solubility-water content and mechanical properties of the film composites were investigated. It was observed that the obtained SCK/AESO composite films were antibacterially effective against Gram-positive Staphylococcus aureus and Enterococcus faecalis) and Gram-negative (Escherichia coli and Klebsiella pneumoniae) bacterias.

KEYWORDS - Sour Cherry Kernel, Antibacterial activity,UV curing,biobased resin,biocomposite film

THE USE OF AN AGRICULTURAL WASTE IN THE SANITARYWARE CERAMICS RICE HUSK ASH RHA

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ABSTRACT

Rice husk is known as an agricultural waste material containing high amounts of silicon dioxide (10-20%) depending on the soil in which the stalks grow. In this study, four different recipes (0%, 3%, 5%, and 8 wt.% with rice husk ashes which is partially replaced by quartz) of sanitaryware ceramics were fabricated using the firing temperature of 1100 °C. The effects of rice husk ash addition on the firing shrinkage, water absorption, density, hardness, and flexural strength of sanitaryware ceramics were investigated. The total shrinkage values of ceramics did not change to a great extent. The addition of 8 wt.% rice husk ash yielded high hardness values (29 HV) and dramatically lower bending strength compared to that of standard ceramic (0 wt.%).

KEYWORDS - rice husk, sanitaryware,physical properties,flexural strength

FACILE PREPARATION AND EFFICIENT DEGRADATION PERFORMANCE OF ZNO CUO COMPOSITE UNDER VISIBLE LIGHT IRRADIATION

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ABSTRACT

In the present study, ZnO/CuO composite photocatalyst were prepared via a chemical precipitation method and characterized with SEM, XRD, UV-DRS, and XPS analysis to explain photocatalytic performance and possible degradation mechanism. Crystallite structure of the samples were investigated with XRD analysis. The results confirmed that ZnO and CuO were hexagonal and monoclinic structure. The SEM results showed that ZnO nanorods and semi-spherical CuO were exhibited an aggregation state. To confirm the formation of heterojunction and changing of electronic states XPS analysis were performed and presented that the peak shifts were observed. Comparing with bare ZnO and CuO, ZnO/CuO composite was extends to visible region and displayed the higher photocatalytic degradation efficiency of bromine thymol blue. These findings suggested that ZnO/CuO composite has broaden light absorption and efficient electron/hole separation with p-n heterojunction. Possible degradation mechanism led that the photoexcited holes and superoxide radicals were dominant role for occurring the reactant intermediates and oxidation of brom thymol blue respectively.

KEYWORDS - Keywords: ZnO/CuO, Composite Phtocatalysts, Organic Pollutant, Material Characterization

THE EFFECT OF CORE MATERIAL AND STRETCH RATIO ON PRE STRETCHED ELEVATOR ROPES

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ABSTRACT

Elevator ropes are subject to permanent and elastic elongation due to their usage areas. One of these types of elongation, permanent elongation occurs during the use of the wire rope and the positions of the elevator car corresponding to the floors changes when the elevator stops at the floors, and this situation needs to be corrected with additional processes. For this reason, within the scope of this study, these permanent elongations that may occur during use have been pre-applied and secondary processes have been eliminated by pre-stretching the relevant wire ropes during their production. The related stretching process was carried out in a double drum production system with different speeds and the required force values were determined for the different applied stress values. In order to be able to make comparative tests and analyzes of the produced wire ropes, first of all, the production of non-pre-stretched ropes, followed by the production of ropes with 40% stretch value was completed. The produced ropes were subjected to the tensile test and the unit elongation amounts were compared by means of force-elongation curves. In the second phase of the study, as a result of the optimization studies and comparison tests carried out in the first phase of the study, the production with jute, polypropylene and sisal core was completed in order to determine the effects of the changes in the core material of the rope on the elongation performance of the rope. The tensile tests of the completed wire ropes were carried out and considering the sector demands; with the force-elongation curves obtained, the force value required for the stress value with the most optimum value, the rope core material to be used and process parameters were determined. These results are the experimental conclusions. In the second phase of the study, as a result of the optimization studies and comparison tests carried out in the first phase of the study, the production of jute, polypropylene and hemp core was completed in order to determine the effects of the changes in the core material of the rope on the elongation performance of the rope. The tensile tests of the completed wire ropes were carried out and considering the sector demands; With the force-elongation curves obtained, the force value required for the stress value with the most optimum value, the rope core material to be used and process parameters were determined. These result are the experimental conclusions.

KEYWORDS - Elevator ropes, Wire ropes, Steel wire ropes, Pre-stretched ropes, Pre-stretched elevator ropes

INVESTIGATION OF TIG MELTING INFLUENCE ON A MECHANICALLY ALLOYED HIGH ENTROPY ALLOY

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ABSTRACT

High entropy alloys (HEAs) can be produced by different techniques such as arc melting, induction melting or powder metallurgy. In this study, AlCoCrFeNi HEA was produced via powder metallurgy (PM) technique. The produced equimolar HEA was exposed to TIG surface melting to get denser surface. The obtained analysis showed that Tungsten Inert Gas (TIG) melting seriously decreased the porosity of surface. After the TIG melting process, elemental distribution changed due to high arc temperature.

KEYWORDS - AlCoCrFeNi, High entropy alloy, Powder metallurgy, TIG surface melting.

CORRELATION BETWEEN MECHANICAL PROPORTIES AND ELECTRICAL CONDUCTIVITY VALUES OF NORDIC GOLD ALLOY WITH DIFFERENT ANNEALING TEMPERATURES

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ABSTRACT

Due to their superior corrosion and electrical conductivity properties, Nordic alloys are commonly utilized to produce coin blanks. Coining is a closed die forging method that involves applying pressure to the forging's surface to obtain tighter tolerances, smoother surfaces, and eliminate draft. Although this procedure focuses mainly on microstructure refining, it can have significant effects on electrical conductivity. The effect of recrystallization on the hardness and electrical conductivity properties of CuAl5Zn5Sn was examined in this work. The Nordic gold alloy was first cast as an ingot using the vertical semi-continuous casting method. The samples were obtained as-cast from the ingot and cut into square-shape samples with an abrasive cutter. Three of the samples were picked as reference samples, while the rest were annealed four by four at varied temperatures for the same duration of time. Samples were prepared for optical microscopy analysis, and microstructural investigations were performed using an optical microscope. Microhardness testing and analyses were carried out in accordance with ASTM standard E384. The annealed samples' electrical conductivity was measured according to ASTM E1004 and reported in conductivity rate compared to the International Annealed Copper Standard (IACS). A relationship between annealing temperature, hardness, and electrical conductivity for CuAl5Zn5Sn was investigated based on the results of the hardness and electrical conductivity tests.

KEYWORDS - CuAl5Zn5Sn alloy, Annealing, Electrical Conductivity, Coining

ABSORPTION COEFFICIENT AND REFRACTIVE INDEX CHANGE OF EXPONENTIALLY CONFINED IN0 52GA0 48AS QUANTUM WELL

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ABSTRACT

In this study, we have studied the optical properties of the exponentially confined In0.52Ga0.48As/Al0.47In0.53As heterostructures. Zero external fields, 20 kV/〖cm〗^2 electric field and 20 T magnetic fields are applied, wavefunctions and corresponding energy eigenvalues are found using the finite element method under effective mass approximations. It is shown that exponential confinement pushes energy states to lower energies. The overlapping probability of the E_12 is low and this results in almost no absorption. However overlapping probability is high for E 23 and E 34 and very high absorption and considerable change in refractive index are observed.

KEYWORDS - Exponential confinement, In0.52Ga0.48As, Al0.47In0.53As, quantum well,optical properties

EFFECT OF ANNEALING TEMPERATURES ON THE MICROSTRUCTURAL AND MECHANICAL PROPERTIES OF COCRFENI HIGH ENTROPY ALLOYS PRODUCED BY POWDER METALLURGY

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ABSTRACT

Powder metallurgy is one of the most intriguing ways to produce nanocrystalline structured materials with considerable advantages than other methods. Accordingly, the mechanical properties of materials can be further increased. Higher operating temperature to obtain bulk materials is widely known as the major disadvantage of powder metallurgy process. It is known that increased operating temperature results in grain coarsening which leads to weakening the enhanced mechanical properties. In this study, nanocrystalline CoCrFeNi high entropy alloys (HEAs) were produced by powder metallurgy and exposed to annealing treatments at varying temperatures between 500 °C and 1100 °C. The microstructural changes and mechanical properties were examined as a function of annealing temperatures by X-ray diffraction (XRD) analysis, focused ion beam microscopy (FIB), and hardness test. The results show that although grain growth to some extent occurs upon annealing, the average grain size remains in the ultrafine range, depending on the annealing temperatures, with hardness results higher than that of produced by casting.

KEYWORDS - powder metallurgy; grain growth; high entropy alloys; annealing

CHARACTERIZATION METHODS OF NANO PARTICLES ADDED TO INDUSTRIAL LUBRICANTS

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ABSTRACT

Lubricants used in mechanical systems are directly related to main factors such as energy consumption, material deformation and environmental pollution. With the additives added to the oils, the tribological performance of the oil can be increased. In recent years, the use of nano-particles as additives has become quite common. Nano-particles, which are especially effective in increasing the heat transfer coefficient, can reduce the friction coefficient by increasing the oil film strength, wettability and penetration of liquids. However, nano-particles must have specific characteristic properties to be used as oil additives and to be stable. In order to determine these properties, it is necessary to determine the characteristic properties of the synthesized nano-particles. In this paper, information will be given about these characterization stages.

KEYWORDS - Nano-particle, Characterization, Colloidal Suspension, Zeta Potential, UV Absorbance

SB2SE3 BASED THIN FILM SOLAR CELLS IN SUPERSTRATE CONFIGURATION

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ABSTRACT

Thin-film antimony selenide (Sb2Se3) solar cells have gained attention as a high-potential photovoltaic technology around the world. Outstanding features like a high absorption coefficient, a suitable direct bandgap, and good hole mobility make Sb2Se3 a promising absorber material for solar cell applications. Sb2Se3 solar cells in superstrate configuration are divided into five parts: glass substrate, front contact, buffer layer, absorber, and back contact. These can be made of different layers and could be of different types, in particular, the front and the back contact. In this configuration, the substrate has to be transparent. In terms of costs, a simple soda-lime glass is generally preferred. The front contact layer needs to be, at the same time, transparent and highly conductive. The absorber layer is the most important part of the device [1,2] since its quality and crystal structure affects not only the carrier concentration but also carrier lifetime, which is strongly affecting the open-circuit voltage and short circuit current density [3]. In this study, Sb2Se3–based thin-film solar cells with superstrate configuration, which consists of glass/ITO/Zn(O, S)/Sb2Se3/Ag layers were fabricated. Sb2Se3 absorbers and Zn(O, S) buffer layers have been grown with the RF magnetron sputtering method [4]. The top contact layer Ag was deposited by the thermal evaporation technique. The XRD and SEM analysis were used to determine the crystal structure and surface morphology of glass/ITO/Zn(O, S)/Sb2Se3 layer stacks. Efficiency analysis of Sb2Se3–based thin-film solar cells obtained from I-V measurements taken under dark and illuminated by AM1.5 spectra. This research was supported by The Scientific and Technological Research Council of Turkey (TUBITAK) with project number 118F143. This study was partially supported by the Scientific Research Coordination Unit of Pamukkale University under projects number HZDP041 and 2019KRM004-221. We would like to thank the Research and Application Center for Quantum Technologies (RACQUT) of IZTECH for experimental facilities.

KEYWORDS - Sb2Se3, Magnetron Sputtering,Thin Film Photovoltaic

OPTIMIZATION OF POLYMER BASED MATERIALS AS ADSORBENTS FOR THE TREATMENT OF WASTEWATERS FROM CIGARETTE MANUFACTURING PROCESS

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ABSTRACT

The occurrence of nicotine in ground, surface and municipal wastewaters has been regarded as a serious concern in recent years. Therefore, the present study is focused on the nicotine removal from aqueous solution over different types of polymeric resins (Amberlite XAD-4, Amberlite IRA and Diaion HP21). The type of XAD-4 resin which is consisted of crosslinked polystyrene-divinyl benzene rings had the highest removal rate as 88.3% while the other resins of Diaion HP-21 (17.5% removal) and IRA (7% removal) showed lower elimination performances. This phenomenon was attributed to the strong hydrogen bonding and Lewis's acid-base interactions between Amberlite XAD-4 and nicotine molecule. The process conditions for the selected adsorbent material were optimized using three-factor three-level experimental design technique and the statistical analysis results demonstrated that solution pH played a major role in the adsorption of nicotine from aqueous media. Evaluation of the process conditions implied that the adsorbent dose and pH variables had a direct relationship with the capacity while the initial concentration of nicotine had a negative impact on the removal efficiency of the adsorption system. From all obtained results, it is plausible to distinguish Amberlite XAD-4 as an optimum material which possessed high capacity for adsorption of nicotine from cigarette manufacturing process.

KEYWORDS - Polymeric material,adsorption,nicotine,tobacco

PRODUCTION AND CHARACTERIZATION OF HYBRID COMPOSITES BASED ON PLA WITH NANOCRYSTALLINE CELLULOSE AND SCOTCH PINE FILLERS

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ABSTRACT

The research aimed to study the effects of adding nanocrystalline cellulose and scotch pine dusts to a polylactic acid (PLA) matrix on the mechanical properties of hybrid composites. Scotch pines were milled to form the dust for the production of the hybrid composites. The 0%, 1%, 2.5%, and 5% by weight scotch pine dusts (SP) and 0.5% nanocrystalline cellulose (NC) were added to the PLA matrix. Composites were produced by making use of a twin-screw extruder and injection molding methods. Tensile strength, tensile modulus, strain at break, and Charpy impact strength were determined. To characterize the morphology and the NC and SP fillers distribution within the matrix, a scanning electron microscope (SEM) was used. The results showed that the addition of the two types of filler enhanced mechanical properties.

KEYWORDS - Green composite, PLA, Nanocrystalline cellulose, Scoth pine, Mechanical properties.

PRODUCTION OF CYLINDER HEADS ENGINE BLOCKS BY USING COMPACT GRAPHITE CAST IRON

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ABSTRACT

Compact Graphite Cast Iron has been occurred by shortage of magnesium and serium and defined as low value iron. Graphite microstructure of Compact Graphite Cast Iron that is described as a new material type likes flake and consists of short and circular edges. accepted as a new material. Compact Graphite Cast Iron has distinguished properties when compared to spheroidal cast iron like casting performance, heat fatigue performance and thermal conductivity. Graphite Microstructure of Compact Graphite Cast Iron Client requests and materials used has been improved parallel to industrial development. Due to request of using light materials by clients in engine blocks and cylinder heads causes trials for reducing of casting thickness. Since spheroidal and gray cast irons do not compensate thick wallness of these materials, Compact Graphite Cast Iron is needed fort his aim. In this study a new composition batch was used for casting. Compact Graphite Cast Iron material is also used for engine blocks of armored vehicles. Due to needs of developing defense and heavy industry, production of Compact Graphite Cast Iron in engine blocks and cylinder heads will become a mandatory situation. It is aimed as supporting to this situation by proceeding of this study.

KEYWORDS - Compact Graphite Cast Iron, Casting, Automotive, Defense Industry

SYNTHESIS AND CHARACTERIZATION OF FEW LAYERED GRAPHENE REINFORCED AL 10SI 2CU MATRIX COMPOSITES

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ABSTRACT

The interest in metal matrix composites has increased over the last years due to lightweight, wear and corrosion resistance and high strength properties. Al-Si alloys are light-weight materials having low density and high wear and corrosion resistance. These properties make these alloys proper candidates to replace steel in some industrial applications[1-3]. Additionally, graphene is a promising reinforcement material due to its properties such as high surface area (2630 m2.g-1), high Young's Modulus (1 TPa) and strength (130 GPa)[4-5]. Al-10Si-2Cu/graphene matrix composites were fabricated from elemental Al, Si and Cu powders via subsequent steps of mechanical alloying, cold pressing and pressureless sintering. Few-layered graphene (FLG) powders were produced via arc discharge method in a stainless steel reactor in our laboratories. Graphene was added into the Al-10Si-2Cu matrix in varying amounts of 0, 0,5, 1, 2 and 5wt.%. Mechanical alloying was applied to the as-blended powders in a Spex-type high-energy ball mill for 2, 4 and 8 hours. The mechanically alloyed powders were compacted under in a uniaxial press and subsequently pressurelessly sintered at 555 oC for 2 hours under Ar atmosphere. Microstructural characterization and phase analysis of composites were carried out by optical and scanning electron microscopy (SEM), and X-Ray diffraction (XRD) techniques. In addition, physical and mechanical characterization of the sintered samples were performed via Archimedes density, microhardness and reciprocating wear tests. Consequently, the optimum milling conditions and graphene amount were determined for the fabrication of high performance Al-10Si-2Cu/FLG composites.

KEYWORDS - Aluminum Matrix Composites, Graphene, Microstructural and Mechanical Properties

AA7XXX PRODUCED BY MECHANICAL ALLOYING METHOD MECHANICAL AND MICROSTRUCTURAL PROPERTIES OF POWDERS

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ABSTRACT

In this study, Al7075 alloys powders were ball milled via high energy planetary ball milling device. Commercial grade of Al alloy powders (Al7075) were purchased from Nanografi nanotechonolgy Co.. The effects of different ball milling times (i.e, 0.5, 1,2,4, and 8 hours) on the morphological properties of Al7075 powders were investigated by scanning electron microscopy (SEM) analyse. The distributon of minor alloying elements within the Al base matrix was examined by enegry-dispersive X-ray spectroscopy (EDS) with mapping mode. Besides, X-ray diffraction analyse was also performed to observe variations in crystallographic characteristics of milled powders. After powder preparation and Characterization stages, 0.5 and 8 hours milled powders were consolidated using cold press followed by sintering routes to precisely investigate the influence of initial and final phase of milling times on the mechanical properties of produced Al-based metal matrix composites (AMCs).

KEYWORDS - Mechanical Alloying, Mechanical Properties, Metal Matrix Composite

CONDUCTIVITY BEHAVIOR OF SB2SE3 THIN FILMS UNDER DIFFERENT STRESS FACTORS

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ABSTRACT

The development of the industry and technological achievements, increases the demand for energy. The cleanest way to produce electrical energy is through renewable energy sources. Solar energy is the most popular among renewable energy sources. In the solar cells family, the most common commercially available solar cells are silicon-based solar cells. However, the production of silicon solar cell is difficult and costly. For this reason, scientists have focused on inorganic and non-toxic thin film solar cells whic are 2nd generation solar cells. Among these materials that can be used in 2nd generation solar cells, V-VI chalcogenide semiconductors are becoming the focus of attention of scientists due to their specific properties. However, the general problem of solar cells is that after a certain period of time, their photoconversion efficiency decreases due to atmospheric conditions. Many studies have focused on achieving the long-term efficiency stability of solar cells using different techniques such as using new materials with different bandgaps, changing film properties, and optimizing solar cell configuration. For this reason, detailed aging analysis of the solar cell layers must be done. Therefore, their behavior against degradation should be understood. Among the V-VI chalcogenide semiconductors, Sb2Se3 is one of the most promising candidates for highly efficient thin film solar cell applications. Sb2Se3 has high absorption coefficient (>10^5 cm^-1), a direct bandgap (1.1-1.3 eV), and a good hole mobility up to 42 cm^2 V^-1 s ^-1 which make this material a suitable absorber layer for thin film solar cells. In addition to these specific properties, both Sb and Se are earth abundant and low-toxic elements with affordable costs. In this study, Sb2Se3 thin films were deposited using binary target by magnetron sputtering technique. The morphological and structural properties of the films obtained were determined using SEM and XRD methods. The produced Sb2Se3 thin films were exposed to different stress factors. Metastability effects on materials due to stress factors were characterized by dark and photoconductivity methods. Acknowledegment This research was supported by The Scientific and Technological Research Council of Turkey (TUBITAK) with the project number of 118F143. This study was partially supported by Scientific Research Coordination Unit of Pamukkale University under the projects number of HZDP041 and 2019KRM004-221. We would like to thank the Research and Application Center for Quantum Technologies (RACQUT) of IZTECH for experimental facilities.

KEYWORDS - Sb2Se3, Magnetron Sputtering, Aging, Conductivity

FT IR ANALYSIS OF NANOCOMPOSITES EXPOSED TO DIFFERENT ENVIRONMENTS

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ABSTRACT

Epoxy resins are widely used as matrix materials for composite materials and adhesives in aerospace, marine applications, thanks to their high mechanical and thermal properties, high hardness/weight ratio, and superior chemical resistance. In addition to these superior properties, epoxy resins lose their reliability in industrial applications where they can be exposed to high temperature, humidity and corrosive liquids, as they are materials prone to water absorption. In the presented work, structural analysis of epoxy nanocomposites subjected to different environment were made via FT-IR technique. For that purpose, hexagonal boron nitride (h-BN) nanoparticles were firstly silanized with silane coupling agent to obtain homogenous distrubituon of nanoparticles in the epoxy matrix. Then, neat and 2 wt.% silanized h-BN nanoparticles reinforced epoxy nanocomposites were produced. To examine the structural changes of epoxy nanocomposites under different operating conditions, epoxy nanocomposites were exposed to distilled water, salt water, sulphuric (H2SO4) acid and UV irradiation environments for 20, 40 and 60 days. When the findings obtained as a result of the study were evaluated, it was seen that different environments and times caused changes in epoxy nanocomposites. When the spectra of nanocomposites produced by reinforcing silanized h-BN to epoxy and neat composites, changes in chemical bond intensities were observed in the structure. It has been also observed that the peak intensity of the hydroxyl (-OH) groups of the unreinforced composite has less peak intensity than h-BN reinforced nanocomposite in the -OH groups observed in the 3000-3600 cm-1 wavelength range, where the degree of water absorption from the FT-IR spectrum of the composites can be examined.

KEYWORDS - FT-IR, Boron Nitride, Environmental Condition, Nanocomposites

THE QUALITATIVE IDENTIFICATION AND COMPARISON OF THE INITIAL MICROSTRUCTURE CHANGE AFTER DOUBLE AUSTENITIZING ON DIN 41CR4 QUALITY STEEL

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ABSTRACT

In this study, the effect of double austenization on DIN 41Cr4 quality steel was investigated. Firstly, martensitic structure was obtained by quenching after a pre-austenitization process at 950ºC. Then, the conventional quenching and tempering process was carried out with two different tempering temperatures of 550 and 650ºC after austenitization at 850ºC. Optical microscopy (OM), scanning electron microscopy (SEM) and X-ray Diffraction (XRD) analyses allowed the qualitative identification and comparison of the initial microstructure change after double austenitizing. Mechanical properties were characterized in terms of hardness and tensile tests. Microstructural examinations indicated that the prior austenite grain sizes were considerably reduced with double austenitization process and the carbide distribution in the structure showed a finer and more homogeneous. Also the tensile strengths of the samples improved significantly with double austenitizing process.

KEYWORDS - DIN 41Cr4 quality steel, Double Austenization, Microstructure, Prior Austenite Grain Size, Mechanical Properties

DETECTING STRUCTURAL PROPERTIES OF 2D MATERIALS BY CONVOLUTIONAL NEURAL NETWORKS

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ABSTRACT

With the increase in the processing power and capacity of computers, artificial intelligence technologies have emerged in many areas that were not used before. Image processing of nanomaterials is one of the high potential application areas of artificial intelligence. A decelerating factor in research on nanomaterials is the disadvantage of visual inspection by optical microscopy, which does not provide much knowledge and remains to be unreliable. Also, although there are other techniques for the characterization of the produced materials, these are time consuming and expensive. Once artificial neural networks are trained by sufficient number of samples, a large of number other samples can be studied and the characterization can be accelerated by using these trained networks. In this study, in order to determine the grain boundaries, crack and oxide formations on some selected 2-dimensional (2D) materials, a convolutional neural network is structured. The network is trained and then tested by the existing labeled data. Results of the test data have yielded satisfactory results which presents the high potential of utilization of convolutional neural networks for the reliable and rapid characterization of 2D materials. This work is supported by Eskişehir Technical University scientific research projects with the project numbers of 20ADP090 and 21GAP084.

KEYWORDS - 2D Nanomaterials, Artifiial Intelligence,Convolutional Neural Networks

FUNCTIONALIZED CNTS DOPED NANOCOMPOSITES STRUCTURAL THERMAL AND MECHANICAL PROPERTIES

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ABSTRACT

Nano-size particles having different properties have been added into the matrix to improve mechanical, thermal and physical properties of polymers. In this context, carbon nanotubes (CNTs) have developed a point of view to the technology and engineering applications due to the superior properties and have found an important place especially in the polymer field. Nowadays, CNTs stands out as an important material of advanced technology in many applications with high performance. In the presented study, the structural, thermal and mechanical properties of the epoxy nanocomposites were investigated by adding different CNTs particles into epoxy matrix at different proportions (1.0%-3.0%) by weight. For this purpose, commercial CNTs were functionalized with silane coupling agent (3-glycidoxypropyltrimethoxy) and then compared with the COOH functionalized CNTs and pure CNTs in terms of its structural, thermal and mechanical behaviour in the epoxy nanocomposites. SEM and FT-IR analysis were made for structural analysis. Moreover, DSC, DMA and tensile test were made to determine the thermal and mechanical properties of produced CNT doped epoxy nanocomposites, respectively. When the results of the analyses were examined, CNTs particles were homogeneously dispersed in epoxy matrix and improved adhesion between matrix and nanoparticles with the effect of silanization process. In addition, the mechanical and thermal properties of epoxies have improved with the addition of functionalized CNT with silane coupling agents and COOH functionalized CNTs in epoxy matrix compared to neat and CNTs doped epoxy. The amount of increase in mechanical (modulus of elasticity and tensile strength) and thermal properties (glass transition temperature) varies according to the type of CNTs and addition ratio. The tensile strength of functionalized CNTs with silane agent doped epoxy nanocomposites was found to be about 85 MPa, while the tensile strength of CNT-COOH doped and neat composites were found to be about 80 MPa and 60.7 MPa at 1% wt. addition ratio, respectively. In addition, significant improvements have been achieved in the storage modulus and glass transition temperature of functionalized CNTs doped epoxy nanocomposites compared to neat and CNTs doped epoxy.

KEYWORDS - Carbon nanotubes, Nanocomposites, Tensile Test, DMA, DSC

SYNTHESIS OF POLYMER COATED MAGNETIC NANO PARTICULAR BY USING ACTIVATED CARBON AND KINETICS STUDIES

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ABSTRACT

ABSTRACT Wastewater treatment is the most important concern in the world. Because it contains stable complex molecules, metal ions and resistant organic pollutant. In the present study, the adsorption performance of activated carbon (AC), magnetic activated carbon (MagAC), styrene-butadiene styrene magnetic activated carbon (SBS/MagAC) and poly carbonate magnetic activated carbon (PC/MagAC) samples were investigated. Adsorption studies were conducted with various parameters for example, temperature, solid-liquid ratio, adsorbent type, initial phenol concentrations and solution pH were investigated under similar experimental conditions. The obtained results showed that higher adsorption capacity of 98-99% was achieved at low pH values with the use of both AC and MagAC adsorbent materials. In addition, the polymer coated magnetic materials did not perform very well at high pH values. The experimental data also showed that MagAC and SBS/MagAC were more effective than AC and PC/MagAC to remove phenol. The kinetic results supported the pseudo second order model ($r2 \geqslant 0.98$) while pseudo-first order model ($r2 < 0.90$) showed very poor. The adsorption isotherms were fitted to Langmuir models more effectively than Freundlich models ($r2 \geqslant 0.95$). according to the values, the thermodynamic parameters were calculated. The obtained results were exhibited that phenol can be adsorbing with both magnetic and polymeric materials effectively

KEYWORDS - Keywords: Activated carbon, adsorption, magnetic adsorbent, phenol, isotherm

EXPERIMENTAL INVESTIGATIONS ON MECHANICAL PROPERTIES OF STEEL WIRE ROPES BY USING DIFFERENT EMPREGNATED THERMOPLASTIC MATERIALS

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ABSTRACT

Steel wire ropes are lifting equipment of produced in different compositions and strength values according to the place of use. In impregnated plastic core (EPIWRC), the plastic coating between the steel core and the outer strands increases the corrosion resistance and fatigue life of the steel core. The plastic impregnated core steel wire ropes have 10% higher strength than the independent wire rope core ropes (IWRC). In this study, plastic impregnated steel wire rope is aimed to examine the effects of polymer coating material on the targeted mechanical properties of steel core plastic impregnated steel wire ropes known as EPIWRC and the polymer selection methods. Impregnated plastic core (EPIWRC) steel wire ropes with 2 different plastic coating were examined. Polypropylene and high density polyetylene, which are plastic coating materials, were made mechanical, FTIR, DSC and TGA analyzes. The differences between the plastic materials were analyzed by applying corrosion, tensile and fatigue tests to the steel wire ropes produced after the coating was applied. This study contains experimental data on different plastic material coat of steel wire rope of 8x26WS composition.

KEYWORDS - Keywords: Steel wire rope, Plastic filled, tensile and fatigue test, corrosion

EXPERIMENTAL INVESTIGATION ON TORQUE ROTATION AND TENSILE STRENGTH BEHAVIOR OF MULTISTRAND ROTATION RESISTANT STEEL WIRE ROPES

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ABSTRACT

Steel wire ropes are used as lifting equipment at different lifting heights and working areas. Steel wire ropes, which stand out with their high lifting capacity and optimum elongation, can be produced in different properties and constructions. Ropes are subject to rotation due to their helical structure. If the lifting height is more than 60 meters, the amount of rotation increases. Exposure of the wire rope to rotation during use causes various damages. These damages end the service life of the wire rope. In this study, the rotation performance of the wire rope with 34x7 construction will be examined. Within the scope of the study, specially designed wire rope production will be carried out. Then the tensile test and torque-rotation test will be applied to the samples. Test results will be compared with other wire rope constructions with rotation resistant. As a result of the tensile tests, it was determined that the the wire rope with 34x7 construction has 5% higher strength than the wire rope with 35x7 construction. 34x7 ropes provide 3 times higher extra torque resistance compared to 35x7 ropes. This study contains theoretical data on steel wire ropes.

KEYWORDS - Steel wire rope, torque behavior, rotation resistant, multistrand

FABRICATION AND CHARACTERIZATION OF MULLITE REINFORCED Y2O3 ADDED ZRO2 CERAMICS

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ABSTRACT

In this study, mullite (3Al2O3.2SiO2) and 3 mol % yttria added zirconia (3 mol % Y2O3 - 97 mol % ZrO2) ceramic powders were synthesized by conventional ceramic production processing route. The mixtures were prepared by mechanical alloying method in acetone environment with zirconia ball mill. The powders were dried in oven at 110 ºC for 24 hours before mixing. Mullite (3Al2O3.2SiO2) and 3 mol% yttria added zirconia (Y2O3-ZrO2) ceramic powders were synthesized by reaction sintering from the powders made up of stoichiometric proportions of Al2O3, SiO2, Y2O3 and ZrO2 powders after being homogenized in acetone environment in ball mills. Mullite and 3 mol% yttria added zirconia ceramic powders were synthesized in air at 1600 oC for 3 h and 1300 oC for 2 h, respectively. Then, the ceramic phases formed were made ready to form ceramic - ceramic composites by crushing, grinding and sieving processes. Then 0 and 10% by weight mullite (M) added yttria doped zirconia (YZ) mixtures were prepared by powder metallurgy method. The prepared mixtures were wet milled with zirconia ball mill for 24 h and sieved. After drying, the powders were compacted to preforms of 56x12x10 mm by uniaxial pressing at 200 MPa. The green compacts were sintered at 1500-1600 oC for 1-5 h in air conditions using a heating rate of 5 oC/min in a high temperature furnace. Then, microstructure (SEM), phase analysis (XRD), mechanical (hardness, 3-point bending and wear) and physical properties (% shrinkage, water absorption, porosity and density) tests were performed on the mullite added yttria doped zirconia ceramic composites. In this study, whether there is a phase change in the ZrO2 - Y2O3 mixture at high sintering temperatures and the effect of mullite additive on the properties of this mixture was investigated. The data obtained were presented in graphs and tables and their comments were made.

KEYWORDS - Zirconia, Yttria, Mullite, Characterization, Wear.

THE INFLUENCE OF MN SUBSTITUTION AND H2S ANNEALING ON CU2ZNSNS4 THIN FILMS

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ABSTRACT

Cu2MnSnS4 thin films were deposited by spin coating technique and annealed under 30 and 40 ccm H2S:Ar (1:9) flows to understand the influence of Mn atom content ratio and H2S flow rate during the annealing of thin films on morphological, structural and optical properties of Cu2MnSnS4 thin films. It was seen that the Mn content has a strong influence on structural and optical properties of the films. The crystal size of the films increase sharply for under 30 H2S:Ar (1:9) flows and start to decrease slowly again owing to the formation of high dislocation density and strain in the structures. For the films obtained under 40 ccm H2S:Ar (1:9) flows has very weak primary and secondary peaks with formation. The UV-Vis data showed the decrease of optical band gap from 1.4 to 1,17 eV with increase of H2S:Ar (1:9) flows in the structures.

KEYWORDS - –CZTS, Mn substitution, annealing condition

FABRICATION OF PVDF MEMBRANES MODIFIED WITH DOPAMINE ZINC OXIDE AND INVESTIGATION OF LEAD REMOVAL FROM AQUEOUS SOLUTIONS

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ABSTRACT

The global water challenge has been an important issue in the last decade as the world population and economies of developing countries expand and existing water and wastewater treatment technologies and infrastructure are becoming critical for providing adequate water quality to meet human and environmental needs. Ultrafiltration (UF) membranes have long been a leading separation technology with a strong historic track record for a wide range of applications such as treatment of ground water and waste water. The fast development of techniques for producing nanostructured materials and nanoparticles has led to breakthroughs in membrane preparation. In the present work, polyvinylidene fluoride (PVDF) based nanocomposite membranes modified with zinc oxide (ZnO), polydopamine (PDA) and ZnO/PDA powders were fabricated using phase inversion technique. ZnO/PDA powders were synthesized via sol-gel method and characterized using XRD analysis. ZnO/PDA nanoparticles were incorporated into membrane matrix by blending method and PDA powders were coated onto pristine PVDF membrane. Surface and cross-sectional morphology, functional groups, crystallinity, thermal behavior and mechanical strength of the membranes were characterized using several analytical techniques and instruments. Membrane filtration performance was tested in terms of water flux, sodium alginate (SA) rejection and antifouling properties in comparison to those of pristine PVDF membrane. Moreover, lead (Pb+2) removal of prepared membranes from aqueous solutions complexed with chitosan was determined. Although modification of pristine PVDF membrane using different powders could not lead to a significant improvement in water flux and SA rejections, flux recovery ratio and resistance values could be enhanced markedly. PVDF/ZnO/PDA membrane has been found to exhibit the best performance in filtration experiments with 92% flux recovery ratio and 97% SA rejection and has the highest lead removal (88.5%) from aqueous solutions.

KEYWORDS - Membrane, ultrafiltration, zinc oxide, dopamine, lead removal

EFFECTS OF REDUCTION RATIO ON WIRE ROPE STRENGTH IN COMPACTED WIRE ROPE PRODUCTION

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ABSTRACT

Compacted wire ropes have more load bearing capacities than the standard ropes with same diameters. Abrasion is less and expected life times are longer as they contact the reel surfaces in a larger area. The reduction ratio applied in the production of compacted wire rope affects the strength of the wire rope. In this study, the effects of different reduction ratios on steel wire rope strength were investigated. In this respect, the strength values of the rope in the 6x36WS IWRC composition compared to the pre-compact strength values and the different reduction ratios were compared.

KEYWORDS - Compacted wire rope, High strength, Reduction ratio, 6x36WS IWRC

THE DETERMINATION OF CHARACTERISTIC AND PHOTOCATALYTIC PROPERTIES OF HOLMIUM NIOBIUM CO DOPED TITANIUM DIOXIDE TIO2

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ABSTRACT

Photocatalysis is the degradation of many pollutants by exciting ultraviolet (UV), visible and near-infrared radiation. Titanium dioxide (TiO2; titania) is a semiconductor material with excellent physical and chemical stability, low cost, non-corrosive, non-toxic and high availability. However, Titania has a number of disadvantages that limit its practical applications in photocatalysis. These can be summarized as wide bandgap and high rate of electron-hole recombination. Various strategies have been applied to overcome these disadvantages in literature. One of the strategies is to improve the photocatalytic properties of TiO2 by doping. The aim of this study is to produce Holmium-Niobium co-doped TiO2 material to investigate its photocatalytic activities under UV light. For this purpose, pure, Holmium, Niobium and Holmium-Niobium co-doped TiO2 had been prepared by sol-gel method. Their structural, morphological and optical properties had been determined by using characterization devices such as X-Ray Diffractometer (XRD), Scanning Electron Microscope (SEM) and UV-vis spectrophotometer. The effect of doping on the characteristic and photocatalytic properties of co-doped TiO2 samples had been determined by comparing the results which were obtained for the pure, Holmium doped TiO2 and Niobium doped TiO2 samples separately.

KEYWORDS - Photocatalysis, TiO2 ,Holmium doped TiO2 Niobium doped TiO2, Holmium-Niobium co-doped TiO2

FPGA USAGE AND APPLICATIONS IN THE INDUSTRIAL AREA

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ABSTRACT

Field programmable gate arrays (FPGAs) have established themselves as one of the preferred digital implementation platforms in a plethora of current industrial applications, and extensions and improvements are still continuously being included in the devices. This paper reviews recent advancements in FPGA technology, emphasizing the novel features that may significantly contribute to the development of more efficient digital systems for industrial applications. Special attention is paid to the design paradigm shift caused by the availability of increasingly powerful embedded (and soft) processors, which transformed FPGAs from hardware accelerators to very powerful system-on-chip (SoC) platforms. New analog resources, floating-point operators, and hard memory controllers are also described, because of the great advantages they provide to designers. Software tools are being strongly influenced by the design paradigm shift, which requires from them much better support for software developers. Focusing mainly on this issue, recent advancements in software resources [intellectual property (IP) cores and design tools] are also reviewed. The impact of new FPGA features in industrial applications is analyzed in detail in three main areas, namely digital real-time simulation, advanced control techniques, and electronic instrumentation, with a focus on mechatronics, robotics, and power systems design. The way digital systems are being currently designed in these areas is comprehensively reviewed, and a critical analysis of how they could significantly benefit from new FPGA features is presented and the use of FPGAs to implement artificial intelligence-based industrial systems is then briefly reviewed.

KEYWORDS - FPGA, industry

DESIGN ANALYSIS AND PROTOTYPING OF A NOVEL THRUSTER FOR ROVS

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ABSTRACT

Underwater vehicles are expected to have flexible maneuverability to perform various tasks such as security, reconnaissance and search rescue. This maneuverability depends on the thruster to perform the specified tasks effectively. The designs of the propeller and the duct in the thrusters have a significant effect on the vehicle's mobility as it directly affects the thrust force. An ergonomic design is aimed by choosing the optimum level in terms of efficiency for the number of propeller blades. In addition, a duct design is needed to prevent water losses due to propeller movement. In this study, an original thruster has been designed by making theoretical calculations. The designed thruster has been analyzed using the Finite Element Analysis (FEA) method. The thrust, friction, torque, and efficiency values of the developed thruster have been calculated using momentum theory and supported by fluid mechanics analysis. In line with the analyses, the prototype of the designed thruster has been manufactured and the necessary performance tests were carried out on an autonomous underwater vehicle named Fersah-ROV, which was also originally designed and manufactured.

KEYWORDS - Thruster, Fluid analysis, Finite element analysis,ROVs

PROTOTYPE AND MODELLING OF CARRYING USEFUL LOAD WITH MULTICOPTERS

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ABSTRACT

In this article describes the project and construction stages created to solve the problem of transporting useful cargo using Unmanned Aerial Vehicles. Our purpose is to keep both the aircraft and the payload stable along the entire trajectory and deliver the useful payload to the target, even if there are parametric uncertainties and measurement errors. The solution is considered an inconvenience for the system due to the load performed on the design, but software is used that prevents the system design and release. To verify the proposed control strategy, simulation and the results of real experiments are carried out.

KEYWORDS - UAVs, Useful Loads, Real Time Point

DESIGN OF A TWO WAY AXIAL FAN FOR SINGLE ROOM VENTILATION UNITS

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ABSTRACT

Regenerative single room ventilation units operate on the principle of cyclic transfer of air between the inside and the outside. In doing so, sufficient pressurization capacity is required to overcome the outside resistance due to wind, as well as the resistance within the unit itself such as heat exchanger and filters. In this study, a unit requiring a fan with 40m3/h flow rate and more than 60 Pa pressurization is considered at the lowest possible rotational speed. A two-way axial fan (reversible axial fan) typically has lower pressurization capacity relative to a standard axial fan or a radial fan. The use of a radial fan for high pressurization capacity, on the other hand, is relatively complex and less efficient because two radial fans placed opposite to each other must be employed and either separate motors or a free wheel must be employed. In this study, designing an advanced two-way axial flow fan, capable of comparable pressurization to radial fans, is aimed. It is shown that when carefully designed, such fans can pressurize air by notably more than 60 Pa at a rotational speed and diameter lower than 3000 rpm and 13 cm, respectively. Therefore, a loading coefficient of around 0.4-0.5 can be achieved despite symmetrical blading in the chordwise direction must be employed. Moreover, very low flow coefficients, less than 0.15 is required for acceptable blade height. These factors, together with two-way operation capability and low Reynolds numbers encountered, the efficiency reduces below 30-40%. The developed two-way axial fan meets the requirements and offers a simplified solution to single room ventilation units.

KEYWORDS - Axial fan,ventilation,turbomachinery,reversible fan,CFD,centrifugal fan

INVESTIGATION OF THE EFFECT OF DIESEL JP8 FUEL BLENDS ON THE EMISSIONS OF A COMMON RAIL ENGINE

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ABSTRACT

Petroleum-based fuels have been used for power generation in internal combustion engines and in the industrial field for over 100 years. For this reason, oil has become one of the most important energy sources today, but emissions as a result of combustion affect the environment and human health negatively. For this reason, studies are carried out to reduce the exhaust emission values caused by vehicles used for passenger and cargo transportation in land, sea and air vehicles. In this study, the effect on emission values was investigated by mixing 5%, 10% and 15% JP8 fuel with standard diesel fuel in a diesel engine with 1.9 Multijet, Common rail injection system and turbocharger, which was produced for commercial use. As a result of the tests, it has been observed that fuel mixtures containing JP8 reduce CO, CO2, HC, and NO emissions and increase O2 emissions

KEYWORDS - JP8, Jet Fuel, Diesel Engine, Exhaust Emissions, Alternative Fuels

MOLECULAR DYNAMICS SIMULATIONS OF THE LATTICE THERMAL CONDUCTIVITY OF MONOLAYER AND BILAYER MOS2

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ABSTRACT

Molybdenum disulfide (MoS2), a semiconductor possesses intrinsic bandgap and high electron mobility, has attracted great attention due to its unique physical properties, in recent years. In this study, the lattice thermal conductivity of single and bi layer MoS2 structures are studied using non-equilibrium molecular dynamics (NEMD) simulation. These structures indicate superior thermal properties, according to the NEMD simulations result. The thermal conductivities of single and bi layer MoS2 structures are also examined at five different temperatures up to 900 K. As temperature increases up to 900 K, the thermal conductivities of single and bi layer MoS2 structures gradually decrease, due to the higher phonon-phonon scattering rates. Additionally, changing of temperature shows more influence on the bi layer MoS2 structure than single layer MoS2 structure. Moreover, the thermal conductivities of these structures are adversely affected by structural defects, which occurs during the production process. Accordingly, the influences of two different S atom types vacancy defect on the thermal conductivity of single and bi layer MoS2 structures were examined. As the defect concentration in MoS2 structures increases, the thermal conductivities of these structures decrease significantly. The S atom single vacancy defect type exerts less effect on the thermal conductivity than the S atom bi vacancy defect type do with rising concentration. Furthermore, defects demonstrate more effect on the bi layer MoS2 structure than single layer MoS2 structure.

KEYWORDS - MoS2 structures, Thermal properties, Molecular dynamics

CONTROL MOMENT GYROSCOPE FOR ROLL STABILIZATION OF A TRAILER

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ABSTRACT

Control torque propagated by a flywheel gyroscope is analysed as a control moment gyroscope (CMG) to prevent trailer rollover. When the torque of the rotating flywheel is controlled, specific sinusoidal motion occurs. The sinusoidal gimbal motion causes to be a smallish vibration amplitude in the upright position of the sprung. Hence, CMG maintains the rollover stability of the sprung mass with a steady motion. In addition to these, there is a simulation model using a CAE software (RecurDyn), which is built to validate the equations of motion.

KEYWORDS - Gyroscope, gyrostabilizer, control moment gyroscope, vehicle rollover, inverted pendulum.

SPECIFICS OF DEVELOPING AND MAKING OF AERODYNAMICALLY BALANCED WIND TURBINE WITH INCLINED AXIS

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ABSTRACT

A new type of wind turbine with an inclined axis which is radically different from all so far known wind generators of two main types (with horizontal and vertical axes) is proposed and contains a wind turbine with vanes, that envelopes a conical surface during rotation, one generatrix of which is horizontal (with the lower arrangement), and its opposite — vertical (with the top arrangement). It does not generate vibrations in the support base, which is a positive factor when installing on high-rise residential buildings. After proper calculations by computer simulation of aerodynamic processes, the angle of attack of the wind turbine blade was optimized and tested on an acting small-scale operating model, and based on the asymmetric loading of a wind generator with a conical wind wheel and an inclined axis, the specifics of its balance was revealed, which was solved by traditional methods of theoretical mechanics and aerodynamics and then, taking into account these results, a prototype was developed and made, the preliminary tests of which were successful with the presence of an easy start in low wind and a stable rotation mode during changes in the direction and speed of the wind. To ensure the optimization of the profile and twist angle of the wind turbine, wings were made on a custom 3D printer in a selected thermal mode, which is an innovative approach and in the case of manufacturing by this method of most of the parts, makes it possible to transfer the technology over the internet.

KEYWORDS - wind turbine, inclined axis, electric generator, vanes wind speed, rotation frequency, relative velocity, angle of attack prototype,3D printer

UTILIZATION OF A PHONONIC CRYSTAL LINEAR WAVEGUIDE IN SIZE BASED SEPARATION OF SOLID PARTICLES IN AIR

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ABSTRACT

Size-based separation of millimeter-scale solid particles in air is carried out by means of acoustic radiation force in a two-dimensional phononic crystal linear waveguide. The hollow-core waveguide is designed to guide ultrasonic waves with frequencies around 20 kHz through band structure calculations via the Finite Element Method. The Gor'kov potential and associated radiation force are calculated by Finite Element simulations. It is shown that when the input sound pressure level is between 171 dB and 178 dB, the waveguide can act as an acoustic sieve in which solid spherical particles in free fall are either trapped at guided mode nodes or pass through the waveguide depending on their radii. The threshold radius can be easily tuned by varying the sound intensity. Efficient separation of glass spheres with 0.5 mm and 1.0 mm radii are experimentally demonstrated. The proposed scheme offers a practical means of contact-free sorting of solid particles, such as industrial products.

KEYWORDS - Gor'kov potential, acoustic radiation force, acoustophoresis, phononic crystal, waveguide.

EMISSION REDUCTIONS BY AN AUXILIARY AIR CONDITIONER IN LIQUID HYDROGEN POWERED FUEL CELL VEHICLES

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ABSTRACT

In this study, an emission analysis has been performed and presented for Liquid Hydrogen (LH2) powered Fuel Cell Vehicles (FCVs) using an Auxiliary Air Conditioning (AAC) system. Benefiting from mainly an evaporator and an air blower, this proposed system vaporizes LH2 at the amount of the need that the vehicle requires for its operation. In the meantime, the air cooled by the enthalpy of evaporation of hydrogen is sent to the vehicle cabin and the cooling load of the Air Conditioner (AC) is reduced. Therefore, fuel consumption and emissions decrease due to the less operation need of the main AC system of the vehicle which consumes power by its compressor. According to the analysis, maximum cooling rate of 250 W and a highest possible Coefficient of Performance (COP) value of 10.4 were calculated for FCVs. Average reductions of the years 2010, 2020, 2030, 2040, and 2050 in emissions for the use of AAC system in average FCVs are calculated as 0.82 g/year, 2.12 g/year, 3.87 g/year, 0.58 g/year, 0.63 g/year, and 5.48 g/year, respectively for Volatile Organic Compounds (VOC), Carbon Monoxide (CO), Nitrogen Oxides (NOx), Particulate Matters (PM10 & PM2.5), and Sulfur Oxides (SOx). Average reduction in Carbon Dioxide (CO2) emission is calculated as 6.99 kg/year.

KEYWORDS - Liquid hydrogen, air conditioning, fuel cell vehicles, emissions.

EFFECT OF NANOFLUIDS ON HEAT TRANSFER IN A ZIGZAG CHANNEL WITH CENTRAL WINGS

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ABSTRACT

Abstract–In this study, effects of Al2O3-water nanofluid on heat transfer and friction factor are investigated numerically in a zigzag channel with central wings. In simulations, mass, momentum and energy equations are discretized with finite volume approach and iterations are solved with SIMPLE algorithm. In the study, Reynolds number ($200 \leq Re \leq 1200$), and nanoparticle volume ratio ($0.01 \leq \varphi \leq 0.05$) are changed, and other parameters kept constant. The lower and upper zigzag walls of the channel are kept at constant temperature, and the Nusselt number and friction factor along the channel are calculated. In order to observe the effects of the parameters examined, the contours of velocity and temperature in the channel are obtained. In addition, the results of the study are compared with the based fluid. The numerical results show that the nanofluids and wings contribute significantly to the heat transfer enhancement while the friction factor increases slightly.

KEYWORDS - Nanofluid, Zigzag channel, Central wings, Heat transfer, Friction factor.

OPTIMIZATION OF MACHINABILITY PARAMETERS OF S960QL STRUCTURAL STEEL BY FINITE ELEMENTS AND TAGUCHI METHOD

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ABSTRACT

In this study, three different feed rates, three different lateral depths and three different axial depths of S960QL structural steel material used as armor and structural steel, regardless of the cutting speed, were optimized for the most effective parameter on shear force, moment and temperature by Taguchi and finite element method. analyzed. In the finite element method, TiAlNi coated cutting tool is used for chip removal with the corner milling command. ANOVA and statistical analyzes based on the "lowest and best" objective function were performed with the Minitab 18 program. It was determined that the optimum cutting parameters obtained as a result of the study were 0.8 mm lateral depth, 4 mm axial depth and 0.08 mm/tooth feed rate. In addition, the lowest feed force value was obtained at A1B1D2 and the highest feed force value was obtained at A3B3D1 levels. In terms of moment and temperature values, the lowest value was determined at A1B1D1 and the highest value at A3B3D3 levels. Finally, according to the results of ANOVA analysis, the axial depth parameter was effective on the process feed force, and the axial depth parameter was effective on the moment and temperature.

KEYWORDS - S960QL, Milling, TAGUCHI Method, Feed Force, Torque, Temperature.

CARDIOVASCULAR ASSESSMENT AT THE EMBRYONIC DEVELOPMENTAL STAGE USING COMPUTATIONAL FLUID DYNAMICS

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ABSTRACT

Cardiovascular disorders are among the most critical heart problems worldwide. Proper development at the embryonic stage is a key factor for a healthy cardiovascular system. Congenital heart defects (CHDs) begin to form during the embryonic developmental phase, and the mechanism of initiation and etiology of CHDs still remain unclear. Genetic factors and disturbed hemodynamics are considered to play a role in the formation of CHDs. The assessment of the blood flow in the heart during embryonic development is challenging due to the limitations in medical imaging and blood flow quantification. At this point, computational fluid dynamics (CFD) simulations provide an opportunity to investigate the flow in the embryonic hearts. In this study, the methodology for the assessment of hemodynamics in embryonic hearts is described. First, three-dimensional geometric models are generated for the embryonic hearts using micro-CT (computed tomography) data. Then, the realistic inflow conditions are determined using the Doppler ultrasound measurements and applied as inlet boundary conditions in the CFD simulations. Finally, wall shear stress (WSS) patterns and blood flow streamlines are determined by post-processing the findings of the flow simulations. The results indicate that the biomechanical environment is significantly different between the healthy and defective embryonic hearts, highlighting the critical importance of hemodynamics in cardiovascular development.

KEYWORDS - Computational fluid dynamics, cardiovascular biomechanics,embryonic heart,blood flow,wall shear stress

DESIGN AND ANALYSES OF A MODULAR EXPERIMENTAL RIG FOR THE EVALUATION OF TURBINE AND COMPRESSOR BLADE FIXTURING CONDITIONS

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ABSTRACT

Turbine and compressor blades operating under severe service conditions need to be replaced or repaired periodically and are therefore designed separately from discs. Appropriate assembly of discs and blades is possible by producing special root geometries with high precision. However, sufficient attention should be paid to the design of the fixtures to be used in the precision production of the complex-shaped and thin-walled blades. Considering these issues and the sequential operations of blades, one of the preferred methods is mechanical pinned fixtures. In the current state-of-the-art, finite element method and computational simulations are performed for the proper application of these fixtures, determination of optimum clamping forces and observation of pin layouts. However, the validation of simulations performed in the computer environment can only be made for one blade geometry or pin layout due to high costs. In this study, a modular experimental rig for the evaluation of blade fixturing conditions has been designed and analyzed. In addition to the mechanical components, force, deformation and vibration measurement sensors is also included in the design. The designed fixture has been produced and its applicability to different component sizes, shapes and pin layouts has been demonstrated by using various real engine blades.

KEYWORDS - Compressor and turbine blades, manufacturing, fixture design, finite element analyses

INVESTIGATION ON REDUCING FUEL CONSUMPTION OF A TRUCK BY ADDING AERODYNAMIC STRUCTURES

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ABSTRACT

In this study, numerical analyzes were carried out to both investigate and develop the aerodynamic characteristic of a truck by developing different aerodynamic structures by using computational fluid dynamic software. The investigated truck is selected as Mercedes Benz Actros, and the model is considered in 1:40 scale for experimental smoke test. Boundary conditions are arranged according to the scale. The combinations of the structures such as top deflector (TD), rear side wing (RSW) and boat tail (BT) are considered to reduce the fuel consumption of the truck in the study. As a result, the all considered structures on the truck show good result for reducing the fuel consumption. The results showed that the influence of the structures is CTD, BT and CRSW in ascending order. The numerical results are supported with conducting the smoke test.

KEYWORDS - Fuel consumption, Drag coefficient, Aerodynamics

AN APPLICATION FOR THE SELECTION OF STEEL SHEET MATERIALS USED IN AUTOMOTIVE CONSTRUCTION WITH THE MOORA METHOD

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ABSTRACT

The new generation steel grades that can be used in automotive construction are increasing day by day and the material selection becomes very important both in the design and manufacturing processes due to the development in the materials. In this study, data on tensile strength, formability, load that weld joints can bear, fatigue stress, corrosion resistance and price criteria of high strength low alloy (HSLA), dual phase (DP), three phase (TRIP) and complex phase (CP) steel sheet materials used in the automotive industry were determined and a study was conducted for the material selection using the MOORA (Multi Objective Optimization on the Basis of Ratio Analysis) ratio approach. It was concluded that the selection of DP grade steel sheet material according to the MOORA ratio approach among the materials used in the study would be the optimum choice.

KEYWORDS - Automotive construction, automotive sheet materials, steel sheet grades, material selection, MOORA method.

THE EFFECT OF SPECIMEN SIZE AND PREPARATION METHOD ON THE MECHANICAL PROPERTIES OF TI 6AL 4V SHEETS

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ABSTRACT

In this study, a research is conducted to determine the effects of tensile test specimens prepared from 0.5 mm thick Ti-6Al-4V material, which is widely used in aviation industry, and the effects of preparation method on yield strength, ultimate tensile strength and fracture strain. In the experiments, tensile specimens of two different sizes in ASTM-E8 standard and cutting processes with laser, waterjet and Electrical Discharge Machining (EDM) are selected as preparation methods. When the results obtained from the tensile tests are evaluated, it is seen that the stress and strain values obtained as a result of repeated tests are more consistent in the samples cut with waterjet, while relatively inconsistent results are obtained from the samples of other cutting processes. It is also determined that the sample size affects the stress strain values at some extend.

KEYWORDS - Ti-6Al-4V, Laser Cutting, Waterjet, Electrical Discharge Machining, Tensile Test

CORROSION RESISTANCE OF ANODIZED ALUMINUM ALLOYS

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ABSTRACT

Aluminum alloys are a preferred material in the defense industry due to their excellent mechanical properties and low density. However, in certain working conditions their corrosion resistance is insufficient. The anodization technique is the most effective technique for increasing the corrosion resistance of aluminum alloys. This technique is interesting because of its ease of use and cheapness. In this study, Al2024 and Al5083 alloys were anodized in different electrolyte solutions (Sulfuric acid, Oxalic acid and Sulfuric acid/Oxalic acid). Anodization was performed for 15 minutes at a current density of 25mA/cm2. The anodized surfaces were examined with an optical microscope and XRD. Electrochemical testing was performed to determine the corrosion resistance of the alloys before and after anodization. Results have shown that the anodization process increased the corrosion resistance of both aluminum alloys. In addition, the properties reported for the Al-2024 alloy were superior to those of the Al-5083 alloy.

KEYWORDS - Aluminum alloys,Anodization,Corrosion

A TEST SCHEME FOR BRAKING OF TRACTOR TRAILER COMBINATION FOR UPDATED BRAKING NEEDS

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ABSTRACT

The highest number of fatal occupational accidents in the world are experienced in the agricultural sector after the construction and mining sectors. Most of the occupational accidents in the agricultural sector are accidents with tractors and trailers. The increase in the speed of the tractor-trailer combination and the innovations in the braking system of the trailer significantly affect the co-operation performance of the trailer and the tractor. Today, studies on braking torque and braking acceleration in agricultural vehicles with advanced braking systems have begun to increase. This study presents an experimental procedure in order to evaluate braking strategies for agricultural tractor-trailer combinations. Tractor and trailer setup is introduced by visuals including photography and schematical sketching. Features of the tractor braking system and trailer braking system are specified. Loading work, braking circuits, transmission tools and additional measurement equipment are described. Two different experimental procedures for on road tests and bench tests are explained. Some preliminary results are given in order to exemplify the effectiveness of the described procedures. Also, jack-knifing phenomena and related travel speeds are discussed. Future work plan is introduced.

KEYWORDS - Accident prevention, agricultural tractor trailer combination, braking, jack knifing, transportation.

APPLICABILITY OF REDUCED ORDER MODELING APPROACH ON RAPID INVESTIGATION OF AIRFOIL VIBRATION CHARACTERISTICS

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ABSTRACT

Structural dynamic behavior of lifting surfaces such as wing, tail, canard, fin is quite critical for the aircraft/missile design process since their natural frequencies determine the flight envelope of the vehicle. The aerodynamic efficiency of an aircraft can be maximized by preferring slender designs which leads to a decrement of the structural stiffness and so the natural frequencies of the structure. To satisfy both aerodynamic efficiency and structural strength, an iterative design process is applied during the preliminary design phase of the lifting surfaces. Application of reduced-order modeling approach on the structural model and modeling the lifting surfaces with shell elements instead of solid considerably shortens both modeling and solution time. This study aims to examine the applicability of the modeling approach by comparing the results of the shell models with solid ones. The applicability of the reduced-order modeling approach is tested for different wings designed from different airfoil sections having different taper ratios and sweep angles. Finite element models are prepared and solved in the Abaqus environment. Thickness distributions of the lifting surfaces are calculated and transferred to the Abaqus using an in-house Matlab script developed within the content of this research. According to the results, the reduced-order modeling approach provides accurate solutions as long as the number of elements in chordwise and in spanwise directions is high enough.

KEYWORDS - Reduced-order modeling, Airfoil vibration characteristics, Rapid investigation, Finite element method

ON THE EFFECT OF CELLULAR PERIODICITY OF ACOUSTIC TRANSMISSION LINE METAMATERIALS WITH VISCO THERMAL EFFECTS

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ABSTRACT

The study investigates the effects of cellular periodicity of acoustic transmission line metamaterials on acoustic performance parameters by considering visco-thermal effects of Kirchhoff model. Acoustic metamaterials (AMMs) are composed of different combinations of expansion chamber type unit cells with such arrangements as mean, linear and golden ratio increase. Transfer matrix method (TMM) is conducted for retrieving effective (homogenous) medium and acoustic performance parameters. The TMM models with and without visco-thermal effects are verified by Finite Element Method (FEM). Acoustic performance parameters such as sound transmission and absorption coefficients are determined using those homogenous parameters. The results showed that all unit-cell arrangements have single negative compressibility properties.

KEYWORDS - Transmission line acoustic metamaterial, visco-thermal effects, cellular arrangements, effective parameters, transfer matrix method.

OPTIMIZATION OF CUTTING PARAMETERS AFFECTING CUTTING FORCE AND SURFACE ROUGHNESS IN MACHINING OF AISI P20 DIE STEEL

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ABSTRACT

This study focuses on optimization of cutting parameters and modelling of cutting force (Fc) and surface roughness (Ra) in the machining of AISI P20 steel. The turning experiments have been performed in CNC lathe at three different cutting speeds (Vc) (120, 180, and 240 m/min), three different feed rates (f) (0.12 0.21 and 0.3 mm/tooth), and three different depths of cuts (a) (0.4, 0.8, and 1.2 mm) according to Taguchi L9 orthogonal array. The effect levels of the cutting parameters on Fc and Ra have been determined with analysis of variance (Anova). The analysis results indicate that the depth of cut is the most significant parameter affecting Fc while the feed rate is the most significant parameter affecting Ra. Moreover, the result analysis shows that cutting speed of 240 m/min, feed rate of 0.12 mm/rev, and depth of cut of 0.4 mm) factor levels were the optimum cutting parameters for the output parameters (Fc and Ra).

KEYWORDS - AISI P20,Machining,Taguchi,Optimization,Cutting force,Surface Roughness

DIGITAL TWIN AND APPLICATION OF BTX FRACTIONATION SECTION

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ABSTRACT

Virtual models of physical objects are created in a digital way to simulate their behaviors in real-world environments. Digital twins are software representations of assets and processes that are used to understand, predict, and optimize performance in order to achieve improved a process or systems. Digital twinning also known as using a digital copy of the physical system to perform real-time optimization. While real-time data is collected by sensors, that is transferred to be processed through mathematical models in process design. In recent years, the long downtime is unwanted situation for testing novel approach or uncovering the potential problems, especially in complex processes. Furthermore, the energy efficiency is of importance in terms of significantly decrease in the annual operating cost. Therefore, digital duplicates help to analyze, retrofit, or optimize these types of processes. In this study, the flow diagram of the Benzene, Toluene, Xylene (BTX) fractionation section at aromatics process with real data was simulated in a comprehensive process simulation package. The effect of some parameters on the process performed at 60 ton/h feed capacity was investigated by sensitivity analysis and the digital twin infrastructure closest to the real data was obtained for adapting to other process steps.

KEYWORDS - Digital Twin, Industry 4.0, Modeling, Simulation, BTX Fractionation, Aromatics

INVESTIGATION OF USABILITY OF CANNY ALGORITHM IN THE FIELD OF MACHINABILITY

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ABSTRACT

Today, it is utilized from image processing methods in many fields. Edge detection is one of the basic and most important stages of image processing. In this study, the usability of the Canny algorithm, an extremely effective algorithm in edge detection method, is investigated in order to determine the cutting tool life, which is one of the important criteria in the interpretation of the machinability of the parts. For this purpose, during the milling process, two separate cutting tool inserts, being in a situation of eroded and usable, are used. The RGB images of the cutting insert have been converted to black-and-white and binary images. Then, the Canny edge detection algorithm is applied to these two different images and the results are compared. When both images results are evaluated, it is seen that the edges are determined better with the Canny algorithm applied to the binary image.

KEYWORDS - Canny algorithm ,Edge detection ,Machinability

IMPROVING LEVEL MEASUREMENT TECHNIQUES AND MEASUREMENT ACCURACY IN VEHICLE FUEL TANKS

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ABSTRACT

Measuring the level and accurate transmission of the amount of fuel in vehicle fuel tanks is important in many ways. In vehicle warehouse designs, very different geometric shapes are encountered. Vehicle geometry and equipment placement cause warehouses to be produced in very different geometries. It is very important that information about the amount of fuel is transmitted to the driver in the most accurate way so that the driving safety and the car can travel safe distances. Shaking the fuel in the tank on a flat road, slope or off-road conditions may affect the display of the correct amount of fuel. In the study, the maximum and minimum production tolerance and geometry of the vehicle tanks, known as the mathematical model, the turbulence caused by acceleration of the float fuel measurement system in contact with the liquid placed in the tank, as well as the accuracy of the Up/Down movement of the level measurement float and the measurement of the fuel level as a result of the turbulence, were examined. Focusing on the shaking state of the measuring part on the float and preventive geometries.

KEYWORDS - Fuel, Tank, Sloshing, Level Measurement

THE EFFECT OF HEAT TREATMENTS APPLIED TO 3D PRINTED CONTINUOUS FIBER REINFORCED THERMOPLASTIC COMPOSITES ON MECHANICAL PROPERTIES

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ABSTRACT

In this study, the effects of different heat treatments on mechanical properties were investigated. Continuous fiber-reinforced thermoplastic (CFRTP) composites were produced using fused deposition modeling (FDM), which is one of the additive manufacturing methods. Polylactic acid (PLA) was used as a matrix, and carbon fibers (3K) were utilized as reinforcement material. First, CFRTP filament was produced on a specially designed melt impregnation line. Then, test samples were manufactured via a conventional 3D printer. Finally, heat treatments (remelting in salt, microwave oven, oven) were applied to the produced samples. The effects of these processes on mechanical properties were investigated using three-point bending tests. As a result of the heat treatments applied to the CFRTP samples, flexural stresses between 200 and 220 MPa was obtained. The highest flexural stress was obtained from oven and in salt remelting heat treatment methods, which has shown similar values. But in-salt remelting process has shown higher flexural modulus of elasticity compared to other methods.

KEYWORDS - Continuous Fiber Reinforced Thermoplastic,Heat Treatment,3D Printing,Fused Deposition Modeling,Mechanical Properties

MIXING METHODS OF CARBON NANOTUBES

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ABSTRACT

In this study, the dispersion methods of carbon nanotubes (CNT) in a structure were investigated. In the literature, it seems that the reasons for the difficulty of dispersion of CNTs in metal matrix or liquid phase structures have been investigated. Many researches on the manufacturing of CNT reinforced metal matrix composites have been by the powder metallurgy technique. Thus, the dispersion of the CNTs in the precursor powders has received much attention. Methods to disperse CNTs can be categorized as solid and liquid processing techniques. From solid processing techniques, the first and widely used method to disperse Within the scope of the research, the applicability, limitations and disadvantages of mixing methods for improving the dispersion or dispersion properties of CNTs were investigated. For CNT reinforced composite structures, the most important difficulty identified in the studies carried out so far is to provide uniform distribution. This problem is encountered in CNT reinforced polymer, ceramic or metal matrix composites.

KEYWORDS - Carbon nano tube, composite, aqueous solution, dispersion, mixing method

INVESTIGATING OF THE EFFECTS OF HOT ISOSTATIC PRESSURE HEAT TREATMENT ON MECHANICAL PROPERTIES OF PLA BASED BCC LATTICES

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ABSTRACT

Lattice structures that have body-centered cubic (BCC) unit cells were manufactured in this study using fused deposition modeling with polylactic acid (PLA) as printing material. Obtained cellular structures were heat-treated utilizing the hot isostatic pressure (HIP) method. Isostatic pressure was applied with nitrogen gas in an autoclave under different temperatures such as 40,50,75°C. Effects of the heat treatment were investigated using compression tests. It was observed that the heat treatment did not have a significant effect on the initial collapse force in the compression tests, but the deformation modes of the lattice structures changed with the heat treatment temperature. In addition, it was determined that the average collapse force increased with the effect of heat treatment at temperatures close to the glass transition temperature, and the energy absorption capability of the lattice structures improved compared to the untreated ones.

KEYWORDS - Additive Manufacturing,Cellular Structures,Mechanical Properties,Fused Deposition Modeling,Energy Absorption

NUMERICAL INVESTIGATIONS AND BENCHMARKING OF THE PHYSICAL AND ELASTIC PROPERTIES OF 316L CUBIC LATTICE STRUCTURES FABRICATED BY SELECTIVE LASER MELTING

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ABSTRACT

Thanks to the design advantages offered by the emerging additive manufacturing (AM) technologies, many features that cannot be practically produced with conventional manufacturing techniques such as lightweight structures, internal channels, topologically optimized geometries and lattice structures have become possible today. In addition to this, by applying selective laser melting (SLM), which is a type of powder bed fusion (PBF) process, these design features can also be produced from different types of metal alloys. However, it is essential to know the dimensional limits, production quality and material properties of these novel designs for a successful product development and implementation. For example, lattice structures, which can be classified in three main groups and have a combination of numerous sub-types, are greatly influenced by their geometrical characteristics on top of parent material attributes from which they are produced. For this reason, researchers are conducting ongoing studies to understand the properties of these lattice structures with numerous combinations. This paper aims to contribute to scientific efforts in this sense and investigates the physical and elastic properties of lattice structures produced by SLM from 316L stainless steel material, which has many uses in various sectors. Within the scope of the presented study, the relative density and relative elastic modulus for 27 types of lattice structures of different sizes with simple cubic (SC), body-centered cubic (BCC) and face-centered cubic (FCC) geometry were evaluated and benchmarked. The results of the study showed that the choice of lattice structure type and geometry is important, and accordingly, even if the same relative density is maintained, the geometry change between the two lattice structure types can result in a significant difference in elastic properties.

KEYWORDS - Additive Manufacturing, Selective Laser Melting, Strut-based Lattice Structures, Design, Finite Element Analysis

NUMERICAL FRACTURE ANALYSES FOR A STRUCTURE CONTAINING INCLINED CRACKS

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ABSTRACT

The presence of cracks in a structure is one of the primary reasons for the occurrence of critical failures. A crack in a component may remain stable in the long run or may growth suddenly and unstable crack growth may occur caused to serious hazards. Therefore, determination of the resistance of components with cracks to potential damages play a vital role to ensure safe use of components and to determine fail-safe design. In this study, numerical fracture analyses were performed for a pressure vessel containing cracks of different sizes and aspect ratios with different inclination angles. The distributions of stress intensity factors, KI, KII, and KIII along the crack front were computed for different crack configurations. The obtained solutions were compared with the results reported previously in the literature. The results from the numerical analyses showed that excellent agreements were obtained between the distributions for the computed stress intensity factors.

KEYWORDS - Fracture analysis,Stress intensity factor,Inclined cracks

EFFECT OF SHRINK FIT PROCESS ON TOTAL EQUIVALENT STRESS AND TOTAL AMOUNT OF MATERIAL

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ABSTRACT

Pressure intensifier's hydraulic cylinders and the extrusion containers are manufactured in compound layers in order to resist the stresses caused by the very high internal pressures. The assembly of the cylinder layers named "shrink fit" is done within certain shrinkage allowances. Thus, the compressive stresses created by the outer cylinder on the inner cylinder reduce the level of radial tensile stresses. In this study, the differences in stress levels of compound cylinders with different material pairs operating under ultra-high pressure were investigated. In addition, the lightest cylinder that can be obtained by determining the optimum dimensions in compound cylinders with the same stress value has been investigated. and the weight savings that can be achieved in case this stress value is carried with a single layer cylinder has been determined. The maximum equivalent stresses in the cylinders were determined by the Finite Element Method (FEM). In this context, material pairs of Aluminium-Steel, Steel-Steel and GGG40 (Cast Iron)-Steel were used. According to the results of the analysis, 716 MPa equivalent stress was calculated under 350 MPa pressure in a single layer cylinder. This equivalent stress was reduced to 579 MPa by using the same amount of material with the Steel-Steel shrink-fit process. The optimum cylinder diameter dimensions with the same stress were determined. The total amount of steel used was 6.65 kg in a single-layer cylinder, while this value decreased to 4.20 kg in the compound cylinder with optimum diameters. So, up to 36% of the amount of material was saved with the shrink-fit process.

KEYWORDS - Extrusion Container, Shrink-Fit, Hydraulic Cylinder, Material Weight Saving

INVESTIGATION OF CUTTING TOOL OVERHANG LENGTH EFFECT ON SURFACE ROUGHNESS OF GGG70 CAST IRON

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ABSTRACT

In machining processes, in order to obtain good surface qualities, it is very important to choose the cutting tool and cutting conditions. In addition, the rigidity of the cutting tool and workpiece fixture systems also majorly affects the surface quality. In many studies in the literature, the effect of cutting speed, feed and cutting depth parameters on the machining process has been investigated. However, there are more limited studies investigating the effect of cutting tool overhang length. In this study, the effects of cutting tool overhang length on the surface roughness of austempered GGG70 cast iron material were investigated in the milling process. In this context, cutting speed, feed rate, cutting depth and number of passes were kept constant and milling was carried out at cutting tool overhang lengths of 2, 2.5, 3, 3.5, 4, 4.5 and 5 times the tool diameter (16 mm). The milling experiments performed with three repeated. As a result of experiments, the surface roughness obtained of 0.383 µm at 32 mm tool overhang length. The surface roughness increased to 0.547 at 80 mm tool overhang length. So, the surface roughness increased by 42.6% with the increase of the tool overhang length. In addition to the critical parameters, it has been observed that parameters such as tool overhang have a significant effect on the surface roughness.

KEYWORDS - Cutting Tool Overhang Length, GGG70 Cast Iron, Milling, Surface Roughness

OPTIMIZATION OF BARREL WALL THICKNESSES USED IN SHOTGUNS THROUGH FINITE ELEMENTS METHOD

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ABSTRACT

Unrifled shotgun barrels are gun elements that have a certain wall thickness and are exposed to high pressures. When the barrel wall thickness is lower than the required amount in gas pressure-powered shotguns, the barrel gets heated and expands when consecutive shots are fired. The expansion of the barrel renders the system to be unable to perform shots in shotguns. As a solution to this problem, barrel wall thickness is unnecessarily increased, which causes the weight of the shotgun to increase. Barrel with more weight than the required amount is an undesired situation for shotguns. Barrel wall thickness should be adjusted to the most suitable values by considering the weight and expansion amounts. In this study, the optimization of design parameters was performed for barrel wall thicknesses used in shotguns as a result of the tests performed by using ANSYS response surface optimization. The study conducted enabled the revision of material choice of the main components in shotguns.

KEYWORDS - Shotgun, response surface method, material

ESTIMATION OF GLOBAL SOLAR RADIATION IN KONYA BEYSEHIR

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ABSTRACT

The total amount of solar radiation and its change over time are crucial parameters for many applications such as solar flat collectors, photovoltaic systems, solar heating, drying and interior lighting of buildings. These parameters should be known in solar energy applications. However, since regular measurements cannot be made in many places, it is not possible to access solar radiation data. In such cases, creating correlations using some measured meteorological data to predict total solar radiation in a region is an effective alternative solution. In this study, some models in the literature developed for solar radiation prediction were examined for use in determining the monthly average of daily total solar radiation incident to the horizontal plane in Konya-Beysehir. The models examined were compared considering error tests such as determination coefficient (R2), mean absolute percentage error (MAPE), root mean square error (RMSE). Appropriate model or models that yield the closest results to the measurement values have been determined.

KEYWORDS - Solar energy, global solar radiation; solar radiation models, estimation, Beysehir

ELECTRIC VEHICLE MECHANICAL DESIGN MANUFACTURING AND ANALYSIS APPLICATION

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ABSTRACT

Today, energy is derived from a very large percentage of fossil-based sources, such as 80-85% worldwide. However, it is not sustainable that the use of fossil-based resources pollutes the environment, causes climate change, runs out of reserves and lacks price stability. The most important measure against climate change that poses a threat to the world is to reduce the share of fossil-based resources in energy supply. In this context, in order to encourage universities in our country to design and manufacture electric vehicles and equipment, tübİtAK organizes competitions for universities and high schools under the name electromobile every year. In this study, TUBITAK Electromobile Battery was designed and manufactured by designing a unique electric vehicle to compete in the Electric Powered Vehicle category. After the mechanical designs of this vehicle we produced were made, the chassis and shell production was carried out by analyzing.

KEYWORDS - Electric vehicle, mechanical design, chassis, analysis

NUCLEAR AND SOLAR ENERGY COMPARISON FOR TURKEY S ENERGY NEEDS

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ABSTRACT

Increasing energy needs and the quest for finding new energy sources worldwide, is also the case in Turkey. Nuclear energy technology has been gaining importance in recent years for developing countries such as Turkey to meet the ever increasing energy needs. Turkey's first nuclear power plant, Akkuyu Nuclear Power Plant is being under construction. Reviewing literature content, private sector in Turkey seems able to compensate a portion of energy needs of Turkey, by means of renewable energy systems. As a rising power, Turkey consumes more energy with its increasing population, daily life comfort expectations and industrialization. On the other hand, public opinion is partially negative about new energy investments such as nuclear energy. This situation should be eliminated by more effective introduction of nuclear technology. Public awareness should be raised. The aim of this study is to compare the costs and environmental factors of currently available energy options in Turkey. In order to make this comparison, a literature review about Akkuyu Nuclear Power Plant and solar power plants has been made and various numerical data have been compiled.

KEYWORDS - nuclear energy, solar energy, LCOE, Turkey

1D ANALYSIS OF THERMAL PERFORMANCE OF A DOUBLE PIPE HEAT EXCHANGER

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ABSTRACT

In this study, a double pipe heat exchanger was modeled considering the conditions obtained from the reference study, and the thermal performance of the heat exchanger was numerically investigated under different Reynolds number and inlet temperature conditions by using the developed three-dimensional CFD and 1D models. Water was selected as a working fluid and counter flow conditions were considered for all analyses. Reynolds number values varied between 10000 and 40000 in increments of 5000 and were kept constant and the same for inner tube and annulus sides. In addition, the inlet temperature difference values were selected as 20, 40, and 60 °C. The results obtained from the analyses were compared to the reference study. All the other performed analyses were compared to each other in terms of thermal performance. It can be concluded that CFD and 1D analysis can be used with a high confidence level for double pipe heat exchangers for Re interval of 10000-40000. In addition, while more comprehensive results can be obtained by using the CFD models, the results of the 1D model were obtained much faster.

KEYWORDS - Double pipe heat exchanger, Thermal performance, 1D analysis, CFD

ELECTROMECHANICAL MODELING OF ENERGY HARVESTING FOR FRP COMPOSITE STRUCTURES COUPLED WITH PIEZOELECTRIC TRANSDUCERS

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ABSTRACT

Supplanting of metals by composites is on the rise for the last three decades in the aerospace, marine and automotive industry following the trend of electrification and indigenous design approaches. In parallel, piezoelectric (PZT) sensors and energy harvesters have gained significant attention due to their applicability and efficacy for microscale power generation systems. From a new perspective, embedding PZT sensors into composite structures will be beneficial in many aspects. Condition monitoring can be performed by using the sensing capability of PZTs while vibration can be controlled by means of its excitation capability. Besides, energy harvesting can be employed due to the mechanical forces exerted on the coupled structure. It is critical to create an accurate numerical modeling of electromechanical coupling for the investigation of efficiency of PZT sensors. In this paper, electromechanical modeling of a Fiber Reinforced Polymer (FRP) composite structure with an embedded PZT patch is presented and validated with an experimental setup. Afterwards, the energy harvesting capability of a PZT patch embedded in the FRP structure is investigated.

KEYWORDS - FRP,piezoelectric,energy harvesting,electromechanical

TENSILE AND FLEXURAL PROPERTIES OF BASALT CARBON GLASS EPOXY HYBRID COMPOSITES

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ABSTRACT

The paper focused on the experimental characterization of the hybrid composites of basalt, carbon, and glass fibers with epoxy resin. Five different composite panels, named Basalt/Epoxy (BE), Carbon/Epoxy (CE), Glass/Epoxy (GE), Basalt-Glass/Epoxy (BGE), and Basalt-Carbon-Glass/Epoxy (BCGE), were manufactured using Vacuum Assisted Resin Transfer Molding (VARTM) techniques in the laboratory of Mechanical Engineering, Konya Technical University. The samples were prepared using PST 650 Jigsaw according to ASTM D3039 and ASTM D7076 standards for tensile and flexural tests respectively. The tensile and 3-point tests were conducted using an Instron 8801 universal testing machine, which has a 100 KN capacity. The tensile stress, modulus of elasticity, and % elongation at the break of BGE hybrid composites are higher than those of GE composites. The flexural stress and flexural modulus of BGE are higher than the BE composite, which has the lowest flexural properties of other composites.

KEYWORDS - Tensile Properties, Flexural Properties, Hybrid Composites, VARTM, Basalt Fiber.

CURRENT SITUATIONS OF WIND ENERGY USAGE IN THE WORLD AND TURKEY

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ABSTRACT

Among the renewable energy sources, wind energy has been the most increasing energy source in use around the world in recent years. Today, more than 100 countries in the world are producing electricity from wind energy. As the countries with the highest installed capacity of wind energy, China, the United States of America and Germany have been in the top 3 for a long time. According to the data from year of 2021, Turkey ranks 7th in Europe and 13th in the world in terms of wind power plant installed capacity. In this study, after examining the wind energy potentials and installed capacities of the other countries of the world and Turkey, their shares in the current electricity energy production and total energy consumption were examined. The conditions that how the energy consumption of the world and Turkey can be met with one hundred percent from renewable energy sources and possible contribution of wind energy to these renewable energies have been estimated. In addition, possible developments that will be seen in wind turbine technology in the near future are also presented.

KEYWORDS - Energy, Renewable Energy, Wind Energy, Wind Energy Potantial, Advances in Wind Turbines

EXPERIMENTAL STUDY ON DESIGN AND OPTIMIZATION OF RUBBER DIE PRE-HEATING FURNACE

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ABSTRACT

Rubber materials are widely used in many fields such as automotive, construction, aviation and health. The physical and mechanical properties of rubber materials are highly affected by the material prescription and production processes. Temperature distributions are the most important parameter during the process at high pressure and temperature. An experimental study was carried out to investigate the effect of die temperatures and preheating on the rubber press process. In order to examine the preheating process of rubber die, a low temperature die heating furnace has been designed, whose main groups, safety systems and automation are discussed in this study. Thermal analysis were made on the die heating furnaces prototype set up with electrical resistance heat cell and mechanical analysis of the rubber products obtained. The most suitable design and usage conditions were investigated and thus the thermal and physical conditions related to the die preheating process. In this way, an important stage of rubber production has emerged for the rubber manufacturer. With the traditional method, the heating process is carried out by means of the resistances placed on the press dies. For the comparison of traditional method and preheating performance; post-compression microstructure and surface quality has evaluated with a parametric study on the preheated samples. In addition, it has evaluated in terms of operation and waiting times and energy efficiency and it has been ensured that the optimum manufacturing conditions of rubber materials were revealed. It has been seen that the when the dies are subjected to preheating process and rapid cooling at low press temperature an economical and fast production process can be planned with an appropriate curing can be achieved.

KEYWORDS - rubber, dir, preheating, furnace

STRUCTURAL PERFORMANCE EVALUATION ON ALUMINUM PLATES RETROFITTED WITH COMPOSITE IMPACT OF HYBRID BONDED BOLTED JOINING METHODS UNDER THE FLEXURAL LOADING

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ABSTRACT

Engineering materials lose their mechanical performance due to environmental loadings during service, and they require reinforcement. Recently, externally jointed to metallic members have been regarded as an effective technique for strengthen structures due to the composites are light and have good mechanical properties. Although the traditional methods (bonded and/or mechanical joining) have been widely used for combining, hybrid joinings have recently become popular to take advantage of the load transfer efficiency of both techniques. On the other hand, it is essential to know which component the stress should be applied as a design criterion and how the damage behavior has changed accordingly. On the other hand, it is essential to know which component the stress should be applied as a design criterion and how the damage behavior has changed accordingly. Since the member below the neutral axis is subjected to tensile and the upper is subjected to compressive stresses during bending loading, it is essential to understand how structural behavior is affected by the reinforcement in both cases. This work investigated the flexural behavior of bolted/bonded hybrid jointed aluminum-basalt composite, in the case of composite is below the neutral axis and aluminum below the neutral axis. Different damage modes were observed depending on different loading conditions and used joining techniques. Experiments indicate that applying the hybrid joining technique enhanced load-carrying capacity significantly attributed to bolts' restriction of shear deformation. This paper extends the understanding of aluminum retrofitting with composites and provides valuable suggestions for the joining method.

KEYWORDS - Aluminum, composite, bonded/bolted hybrid joint, epoxy, bending test

A PROCEDURE TO ACQUIRE NOISE FREE RECEPTANCE MATRIX FOR RECEPTANCE COUPLING SUBSTRUCTURE ANALYSIS

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ABSTRACT

This paper proposes a procedure to eliminate measurement and calculation noises on the translational and rotational receptances for receptance coupling substructure analysis (RCSA). To this end, the holder-spindle subassembly direct and cross receptances are measured at three locations. For each measurement, a nonlinear least squares modal fitting approach is implemented with employing Levenberg-Marquardt method. By using those fitted receptances, the rotational receptances for the holder-spindle subassembly are derived through the synthesis method. It has been seen from the comparisons between the obtained rotational receptances via the proposed procedure and directly measured receptances that the proposed modal fitting approach entirely eliminates the measurement and calculation noises without using any filter and enables us to accurately obtain full receptance matrix for the RCSA. This will lead to improve the tool point receptance estimations with the RCSA.

KEYWORDS - Receptance coupling substructure analysis; modal fitting; chatter stability

INVESTIGATION OF TORSIONAL PERFORMANCE OF CARBON FIBER COMPOSITE DRIVESHAFT WITH DIFFERENT STACKING SEQUENCE AND FIBER ORIENTATION

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ABSTRACT

As is known, the design of shafts operating under the effect of torsion is made by considering the risk of resonance during operation as well as strength expectation, and the weight limitation of the part may cause some restrictions in both cases. Due to the advantage of composite materials in terms of lightness and strength, the application area is expanding, and it is seen that the studies on composite shaft design have continued with increasing interest for the last 30 years. The fact that there are many variables affecting composite part performance, damage conditions, fiber winding angle, stacking sequence, and layer thickness with respect to loading type makes it difficult to generalize the design rule. Within the scope of this study, the stiffness, bending natural frequency, and critical buckling moment values of carbon fiber tubes consisting of ten layers were examined analytically for a constant torsion moment. Twenty-five different array combinations for various winding angles (0, 45, and 90) were considered. Appropriate combinations have been determined according to the performance values. The finite element method was also used in the studies.

KEYWORDS - composite driveshaft, torsional strength, fiber orientation, finite element method

THE INFLUENCE OF SINGLE SIDED MOUNTING MATERIAL ON LONGITUDINAL WAVE PROPAGATION IN TI6AL4V ROD

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ABSTRACT

This study examines the wave propagation, displacement and dynamic stress distribution within a solid Ti6Al4V rod mounted on a single side. Ti6Al4V alloy is used in some machine parts in automotive, aerospace/aeronautics, energy and biomedical applications. Due to its superior material properties and resistance to harsh environmental conditions, it is a future promising material. The influence of mounting material on displacement and stress behavior of Ti6Al4V rod is investigated by means of modelling one dimensional (1-D) wave propagation problem within the rod. Boundary conditions and initial condition is specified and governing partial differential equation (PDE) is solved computationally using an explicit scheme. Parametric analyses are performed to observe the effects of mounting material, mounting thickness and time on displacement and stress behavior. It is clearly observed that metallic mounting materials are efficient to delay stress and displacement waves without considerable reduction in their magnitude whereas rubber is very efficient in reduction of displacement and stress levels without considerable delay in displacement and stress waves.

KEYWORDS - Wave propagation, Ti6Al4V rod, mounting material, explicit method, dynamic stress.

EVALUATION OF FREE VIBRATION ANALYSIS OF EPS FILLED SYNTACTIC FOAM CORE

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ABSTRACT

Sandwich structures using foam as core material are widely used in engineering applications such as aircraft, automotive, marine and construction. Therefore, for the design of these engineering applications is in need of free vibration analysis results. In this study, free vibration behavior of new designed EPS filled syntactic foam core was investigated with experimental approach. Syntactic foam core was prepared using epoxy resin, glass microballoons (GMBs) and expanded polystyrene (EPS). The influences of density on the free vibration performance for new designed the core were evaluated. The natural frequencies and damping ratios of the samples were investigated under boundary conditions as fixed- free. The vibration tests were performed with the PULSE vibration measurement system using the impulse frequency response technique. Finally, the natural frequencies and damping ratio of EPS filled syntactic foam core were obtained and discussed.

KEYWORDS - EPS filled syntactic foam, vibration analysis, natural frequencies, damping.

MODELLING AND VIBRATION ANALYSIS OF A SINGLE LINK FLEXIBLE MANIPULATOR IN SIMMECHANICS

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ABSTRACT

SimMechanics that is a toolbox in Matlab/Simulink uses to dynamically model and simulate the mechanical, thermal and fluid systems. In this study, the dynamic modeling and vibration analysis of a single-link flexible manipulator (FM) based on MATLAB SimMechanics is simulated and then, verified with experimental results. The dynamic model of manipulator is established by using flexible beam element in SimMechanics. Vibration analysis is carried out with the transient analysis using trapezoidal motion curves defined to move the manipulator. Acceleration responses of residual vibrations at endpoint of the FM are obtained. Reduction ratios and root mean square values are calculated from residual vibration responses and tip vibration results are presented for different motion cases. Then, simulation results for different stopping positions are compared with experiments. It is observed from results that simulation and experimental acceleration vibration responses are successfully matched well. In flexible manipulator, the reliability of the SimMechanics-based modeling method is increased by confirming with the experimental results.

KEYWORDS - single-link flexible manipulator, dynamic modeling, vibration analysis, SimMechanic.

EFFECT OF ADHESIVE FAILURE GEOMETRY ON STRESS BEHAVIOR FOR SINGLE LAP JOINTS

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ABSTRACT

In this study, the effect of adhesion damage geometry on the joint strength due to the lack of adhesive material in single-lap joints of fiber reinforced composite boards was numerically investigated. This damage in the adhesion zone is modeled as an adhesive volume void at the edge of the sheet. To define this region, a positive damage angle and starting point are defined relative to the direction of the thrust length. While the left side of the connection is fixedly supported, the right side is subjected to equal elongation load. Analyzes were made with ANSYS APDL using the finite element method. The effect of the variation of the damage angle and damage length at the thrust edge on the stress distribution under tensile load is presented with graphics. Increasing the damage angle by 35° increased the von Mises stresses by 52%.

KEYWORDS - Single lap joints, fiber reinforced composites, adhesive, finite element method, adhesive failure.

ASYMPTOTIC SAMPLING REGRESSION WITH MACHINE LEARNING AND SURROGATE MODELING TECHNIQUES

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ABSTRACT

Asymptotic sampling is an efficient simulation-based technique for estimating small failure probabilities of structures. The concept of asymptotic sampling utilizes the asymptotic behavior of the reliability index with respect to the standard deviations of the random variables. In this method, the standard deviations of the random variables are progressively increased using a scale parameter to obtain a set of scaled reliability indices. The collection of the standard deviation scale parameters and corresponding scaled reliability indices are called support points. Then, a regression is performed using these support points to establish a relationship between the scale parameter and scaled reliability indices. Finally, an extrapolation is performed to estimate the actual reliability index. In the previous studies, the relationship between reliability indices and support points has been established using nonlinear regression. In this study, we explored the use of more advanced machine learning (e.g., Gaussian process, support vector regression) and surrogate modeling (e.g., Kriging, linear Shepard) techniques, and compared the accuracies of these techniques to that of the nonlinear regression on six benchmark problems. It is found that using nonlinear regression yields more accurate results than machine learning and surrogate modeling techniques evaluated within the scope of this study.

KEYWORDS - asymptotic behavior, extrapolation models, Gaussian process, Kriging, linear Shepard, machine learning, reliability index, small failure probability, support vector regression,surrogate model

EFFECT OF LINE SEARCH CONDITIONS ON CONJUGATE GRADIENT METHOD PERFORMANCE IN NONLINEAR LEAST SQUARES FITTING OF 2D GEOMETRIES

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ABSTRACT

This paper investigates influence of line search conditions including Backtracking (BC), Armijo-Backtracking (ABC) and Goldstein (GC) on the performance of the well-known conjugate gradient (CG) method (i.e., Fletcher-Reeves) while nonlinear least squares fitting of 2D primitive geometries (i.e., circle, ellipse, square, rectangle and triangle) profiles obtained from coordinate measuring machine (CMM). First, the five primitive geometries are built using 3D printer. Second, those geometries are scanned with CMM to acquire their 2D profiles. At the third stage of the work, the nonlinear least squares process is conducted by employing the above-mentioned CG-line search condition combinations to be able to reach best parameters that represent the measured data. During this fitting process, the maximum number of function evaluations for each combination are recorded when the combination in question satisfies the defined converge tolerance. Those data are later used to generate performance and data profiles which enable to assess the combination performance. By means of these profiles, it has been determined that the GC provides best performance for CG method. For the second best, the ABC stands out. All those results have shown that the line search conditions have a great importance on the performance of the CG method. Therefore, its selection requires a special attention for optimal performance.

KEYWORDS - Conjugate gradient method; nonlinear least squares fitting; performance profiles; data profiles; optimization

USE OF F TYPE FLY ASH IN CEMENT MORTAR WITH ALTERNATIVE MIXING METHODS

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ABSTRACT

In this study, it is focused on the use of fly ash, which is one of the industrial wastes, as a partial replacement of cement and fine aggregate in cement mortar. The feasibility of using fly ash as an alternative to cement and fine aggregates in concrete was determined by examining its effect on strength and durability properties in composites. Fly ash was used in the mixtures with three different mixing methods. These is the simple substitution method, addition method and the partial substitution method. In each method, 10%, 20% and 30% of the material was removed by weight, and a total of ten different mixtures were prepared by adding fly ash instead. As a result of the experiments to determine the properties of the mixtures in fresh and hardened state, the inclusion of fly ash in the mixtures improved the workability, freeze-thaw resistance, water absorption and capillary water absorption rate increased with the increase of the fly ash content. The results obtained in terms of the methods used in the study; in the pressure, water absorption and capillary water absorption experiments, the addition method gave better results than the other methods, and according to the bending and cylinder splitting test results, the mixtures prepared with the partial substitution method were found to be higher than the other mixing methods.

KEYWORDS - Fly ash, simple substitution method, partial substitution method, addition method, mechanical properties, freeze-thaw, permeability properties

MECHANICAL AND PHYSICAL PROPERTIES OF GLASS FIBER AND FLY ASH ADDED CEMENT BONDED COMPOSITES

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ABSTRACT

In this study, the changes in the mechanical and physical properties of cementitious composites containing fly ash with different characters at high and low rates were investigated with varying proportions of glass fiber reinforcement. F and C class fly ash was added to the mixture in varying proportions (10%, 20%, 50%, 60%) by cement replacement method. In addition, 16 different mixtures containing fly ash were obtained by including glass fiber in two different ratios (10%, 20%).For control, fly ash was not used in the reference samples, and two different reference mixtures were prepared with two different fiber ratios. As a result of the experiments, it was observed that the strength properties were higher in the samples containing Class C fly ash. Depending on the changing glass fiber ratio, as the fiber ratio increased, an increase was observed in flexural strength, while a decrease incompressive strength was observed. In the permeability tests including water absorption tests, it was observed that the samples containing Class F fly ash generally gave better results than the samples containing Class C fly ash. In addition, the increase in permeability values due to the increase in the glass fiber ratio is among the results obtained.

KEYWORDS - glassfiber, flyash, mechanical properties, physical properties

HYDROMETEOROLOGICAL TREND ANALYSIS FOR 1990 2017 A CASE STUDY SARIZ TURKEY

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ABSTRACT

Climate change significantly affects the variability of hydro-meteorological parameters. Within the scope of this study, a trend analysis study was conducted for Sarız district in the Seyhan basin. Monthly data for the period 1990-2017 were provided for the parameters of flow, temperature, precipitation, relative humidity and wind speed. In the study, Mann Kendall (MK), Spearman's Rho (SRho) and Innovative Şen Trend (IŞT) methods were used for trend analysis. According to the results obtained, a significant trend in precipitation and temperature could not be determined. While there was a significantly decreasing trend in flow and wind speed, a significant increasing trend was revealed for relative humidity.

KEYWORDS - Innovative Şen, Mann Kendall, Spearman's Rho,Sarız, Trend

TEMPORAL TRENDS OF EXTREME PRECIPITATION AND TEMPERATURE INDICES

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ABSTRACT

In this study, 45 years of daily total precipitation, daily minimum and maximum temperature data between 1975-2019 belonging to Niğde station (No: 17250) operated by the State Meteorology office were used. A total of 8 precipitation and temperature indices were applied to these data. The changes of the determined index values were examined using Mann-Kendall and Mann-Kendall Rank Correlation tests. As a result of the application, a generally significant increase was observed in the indices of both low temperature data and high temperature data. There is a significant decrease in the number of consecutive wet days (CWD) in the analyzed precipitation indices, while there is an increase in the other precipitation indices, although there is no significant trend.

KEYWORDS - Mann-Kendall, precipitation, temperature, trend

EVALUATION EFFECT OF HIGH VOLUME FLY ASH MORTAR CONTENT TO COMPRESSIVE STRENGTH BY EFFICIENCY FACTOR

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ABSTRACT

In this study, the development of compressive strength of mortars with high fly ash content produced with high fly ash substitution of cement and the effect of high fly ash substitution on compressive strength was evaluated using the efficiency coefficient of fly ash. This evaluation, made using the effectiveness coefficient, provided a fair basis for comparing compressive strength obtained from samples containing fly ash and compressive strength of control Portland mortar samples. Although mortars containing fly ash could not match the compressive strength of control Portland cement, samples containing fifty percent fly ash approached the control strength. For example, mortars produced with control Portland cement for wet and dry curing developed strengths at most 118.7 and 98.7 MPa, while mortar mixture containing fifty percent fly ash developed 96.8 and 73.4 MPa. Assuming that the effectiveness of fly ash is zero and it is assumed to behave inert, the compressive strength to be developed by the mortar containing fifty percent fly ash should be equal to half of the Portland cement mortar for wet and dry curing (58.4 and 49.4 MPa). It is understood that the presence of fly ash in the mixture is quite effective on the compressive strength and that it develops 65% and 48% more strength than the strength to be formed as a result of its inert behavior. As an additional observation, it has been revealed that mortars containing fly ash are more affected by dry curing conditions compared to Portland cement.

KEYWORDS - High volume fly ash , compressive strength,long term curing

EARTHQUAKE RISK ASSESSMENT OF MASONRY AND MIXED BUILDINGS A CASE STUDY

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ABSTRACT

Masonry and mixed structures are widely used in Turkey, which is located in the earthquake zone. In this study, it was aimed to determine the earthquake risks of masonry and mixed buildings by using the visual screening method. The visual screening method provides a fast and safe way to determine the risks of the building. In this context, this method is extensively used to determine the risk situations of buildings that may damage in a forthcoming earthquake. A total of 103 buildings, including 95 masonry and 8 mixed buildings in 10 neighborhoods in the Ercis district of Van, were assessed based on a visual screening method. In the risk assessment of masonry and mixed buildings, visual quality, wall space rate, wall space arrangement and pounding effect were taken into account as negative parameters. Building earthquake scores were calculated by reducing these negativity parameter scores from the velocity zone score, which depends on the number of stories. The inspected 103 buildings were grouped as high risk, medium risk, low risk, and safe according to building earthquake scores. The results showed that 26% of these buildings were at the low-risk level and 74% were safe. It is recommended to carry out more detailed investigations for these low-risk buildings.

KEYWORDS - Visual Screening Method, Ercis, Seismic Risk Situation, Masonry and Mixed Buildings

GROUNDWATER FLOW SIMULATION WITH HIGH ORDER FINITE DIFFERENCE METHOD

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ABSTRACT

This paper has introduced a numerical model for predicting the behavior of unsteady, one-dimensional groundwater flow. An analytical model and one experimental data are used to assess the results of the proposed model. The Boussinesq equation, which is the governing equation in this domain, is linearized and solved. The fourth-order finite difference method is employed to discretize the equations. Moreover, the numerical results of the offered model compared with the outcomes of the second-order finite difference method. The calculated results of the introduced model showed well agreement with the results of analytical and laboratory experiment data.

KEYWORDS - Groundwater, Finite Difference Method, Second-Order, Fourth-Order, Boussinesq Equation

INVESTIGATION OF THE USAGE OF STONE POWDER WASTE COOKED WITH BORON MINERALS AS A SUBSTITUTION AND ADDITIVE MATERIAL IN METAKAOLIN BASED GEOPOLYMER MORTARS

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ABSTRACT

Portland cement, which is used as a binding material in traditional concrete, continues to have a market advantage in the construction industry in the past and still thanks to its cheap and easily available raw materials (limestone and clay). Although Portland cement continues to be the most used binder material in the concrete industry today, due to the high energy requirement during the production of cement and the harmful effect of the CO_2 gas released on the atmosphere, some studies have been carried out for the production of alternative binder building materials to cement in recent years. In this study, while producing geopolymer mortars, metakaolin as a binder, baked stone dust waste at 15%, 30%, 45% replacement ratios as substitute material, colemanite mineral at 10%, 20%, 30% replacement ratios as substitute material, borax penta hydrate mineral at 10%, 20%, 30% replacement ratios as substitute material, borax deca hydrate mineral is used at 10%, 20%, 30% replacement rates. At the same time, metakaolin as a binder, colemanite mineral as an additive at 10%, 15%, 20% additive rates, borax penta hydrate mineral at 10%, 15%, 20% additive rates, and borax deca hydrate mineral was used in 10%, 15%, 20% additive ratios. In mortar production, 50% of 10M sodium hydroxide (NaOH) and 50% of 2 Module sodium silicate Na_2SiO_3 were used as alkali activators. Geopolymer mortars produced using a liquid/binder ratio of 1, a water/binder ratio of 0.60, and a sand/binder ratio of 2.25 were cured for 24 hours at room temperature and 60 ℃ curing conditions. When the dispersion values of the produced geopolymer mortars were examined, it was observed that the dispersion value increased with the increase of the replacement rate of the baked stone dust waste substituted for the metakaolin as a binder, and the dispersion values increased with the increase of the substitution rate of colemanite, borax penta hydrate and borax deca hydrate substituted for the metakaolin.When the mechanical properties of geopolymer mortars were examined at different curing temperatures, it was observed that the 7 and 28-days flexural and compressive strengths of the samples containing only metakaolin as a binder at room temperature and 60 ℃ curing temperature did not differ. It was observed that the best results were obtained at 30% substitution rate in 7-days flexural and compressive strengths at room temperature and 60 ℃ curing temperature in the samples using baked stone dust waste as a substitute material, while the samples using only metakaolin gave the best results in the 28-days compressive strength. In the samples using colemanite mineral as a substitute material for metakaolin, it was observed that the best values in flexural and compressive strength of 7 and 28 days at room temperature curing were found only in the samples using metakaolin. In the samples cured at 60 ℃, it was observed that the best strength value in 7-days flexural and compressive strength was obtained in 10% colemanite mineral substitution. Likewise, considering the 28-days compressive strength of the samples cured at 60 ℃, the best values were obtained in the samples using only metakaolin as a binder. On the other hand, in the samples where borax penta hydrate and borax deca hydrate mineral were used as substitute materials instead of metakaolin as binder, it was observed that the best strength values were obtained in the samples produced using only metakaolin at both room temperature and 60 ℃ curing temperature. When colemanite mineral was used as an additive to metakaolin binder geopolymer mortars, it was observed that the best results at room temperature curing were obtained only in samples using metakaolin. At 60 ℃ curing temperature, it was observed that the best value in 7-days flexural and compressive strength was observed in the samples using 20% colemanite mineral, while in the 28-days compressive strength, only metakaolin was used as a binder.When borax penta hydrate mineral is used as an additive to metakaolin binder geopolymer mortars in mortar production, it has been observed that the best value in 7-days flexural and compressive strength at 60 ℃ curing temperature is obtained with 10% additive, while 28-days compressive strength is obtained in samples produced using only metakaolin. Likewise, in the samples using the mineral borax deca hydrate as additive material, it was observed that the best values in the flexural and compressive strength of 7 and 28 days at room temperature curing and 60 ℃ curing temperature were found only in the samples using metakaolin. As a result, it has been seen that metakaolin should be used as the main binder in the production of geopolymer mortar and that metakaolin gains strength at room temperature.It has been observed that up to 30% baked stone dust waste can be used as a metakaolin replacement material in geopolymer mortars, especially in early strength conditions. It has been observed that boron minerals cannot be used as a substitute material in geopolymer mortars in any way, and it has been observed that colemanite and borax penta hydrate minerals can be used up to 10% to 20%, especially in early strength conditions, in terms of additive material.

KEYWORDS - geopolymer mortar, alkali activator, compressive strength, flexural strength,cooked stone powder waste

A NUMERICAL STUDY ON PERFORATED COLD FORMED STEEL SQUARE HOLLOW SECTION MEMBERS UNDER AXIAL AND ECCENTRIC COMPRESSION LOADING

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ABSTRACT

Cold-formed Hollow Steel Sections (HSS) are widely used in the construction industry. These members are perforated for various reasons, such as ductwork, connection to other members, creating aesthetic form, geometric optimization to produce lightweight structural members, and accommodation of many services like plumbing, electrical cables, wires, heating, etc. However, the existence of the perforations is likely to impact the structural stability and performance of columns. Therefore, finite element analysis (FEA) was performed in this study to examine the load-carrying capacities and behaviors of perforated cold-formed square hollow steel stub columns under axial and eccentric compression loading. The perforations have a circular form located at column mid-height and, the diameter of perforation to cross-section width ratio was constant in all models with the value of 0.44. In addition, to investigate the eccentricity of the circular perforations, stub columns were modeled with the ratio of the transverse displacement of the circular perforation to the section width was 0.20, and both axial and eccentric compression loading was applied separately. The analysis results showed that the most critical case occurred when the circular perforation and the eccentricity of the compression load were on the same side.

KEYWORDS - Cold-formed,Finite element,Eccentric compression loading,Circular perforation

INVESTIGATION OF THE DYNAMIC BEHAVIOR OF SOILS OF KONYA ORGANIZED INDUSTRIAL ZONE BY EQUIVALENT LINEAR ANALYSIS METHOD

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ABSTRACT

In seismically active regions, earthquakes occur with sudden vibration waves as a result of fractures in the earth's crust since the formation of the Earth. It is not possible to prevent earthquakes, which cause loss of life and property, as in other natural disasters. However, it is possible to minimize the damage caused by earthquakes. Predicting and determining the behavior of soils under the influence of earthquakes is of great importance in the design of structures. Our country is also characterized as an active country in terms of earthquakes. As it is known, soils can reduce their effect by dampening seismic waves at certain frequencies acting on them, while some frequencies can have amplifying effects. Therefore, the dynamic behavior of soils must be determined through analysis. In this study, regions in different locations in Konya Organized Industrial Zone were determined and different numbers of boreholes were selected. The data to be used in the analyzes were obtained from the region and representative soil profiles were created. Equivalent linear soil behavior analysis of the obtained soil profiles was carried out using the DEEPSOIL program. Values such as maximum surface accelerations, spectral accelerations, ground amplifications obtained as a result of the analyzes made in this region have been examined in detail in comparison.

KEYWORDS - DEEPSOIL, Equivalent Linear Analysis, Konya

A BRIEF STUDY ON THE COMPRESSIVE STRENGTH AND FLEXURAL STRENGTH OF FLY ASH AND GROUND GRANULATED BLAST FURNACE SLAG GEOPOLYMER MORTAR

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ABSTRACT

The effect of sodium concentration ratio (Na) on the compressive and flexural strength of fly ash mortars activated with sodium hydroxide (NaOH) was studied. Compressive strengths and flexural strengths of geopolymer mortars obtained by using F class fly ash and Ground-granulated blast furnace slag (GGBFS) mixtures at different rates of NaOH were determined at constant water content. 40 40 160 mm prismatic samples prepared from alkali-activated fly ash to obtain geopolymer mortar samples for the study. At the end of the 28-day curing period, the C3 mixture at molarity= 12 (12M) reached a compressive strength of 28.22 MPa, while the C1 (10M) mixture reached a compressive strength of 23.8 MPa. Concrete samples with a concentration of 12 M NaOH produced the highest compressive strength.

KEYWORDS - Class F fly ash, Ground-granulated blast furnace slag GGBFS, Geopolymer, compressive strength, flexural strength.

INVESTIGATION OF THE USE OF TEFLON PTFE LEAD BRASS AND CARBON FIBER PLATES AS FRICTION PADS IN ROTATIONAL FRICTION DAMPERS

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ABSTRACT

In terms of civil engineering buildings, earthquake mitigation is a rapidly developing new research area. In general, it is aimed to reduce the effects of earthquakes by consuming some of the earthquake energy acting on the buildings through various mechanisms, so that less earthquake energy will affect the building and smaller accelerations will occur in the building. One of these mechanisms, rotational friction dampers, are mechanisms that convert kinetic energy into thermal energy, work with a rotational deformation mechanism, and consist of steel plates and friction pads, which are clamped with high-strength bolts. In order to improve the damping behavior of these dampers operating according to the Coulomb friction law ($Ff = \mu \times N$), it is necessary to steadily increase the friction coefficient (μ) or the force acting perpendicular to the friction surfaces (N). The dampers should be stable in increasing displacements while operating, maintain their capacity under repetitive cyclic loads, dissipate sufficient energy and should not decrease in resistance. In our experimental study, different friction pad materials have been tried to improve the friction coefficient in rotational friction dampers. Energy dissipation behavior was observed by clamping the dampers formed with Teflon (PTFE), lead, brass and carbon fiber friction pads with bolts clamped at certain torques. By comparing the test results obtained, the suitability of the use of these materials as friction pads was determined.

KEYWORDS - Friction damper, friction pad, Earthquake mitigation, energy dissipation

COASTLINE CHANGE ANALYSIS IN SEYHAN DAM LAKE WITH GEOGRAPHIC INFORMATION SYSTEMS AND REMOTE SENSING METHODS

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ABSTRACT

Seyhan Dam is an earth-fill type dam constructed 15 km above the old Adana to save 850,000 decares of land and Adana from flooding that may be caused by the Seyhan River. In this study, the coastline change of Seyhan Dam Lake was determined using Remote Sensing and Geographic Information Systems techniques. In this context, Landsat satellite images of 20 August 2010, 18 August 2015 and 15 August 2020 were used for the analysis of the coastline change of the Seyhan Dam Lake. These satellite images were evaluated with ArcGIS software and the changes in the coastline were examined using the controlled classification method. The lake area for the years 2010, 2015 and 2020 is 49.981 km2, 49.340 km2 and 44.626 km2, respectively. According to the results obtained, it was determined that there was decrease in the lake area.

KEYWORDS - Seyhan Dam Lake, Remote Sensing, Geographic Information Systems, Coastal Change, Analysis

WAYFINDING SOLUTION AS STRENGTHENING METHOD FOR SCHOOL BUILDINGS IN CYPRUS

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ABSTRACT

The island of Cyprus faced many fatal earthquakes throughout its history. Yet, the application of decent seismic design codes is rather recent. A significant number of school buildings in Cyprus were built between 1950-1980s, where the gravity load design and poor material properties were dominant. The school buildings have a prominent role in the education of students, for earthquake preparedness. This study, suggests a methodology where the seismic strengthening process demands the least social intervention on the school environment. Furthermore, the old type reinforced concrete buildings also suffer fire resistance deficiency. In case of an earthquake or fire, as part of the evacuation process, students in the building will face a significant crowd flow towards the way out. Any intervention applied for strengthening the school buildings, will affect the wayfinding characteristics of the school environment. For this purpose, a case study school building is analysed at a densely populated area of the capital city Nicosia. The case study building was built in 1950's with reinforced concrete frame with non-load bearing walls. Gravity load design by the British Standard CP114 dominated the era. Initially, a seismic assessment was conducted on a current frame structure and several strengthening intervention alternatives were applied. As a result, a multidimensional judgment was considered for the selection of strengthening measures. The innovative design procedure is believed to guide the region for a safer urban regeneration.

KEYWORDS - Seismic Strengthening

COMPUTER AIDED DETERMINATION AND COMPARISON OF EARTHQUAKE DAMAGE SCORES OF RC BUILDINGS IN TURKEY USING RAPID ASSESSMENT METHODS

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ABSTRACT

In this study, 7 different rapid evaluation methods which are used to determine the performance of buildings under the influence of earthquakes in a fast and practical way are examined. These methods were used to determine the earthquake performance behaviors (risky or safe) of buildings according to each method by using the parameters of 50 buildings that were collapsed or severely damaged in Van earthquake that occurred in 2011. Accurate estimation percentages of the methods on the buildings were calculated by comparing the obtained earthquake performance behaviors with the current situation of the buildings. The most suitable method has been tried to determine for 50 buildings related to these calculations. At the same time, a computer program called EPA (Earthquake Performance Analysis) was developed in order to evaluate the parameters of the related data set faster, easier and without error. Three of the 7 rapid assessment methods used to determine the earthquake performance behavior of buildings are first-stage methods called street screening (6306 RYY, FEMA P-154 and Sucuoğlu and Yazgan level-1), and the remaining four methods are second-stage methods called pre-assessment (Sucuoğlu and Yazgan level-2, Özcebe, Yakut and MVP). According to the results, the pre-assessment methods predicted the earthquake performance status of the buildings examined by 24% higher than the street screening methods. At the same time, the most successful method of street survey methods was 6306 RYY with 74% accurate estimation, and the most successful method of preliminary assessment with 86% accurate prediction was Yakut method.

KEYWORDS - Damage score, Earthquake performance, Rapid assessment methods, Reinforced concrete buildings

EFFECTS OF MOLDS OF DIFFERENT DEPTHS ON MICROBIAL CARBONATE PRECIPITATION

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ABSTRACT

Microbially Induced Calcite Precipitation (MICP) has emerged as an alternative to the soil improvement methods used today. In our study, the effects of different mold heights on permeability and calcite percentage were investigated in the improvement of sand soils by using the MICP technique. In this context, the soils were placed in molds with a relative density of 45%. Afterward, the culture medium for 24 hours and the cementing solution for 96 hours was applied to the soils. As a result, the increase in die heights increased the permeability. Calcite percentage results were similar. It has been determined that the mold height is especially effective on the permeability in the improvement of soils with MICP.

KEYWORDS - MICP, Viridibacillus arenosi, Ground Improvement, Biologically Soil Improvement, Calcite Content

A NON SYMMETRIC RECEDING CONTACT PROBLEM OF FUNCTIONALLY GRADED LAYER RESTING ON QUARTER PLANES

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ABSTRACT

A non-symmetric receding contact problem of a functionally graded (FG) layer resting on two-quarter planes (QPs), loaded by a flat rigid block, is discussed in this study. The contact surfaces are assumed to be frictionless and only compressive normal tractions can be transmitted through contact surfaces; the influence of gravity is excluded from the problem solution. The problem is reduced into a set of singular integral equations in which contact distances and pressures are the unknowns using the theory of elasticity and Fourier integral transform techniques. The unknowns of the problem are found with the help of the corresponding Gauss–Chebyshev quadrature and an iterative scheme. A parametric study is carried out to investigate the influence of material properties, geometry, and loading of the problem on contact distances and pressures. Obtained results provide a deep insight into the non-symmetric contact mechanism between the FG layer and QPs.

KEYWORDS - non-symmetric contact, receding contact, functionally graded layer, quarter plane, Fourier integral transform

COASTLINE CHANGE ANALYSIS IN IZNIK LAKE WITH GEOGRAPHIC INFORMATION SYSTEMS AND REMOTE SENSING METHODS

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ABSTRACT

Iznik Lake, a tectonic freshwater lake, is the largest lake in the Marmara Region. It is also Turkey's fifth largest natural lake. In this study, it is aimed to determine the coastline change of Iznik Lake over time. Landsat satellite images of the years 1985, 2000, 2010, 2020 were used to determine the coastline change of Iznik Lake. Satellite images were analyzed using Geographic Information Systems and the coastline of Iznik Lake for the years 1986, 2000, 2010 and 2020 was determined. The lake area for the years 1986, 2000, 2010 and 2020 is 301.185 km2, 300.082 km2, 299.077 km2 and 297.860 km2, respectively. According to the results obtained, it was determined that there was decrease in the lake area.

KEYWORDS - Iznik Lake, Remote Sensing, Geographic Information Systems, Coastal Change, Analysis

THE COMPARISON OF THE APPROACHES FOR DETERMINING THE ACTUAL EMBEDMENT DEPTH OF CANTILEVER SHEET PILE WALLS

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ABSTRACT

Designing cantilever sheet pile walls is one of the most significant and complicated projects in geotechnical engineering because the complicated interaction between wall movement and earth pressure determines the distribution of earth pressure on the submerged part of the wall. Therefore, there are many approaches that relies on various assumptions and simplifications to modify the basic form of the pressure distribution to discover a solution. In this paper, the embedment depths of the cantilever sheet pile walls in the sand are calculated by using the simplified method(SM) and full method(FM) considering different safety approaches in order to determine the effect of the earth pressure and safety approaches to the embedment depths are examined.

KEYWORDS - Cantilever sheet pile,Embedment depth,Net earth pressure method,Approximate mathod,Factor of safety

STATIC RESPONSE OF STEEL BEAMS WITH RECTANGULAR WEB OPENINGS

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ABSTRACT

Steel beams are widely used in many engineering applications as structural members, therefore understanding their static behaviors is an important case. In this research, the finite-element method (FEM) is used to examine the static response of steel I-beams with rectangular web openings subjected to uniformly distributed loads. The finite-element software package, SAP2000 is used in the analysis. Results are obtained by using the thick shell and thin shell elements and comparisons are presented. The influence of the location of the rectangular web openings on the maximum vertical deflections and stresses is carried out for a clamped - clamped steel I-beam. The location of the web openings is determined to acquire the best performance of the beam under the same distributed load and fixed support conditions. Also, a parametric study is carried out to obtain the appropriate mesh of finite elements.

KEYWORDS - Steel beams, web openings, static response, stress, finite element method.

INVESTIGATION OF THE TECHNICAL PROPERTIES OF PANELS PRODUCED USING EXPANDED PERLITE

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ABSTRACT

In this study, 600 and 1000 kg/m^3 densities panel walls were produced with mixtures of gypsum, polypropylene fibers (1% by volume) and expanded perlite (added to the slurry at the volume ratios calculated for the targeted densities) to be used in building interiors. For the compressive strength and thermal conductivity tests, samples with dimensions of 150×150×150 mm and 30x30x5 cm, respectively, were produced. The prepared samples were subjected to compressive strength test and thermal conductivity test on the 28th day. According to the results obtained, the thermal conductivity coefficient and compressive strength for samples with a density of 1000 kg/m^3 were found as 0.215 W/mK and 1.2 MPa, respectively. In addition, the thermal conductivity coefficient and compressive strength for samples with a density of 600 kg/m^3 were found as 0.150 W/mK and 0.40 MPa, respectively. In short, the densities of the gypsum panels produced by using expanded perlite in mixtures have been reduced and a decrease in thermal conductivity coefficients has been achieved.

KEYWORDS - Thermal conductivity coefficient, panel, expanded perlite, gypsum, compressive strength test.

EFFECT OF LIQUID MEDIUM AND DIFFERENT APPLICATION USED IN MICP ON SOME PROPERTIES OF CEMENTED SOILS

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ABSTRACT

There are many different techniques used today in the improvement of soils. However, many of them contain components that are harmful to the environment. Improvement of soils with MICP (Microbially Induced Calcite Precipitation) emerges as an environmentally friendly technique. Our study investigated the effects of different liquid media and application techniques on soil improvement using the MICP technique. It was determined that different media were effective on bacterial densities. With the increase of the application time, better results were obtained in soil improvement. It has been determined that the application times and different media are effective in improving the MICP technique.

KEYWORDS - MICP, Ground improvement, Biological soil improvement, Microbially induced calcite precipitation, Viridibacillus arenosi

URBAN GREEN AREA AND PARK ACCESSIBILITY GIS BASED HYBRID MODEL ANALYSIS AND ASSESSMENT

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ABSTRACT

Since the concept of spatial equality is an important component of sustainable planning, the distribution of green areas within the city should be fair and balanced. The fact that the majority of people now live in cities has increased the need for parks and green areas, which are social and sports areas. This need has become more evident, especially during the Covid 19 pandemic we have experienced in the recent past. During the closure or administrative leave processes, people flocked to green areas to reduce their stress and move. In this study, the distribution of public urban green areas was examined separately according to population-based planning and geometric distribution. Then, these two approaches were hybridized and it was analyzed whether there was a balanced and fair green area distribution in the selected pilot region (Gaziantep). Geographic Information Systems (GIS) technologies were used in data collection and analysis processes in the study. In the study, besides whether there are spatial inequalities in the distribution of green areas, the accessibility of green areas was also examined. The results were reported and regions with deficiencies in the distribution of green areas were reported

KEYWORDS - GIS,Green Area,Spatial Equality,Urban Design

PIEZO RESISTIVITY OF CEMENT BASED MORTARS DOPED WITH CARBON BLACK AND CARBON FIBERS FOR SELF SENSING BEHAVIOR

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ABSTRACT

The efficient use of carbon-based materials is of a challenge for the advanced self-sensing behavior of cement-based mortars. This study deals with the dispersion of the carbon-based materials and investigating the self-sensing response by using conductive fillers. To do this, carbon black (CB) and carbon fibers (CF) were used cement mortars to evaluate the piezo-resistivity response. Dispersion of the conductive fillers was achieved by using sodium hydroxide as surfactant. Reference specimens were produced and comparison was made with the specimens doped with CB and CF. Experimental work reveals that CB and CF enabled superior relative change in electrical resistivity of composites. However, CF was more promising than CB in terms of achieving higher piezo-resistivity. In addition to non-structural functionalities, mechanical properties of developed mixtures were also evaluated. The use of CF provided higher flexural strength compared to reference and CB-bearing specimens. On the other hand, carbon-based materials made a negligible contribution to the compressive strength of the cement-based mortars.

KEYWORDS - Carbon Black, Carbon Fiber, Cement Mortars, Self-sensing

DROUGHT ASSESSMENT BY USING GEOGRAPHIC INFORMATION SYSTEMS AND REMOTE SENSING

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ABSTRACT

Drought is one of the natural disasters that has effects on water resources, socio-economic factors and environmental conditions on earth. Evaluation of drought hazard areas and drought risk mapping contribute management strategies and developments of natural resources. The use of geospatial information technology in monitoring and assessments of drought phenomenon provide estimations of drought prone areas, and prediction results can be considered in climate change adaptation works. In this study, a literature review on the use of Geographic Information Systems (GIS) and Remote Sensing (RS) on drought management is presented.

KEYWORDS **-** Drought Analysis, Geographic Information Systems, Remote Sensing, Climate Change

INVESTIGATION OF THE USE OF MARBLE POWDER IN PRODUCTION OF HIGH STRENGTH CONCRETE

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ABSTRACT

One of the aims of this study is to determine the amount of marble powder to be used in the optimum amount to high-strength concrete (HSC). The second is to contribute to the reduction of natural resources using marble powder from waste materials in HSC production. The fine aggregate was used by the marble powder with 0%, 8%, 16% and 24% . In concrete mixtures, the cement was added to the maximum use of the cement to increase the puzolanic activity and to ensure the maximum use of the marble powder. The slump experiment was applied to the mixed mixtures. Then fc-7., fc-28. and fc-90. days It has been kept in the curing pool to be subject to compressive strength test on the days. According to the results obtained from the compressive strength test, the amount of optimum marble powder was determined by taking into account the high strength value. It is also thought that the use of marble powder is positively contributed to the reduction of concrete compressive strength, natural resource consumption and environmental pollution.

KEYWORDS - High strength concrete, marble powder, compressive strength, silica fume.

INVESTIGATION OF THE EFFECT OF CHEMICAL ADDITIVES NN MECHANICAL PROPERTIES OF CONCRETE

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ABSTRACT

Various chemical additives are used in order to improve some properties and increase the performance of concrete from the first production to the service life in the hardened state. The most widely used of these chemical additives are viscosity increasing superplasticizer additives. In this study, the amount of chemical admixture that can be used at the optimum ratio for concrete with low water/cement ratio was determined and its effect on the performance of the concrete was investigated. For this purpose, 10 series of concrete mixtures were prepared by using cement dosage of 400 and 500 kg/m3, water/cement (W/C) ratio of 0.20 and using chemical additives of 1%, 1.5%, 2%, 2.5% and 3% by weight of cement. Silica fume up to 5% by weight of the cement was used as a mineral additive. The fresh and hardened concrete properties of the series prepared with these mixing ratios were investigated. As a result, the and-be and slump values were compared with the daily compressive strength values of fc-7 and fc-28. As a result, it has been determined that the optimum chemical admixture ratio is 2% in order to obtain suitable workability and high strength in concrete. In addition, it has been observed that the use of chemical additives above the optimum amount reduces the strength of the concrete.

KEYWORDS - Concrete, chemical additive, compressive strength,slump

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