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IEI EPITOME

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In this issue

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Announcements

Members in the News

Dr Narayan Kumar Bhagat, MIE
Sr Technical Officer-2
CSIR-Central Institute of Mining and Fuel Research, Dhanbad, Jharkhand
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Dr Narayan Kumar Bhagat successfully passed the viva-voce examination on 30 May 2022 and fulfills the requirement(s) for the award of Degree of **Doctor of Philosophy** on the basis of thesis entitled "**Controlled Blasting Techniques for Safe Excavation and Stabilization of Rock Slopes on Railway Transportation Route**" vide result notification No. Exam/219905/Ex.Bd/2007-08 (Vol. III) dated 13 June 2022, of Indian Institute of Technology (ISM) Dhanbad.

Dr Dilip Pandurang Deshmukh, AMIE
Assistant Professor
D Y Patil College of Engineering, Ambi, Pune, Maharashtra
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Dr Dilip Pandurang Deshmukh has been conferred the Degree of **Doctor of Philosophy** in the faculty of Engineering for the thesis entitled "**Evaluating the Performance of Gas Turbine by using Bio-Mass**: **A CFD Approach**" from Shri Jagdish Prasad Jhabarmal Tibrewala University, Jhunjhunu, Rajasthan, India during 10th Convocation of the University held on 06 March 2022 .

IEI Industry Excellence Award 2022

Request for Participation

The IEI Industry Excellence Award has been instituted to recognize industry leaders for their innovation, excellence in engineering operations and thereby, to lead their industry in competitive manner. The benchmarks created by the industries in India have included productivity, quality, safety and performance assurance thereby giving India the rightful place in the global markets. Realizing that such industries can provide the leadership to a large number of other industries in the country, it has been considered appropriate by the IEI Council to institute the IEI Industry Excellence Awards in the year 2008.

Applications in specified format (visit link: ***https://www.ieindia.org/webui/IEI-Activities.aspx#industry-excellence-award***) are invited from prospective applicants for IEI Industry Excellence Award 2022. The last date of receipt of application for the Award 2022 is **30 September 2022**. Interested applicants are requested to send their applications (Two hard copies & One soft copy in Pendrive/CD) to the below mentioned address.

The Director [Technical]
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Publication by Members

Book

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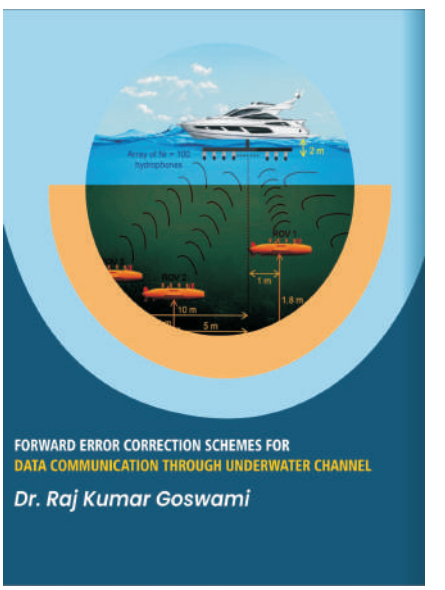
Forward Error Correction Schemes for Data Communication through Underwater Channel

About the Book

The primary endeavor of this book is to provide an insight to the Forward Error Correction schemes so as to transfer the extracted features of the detected objects along with any intended data in a reliable manner through underwater channel. The main challenge with respect to the development of the coding techniques is the phenomena governing the propagation of signals through the underwater channel. It offers the biggest challenge imposing severe limitations on the effective throughput of transmission. The major problems encountered in the underwater channel are related to time-varying ISI and frequency-selective fading. An extensive literature review has also been presented with respect to Error Correction Coding schemes. This survey provided the necessary base for formulating the design alternatives. These alternatives attempted to exploit the recent advances in the error correction coding techniques, for data communication through underwater channel. Factors like design and implementation complexity of error correction schemes and the amount of overheads involved in transmission have also been considered in the critical assessment of these alternatives. An overview of the Sonar theory has also been presented along with the brief introduction of the forward-looking Sonars. The types of Forward-Looking Sonars have also been discussed in very brief.

A comparison of the general parameters of the terrestrial and underwater systems is also carried out along with the variations in the path loss offered by the two systems with frequency and distance. The characteristics of propagation in the underwater medium are also elaborated. Underwater Channel modeling is also introduced in the book along with a study of the Rician and Rayleigh models which characterize the fading environment. The Rician and Rayleigh distributions are compared in terms of their application to real world scenarios. In the real underwater scenario, there is also a direct path along with the diffused/ indirect paths.

Therefore, the most suitable model that can be used for testing the designed coding schemes is the Rician Fading model (K-factor = 2) along with the Additive White Gaussian Noise. The various Forward Error Correction Schemes have been discussed for the purpose of achieving reliable transmission of the formulated data block. The designs of the two Convolutional coding schemes i.e. rate 1/n and rate n/(n+1) have also been presented. It is observed from the comparison of Convolutional and TCM coding schemes that improvement in the performance of either code can be obtained with increase in the coding rate. The Turbo Codes have also been introduced and it will be seen that the performance of turbo code is sensitive to its code structure. The problem of the application of turbo codes to underwater communication systems has also been addressed. The main disadvantage of the Turbo codes is their long latency due to their relatively large codewords and iterative decoding process. However, the Turbo codes score over the Convolutional and the TCM codes in that they can be made sufficiently random to achieve a given BER and by using iterative methods, can be efficiently and feasibly decoded. The designed coding algorithm has been incorporated into the various configurations of the Turbo coding scheme. The variation in the configurations is in the coding rate and the number of states. The interleaver used in the design has been chosen as the random interleaver. The Turbo Coding Schemes have been designed by implementing the Convolutional coders as the constituent encoders using the proposed design rules. The design has been carried out for the 1/n and the n/(n+1) code rates with various states. The performance analysis of the proposed turbo schemes is also presented in terms of the Bit Error Rate (BER) achieved.



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Publication by Members

Papers published in the Journals / Proceedings

Dr Srinivasa Rao Pundru, FIE
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Title of Paper: **Calibrating a Synthesized 3-PRS Manipulator by Minimizing the Errors in Positions of Revolute Joints**

Journal of The Institution of Engineers (India): Series C, Springer, 103, 2022, pp 1083-1093, Print ISSN: 2250-0545, Electronic ISSN: 2250-0553

DOI: https://doi.org/10.1007/s40032-022-00866-0

Abstract: This paper presents error analysis in the position of parameters of a synthesized 3-prismatic-revolutespherical (3-PRS) manipulator. The design parameters such as orientation, position, location, direction of revolute and spherical joints are designed based on design constraints. Based on prescribed set of positions and constraints, the physical parameters of a manipulator are determined and by using its kinematics- position, orientation, location, direction of a revolute and spherical joints are determined. The position and orientation of the parameters of a 3-PRS manipulator is calculated by using closed and vector loop techniques. By comparing prescribed and occupied locations of the manipulator the error in obtained position and orientation of a revolute joints of a manipulator are determined. This results shows that the orientation, positional error in synthesized 3-PRS manipulator are negligible. It concludes that the obtained position and orientation of a manipulator are close agreement with prescribed position and orientation of a manipulator and this work is used to obtain tip, tilt and position of the 3-PRS manipulator.

Keywords: Synthesis, Orientation, Location, Actual and Resultant Positions of Revolute Joints, Calibration of Error in Position of Revolute Joint

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Title of Paper: **Detection of Impaired Objects in Roadways using Metaheuristic Algorithms**

International Journal of Engineering Systems Modelling and Simulation, 13(3), 2022, pp 209-217, Online ISSN: 1755-9766, Print ISSN: 1755-9758

DOI: https://doi.org/10.1504/IJESMS.2022.123953

Co-authors : Sambandam Ramachandran Balaji, Manikandan Radhakrishnan & Albert Mayan John

Abstract: Roads have become the most fundamental element in land transportation system. In the long run, some malformations will appear on the road, such as potholes and cracks. Since manual inspection is unpredictable, subjective and prolonged, we go for computer vision-based methods. Thus our work focused on the automatic detection of the cracks and potholes. For the detection process, we acquire the video, convert them into frames and use metaheuristic algorithms to implement detection of the roadway damages (i.e., cracks and potholes). The novelty of this approach lies in using texture-based features to differentiate between crack surfaces and intact roads. Three different metaheuristic algorithms are used to detect the crack and potholes. The performance of the algorithms is evaluated using the different parameters. Based on the performance, it is observed that grasshopper optimisation algorithm outperforms well for this application.

Keywords: Crack Detection, Pothole Detection, Metaheuristic Algorithm, Particle Swarm Optimisation, PSO, Whale Optimisation, Grasshopper Optimisation

Publication by Members

Dr Gowthul Alam M M, MIE
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Title of Paper: **An Efficient SVM based DEHO Classifier to Detect DDoS Attack in Cloud Computing Environment**

Computer Networks, Elsevier, 215, 2022, ISSN: 1389-1286
DOI: https://doi.org/10.1016/j.comnet.2022.109138

Co-authors : Jerald Nirmal Kumar S, Uma Mageswari R & Michael Raj TF

Abstract: Distributed denial of service (DDoS) attacks is rising exponentially and creates a severe threat to security. Generally, the DDoS attack may appear uncomplicated but they are hard to prevent and considered as one of the most significant cybersecurity issues. Hence, addressing against DDoS attacks turns out to be imperative. The major goal of this paper involves the optimal detection of data samples as normal data samples and malicious/attacked data samples. This paper proposes a security algorithm against DDoS attacks by employing four significant phases namely the Database training phase, Data pre-processing phase, Feature selection phase and Classification phase. Initially, the data samples are to be trained before using it for attack detection. Later, the sample group is created for every file and the data samples are pre-processed in the data pre-processing phase. Secondly, in feature selection phase, the selected features are optimized by employing kernel principal component analysis (KPCA) to obtain optimal features. Later, in the classification phase, a support vector machine-based discrete elephant herding optimization (SVM-DEHO) classifier is utilized to detect the data sample as normal data and attacked or malicious data. Finally, the proposed approach is examined for four different databases namely NSL-KDD, UNSW-NB15, ISCX ID and CIC-IDS2017 databases respectively. The experimental analyses are performed for various simulation metrics and the outcome reveals that the detection system performances are high using SVM-DEHO approach than other approaches.

Keywords: DDoS Attack, Cloud, DEHO, SVM, KPCA, Databases, Data Samples, Cyber Security

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Title of Paper: **Application of Logistic Regression, Cart and Random Forest Techniques in Prediction of Blast-induced Slope Failure During Reconstruction of Railway Rock-cut Slopes**

Engineering Failure Analysis, Elsevier, 137, 2022, ISSN: 1350-6307
DOI: https://doi.org/10.1016/j.engfailanal.2022.106230

Co-authors: Arvind K Mishra, Rakesh K Singh, C Sawmliana & P K Singh

Abstract: Drilling and blasting operation is often required to excavate the infrastructure slopes for enhancing their stability or creating space for upgradation. While conducting blasting, there are many incidents of slope failure or rockfall. Thus, proper planning and careful designing of different blasting parameters are essentially required to reduce the incidents of slope failure or rockfall. In the present research, the efficacies of three machine learning (ML) techniques; Logistic Regression (LR), Classification and Regression Tree (CART) and Random Forest (RF) were examined for predicting the blast-induced slope failure (BISF) or blast-induced rockfall during reconstruction of slopes on railway route. 490 databases with thirteen variables were considered for the prediction of BISF. By applying Multicollinearity and LR technique based on minimum Akaike Information Criterion values, the six most influential input parameters were identified. With the selected input datasets, fivefold cross-validation was carried out on randomly selected five sub-groups of datasets using LR tool. Then, the best LR model having the highest prediction rate was selected and with the same training and testing datasets of the selected model, the CART and RF models were also developed. The various performance indices such as correctness, recall rate, precision, specificity, F-beta score, receiver operating characteristics (ROC) and area under the curve (AUC) were calculated to evaluate the developed models' accuracy and applicability. The developed models showed good prediction abilities, with the RF model having highest performance in terms of recall rate (90%), accuracy (96.94%) and F-beta score (0.882). The LR model has higher precision (88.9%) and AUC value (0.96) than CART and RF models. The findings of the research work demonstrate the applicability of all three models in selecting the blast design parameters to prevent BISF during blasting. The use of developed models would result in saving the commuter's lives, avoiding traffic delays and minimising property damages in similar situations.

Keywords: Railway Rock-Cut-Slope, Blast Design Parameters, Blast-Induced Slope Failure, Machine Learning Technique

Publication by Members

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Title of Paper: **Recent Advancements in Utilization of Municipal Solid Waste for the Invention of Bioproducts: The Framework for Low Income Countries**

Journal of East China University of Science and Technology, Theme: Municipal Solid Waste Management, 65, 2022, pp 422-435, ISSN:1006-3080
DOI: 10.5281/zenodo.6971080
URL: https://zenodo.org/record/6971080#.YzLlqT1BzIU

Co-authors : Biswajit Patra, Saroj Kumar Deep, SK Imran Ali, Surya Narayan Pradhan & Chittaranjan Sahoo

Abstract: In developing countries, the generated waste is simply disposed of in an open area, which causes a severe threat to humans, animals, and the environment. To date, organic waste and fourth-generation biomass have been investigated for multiple targeted products. Thus, the present review article highlights the emerging problems in organic waste generation, management, and converting them into various value-added bioproducts. This review also deals with the conversion of multiple biofuels such as liquid, solid, gaseous, and bioelectricity from organic waste resources. Besides, the latest approaches in organic waste are also detailly addressed for the production of value-added bioproducts such as bioplastic, bio-compost, and organic acids. Furthermore, the techno-economic analysis and life cycle assessment of organic waste is also explored. The transformation of organic waste to value-added bioproducts enhances the circular bioeconomy approach by reducing waste, increasing energy production, and other healthcare products. Finally, it is concluded that the utilization of organic waste to value-added bioproducts and biofuels production will be helpful in achieving high energy security, environmental protection, as well as enhancing the bioeconomy perspective.

Keywords: Solid Waste, Bioplastic Reduce, Management, Landfill, Compost

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Title of Paper: **The Fate of Microplastics in Wastewater Treatment Plants: An Overview of Source and Remediation Technologies**

Environmental Technology & Innovation, Elsevier, 28, 2022, ISSN: 2352-1864
DOI: https://doi.org/https://doi.org/10.1016/j.eti.2022.102815

Co-author : A Sudharshan Reddy

Abstract: Microplastics (MPs) in everyday consumer products have paved the way for high Mps concentrations in wastewater. Wastewater treatment plants (WWTP)s are the significant focal points for MP pollution, as millions of MP particles with varying characteristics enter WWTPs through the sewage systems of urban areas. Although the units in the WWTPs are not primarily designed to target MPs specifically, researchers have reported a large amount of microplastic removal from various units of WWTPs. The scientific community has remarkably studied various conventional and advanced treatment methods to remediate MPs and nanoplastics (NPs) from wastewater. This review aims to provide comprehensive knowledge about the source of MPs and NPs in wastewater, their composition, toxic effects, and remediation from treatment units of the WWTPs. The WWTPs comprise several physical, chemical, and biological treatment processes broadly categorized into three key stages: primary, secondary, and tertiary. The interaction of MPs and NPs with these processes have also been reviewed. Literature indicates that the WWTPs can separate more than 90% of MPs from wastewater. However, despite low concentrations of MPs in the treated effluent, large discharge volumes contribute to millions of MPs/NPs into the environment. Also, the separated MPs/NPs re-enter the environment through sludge applied on land. The paper also discusses the application of various advanced wastewater treatment technologies and their efficacies in remediating microplastics. Finally, the paper also highlights the research gaps where additional exploration is required, providing a new perspective on developing policies for controlling microplastic pollution.

Keywords: Microplastics, Nanoplastics, Wastewater Treatment Plant, Sewage Sludge, Aquatic Environment

Publication by Members

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Title of Paper: **Efficient Pairing-Free Identity-Based Signcryption Scheme for Cloud-Assisted IoT**

International Journal of Cloud Applications and Computing (IJCAC), 12(1), 2022, ISSN: 2156-1834, E-ISSN: 2156-1826, EISBN13: 9781683182535

DOI: https://doi.org/10.4018/IJCAC.305216

Co-authors : Syam Kumar Pasupuleti & R Eswari

Abstract: The Internet of Things (IoT) has become a part of our everyday life. Due to limited storage and computational capabilities, data collected by IoT devices out source to cloud servers. Although cloud servers provide many benefits, confidentiality and authenticity are the major issues. Signcryption is a cryptographic technique to address the above issues. Several identity-based signcryption schemes are proposed; however, these schemes create heavy computation and communication overhead because of bilinear pairings. This paper proposes an Efficient Pairing-Free Identity-based Signcryption (EPFIBSC) scheme based on Elliptic Curve Cryptography (ECC), which reduces computation and communication overhead. The EPFIBSC scheme's security is proven under Elliptic Curve Discrete Logarithm Problem (ECDLP). The scheme also meets the security requirements such as confidentiality, authenticity, and unforgeability. In performance analysis, the authors compare the scheme with some of the existing schemes; the comparison shows that this scheme is more efficient in computation and communication costs.

Keywords: Cloud, Designcryption, Elliptic Curve Cryptography, Internet of Things, Pairing-Free, Signcryption

Publication by Members

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Title of Paper: **Experimental and Numerical Analysis on Suitability of S-Glass-Carbon Fiber Reinforced Polymer Composites for Submarine hull**

Defence Technology, Elsevier, 4(8), 2022, ISSN: 2214-9147
DOI: https://doi.org/10.1016/j.dt.2022.06.003

Co-authors: Elango Natarajan, Lídio Inácio Freitas, Kalaimani Markandan, Ammar Abdulaziz Majeed Al-Talib & C S Hassana

Abstract: Suitability of S-Glass/carbon fiber reinforced polymer composite for submarine hull subjected to hydrostatic pressure has been investigated in the present study. Metallic materials have raised concerns owing to their decomposition due to low resistance towards salinity and hence polymer composites have been explored to showcase their mechanical stability to withstand transverse and impact loads. To this end, the mechanical properties of S-Glass/carbon fiber reinforced polymer composite were experimentally investigated and higher specific strength and stiffness of the composite in comparison to many metallic materials used for submarine hull were reported. The obtained experimental values were used for the static and dynamic crash analysis of the bow, stern and foil through Finite Element Analysis (FEA); where depth of travel was varied from sea surface level of 0–7000 m. Submarine assembly was later developed with the optimum shape and thickness of each part. We also report the nonlinear crash analysis upon impact at velocity ranging from 3 to 21 m/s. Besides, kinetic energy, acceleration peak and internal energy in struck submarine revealed that travel depth 1750 m and 3500 m is recommendable, more particularly, crash safety factor of the submarine is found to be within limit when submarine encounters crash at 1750 m.

Keywords: Crash, Impact, Design, Submarine Hull, Bow, Stern, Foil

IEI AWARDS

CALL FOR PAPERS

The **Steel Authority of India Ltd** (SAIL) has instituted two Awards, namely, **SAIL AWARD** and **DR M VISVESVARAYA AWARD** to be given away every year during the Indian Engineering Congress to author/s of the articles adjudged best on selected topics.
The topics for the year 2022 are given hereunder.

SAIL AWARD

Countering Cyclic Downtrends in Steel Industry

DR M VISVESVARAYA AWARD

Contribution of Indian Steel Sector towards Net Zero Emission by 2070

The articles preferably restricting to 3000 words along with good quality photographs may be submitted along with a Declaration Form to award@ieindia.org within October 15, 2022. The template of the paper and the Declaration Form are enclosed, which are also available under the following link:
https://www.ieindia.org/webui/IEI-Activities.aspx#Call_Papers
Intending contributors are requested to send the soft copy of the paper by email to award@ieindia.org (with subject heading Paper for SAIL/Dr M Visvesvaraya Award) and submit four nos. printed copies of their articles to :

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The Institution of Engineers (India)
8 Gokhale Road, Kolkata 700 020
e-mail: award@ieindia.org

Publication by Members

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Title of Paper: **Adsorption of Hexavalent Chromium from Aqueous Stream by Maghemite Nanoparticles Synthesized by the Microemulsion Method**

Energy Nexus, Elsevier, 5, 2022, ISSN: 2772-4271
DOI: https://doi.org/10.1016/j.nexus.2021.100035

Co-authors : Jaydeep M Barad & Mousumi Chakraborty

Abstract: The maghemite nanoparticles were synthesized by the co-precipitation reaction of ferric and ferrous salts with oleic acid and into a water-in-oil micro emulsion using Sodium dioctyl sulfosuccinate surfactant. Dynamic light scattering and X-ray diffraction were used for the characterization of formed nanoparticles. The nanoparticles thus obtained were used as adsorbent for the adsorption of hexavalent chromium from the synthetic aqueous stream in a batch experiment and subsequently the adsorption kinetic mechanism of hexavalent chromium uptake was investigated. The uptake of hexavalent chromium was also found to be pH dependent. Experimental values of hexavalent chromium adsorption were fitted with Freundlich, Langmuir, Sips, Redlich-Peterson and Koble-Corrigan isotherms models. The best possible fits were yielded through five error functions. Adsorption thermodynamics was also studied.

Keywords: Microemulsion, Hexavalent Chromium, Maghemite Nanoparticles, Adsorption Equilibrium Isotherms, Adsorption Thermodynamics

Title of Paper: **Artificial Neural Network Approach towards the Separation of Ethylparaben and Diclofenac using Pseudo-emulsion Hollow Fiber Strip Dispersion Technique**

Chemical Data Collections, Elsevier, 40, 2022, ISSN: 2405-8300
DOI: https://doi.org/10.1016/j.cdc.2022.100890

Co-authors: Pavitrakumar Sarang, Arvind Kumar Mungray & Mousumi Chakraborty

Abstract: Pseudo-emulsion hollow fiber strip dispersion technique is known to be an effective way to separate pollutants from industrial wastewater. In the present study, data driven model like artificial neural network was developed for the prediction of extraction of ethylparaben and diclofenac using pseudo-emulsion hollow fiber strip dispersion technique. The feed, carrier and stripping phase concentration were taken as input parameters, whereas percentage of the extraction was chosen as an output parameter. The models were developed by carrying out the statistical analysis of parameters namely; root mean square error and mean absolute percentage error. The regression values achieved for training data set were 0.9956 and 0.97562 for ethylparaben and diclofenac separation, respectively. The results demonstrated that the artificial neural network model gives an accurate prediction of extraction data and hence can be quite helpful in designing the wastewater treatment plants.

Keywords: Ethylparaben, Diclofenac, Pseudo-emulsion Hollow Fiber Strip Dispersion, Artificial Neural Network

Publication by Members

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Title of Paper: **Mental Stress Detection using GSR Sensor Data with Filtering Methods**

Intelligent Systems, Proceedings of ICMIB 2021, Lecture Notes in Networks and Systems book series, Springer, 431, 2022, pp 537–548, Print ISBN: 978-981-19-0900-9, Online ISBN: 978-981-19-0901-6

DOI: https://doi.org/10.1007/978-981-19-0901-6_47

Co-authors : Ramesh K Sahoo, Ashima Rout, Binayak Das & Padmini Sethi

Abstract: Study of the stress level in the human body is vital now a days. It is very important to assess the mental state of the human being with significant physiological changes. Proper and on time diagnose of the stress and anxiety may make one's lifestyle happier, healthier, and more productive. Persons, when stay and work far from their places; undergone many types of life changes and become the victim of stress, trauma, and anxiety. Hormonal changes in the human body due to stress can be reflected in terms of physiological and psychological changes. It becomes more significant to address such situations at remote places by analysing physiological data and send the same data through heterogeneous wireless communication for further analysis. In this paper, it has been identified three different activities with varied positions and sending of galvanic sensing response sensed data to the intended sink node through the heterogeneous wireless communication medium. Galvanic sensing response sensed data are different in respect to the contact surface area with the body, body position, environment, and activities. Proper investigation of sensed data can give real time solution.

Keywords: Physiological Data ,Wireless Communication, GSR Sensor, Heterogeneity, Filtering

Publication by Members

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Title of Paper: **Comparative Study of Conventional Slab with Slab Constructed using AAC Block and Steel Grid**

Materials Today: Proceedings, Elsevier, 65(2), 2022, pp 448-454, ISSN: 2214-7853
DOI: https://doi.org/10.1016/j.matpr.2022.02.634

Co-authors: Anu Mohan, B Akhila, Anjali Alexander & Jacob Mathew

Abstract: The environment can no more handle the waste produced by mankind in the near future. Concrete is a non-decomposable material that is damaging the environment on a wide scale. Every day, the number of concrete structures demolished rises, but the construction of concrete structures that should be demolished is rising as well. A composite structure is the most proper concept to obtain easy to construct floor system, by optimally utilizing available materials. This paper deals with the comparative study of a conventional RCC slab system with a slab system constructed using AAC (Autoclave Aerated Concrete) block and steel grid using ETABS software. Even though the initial cost of construction of this slab system is high, its low maintenance cost, long life, and reusability makes it advantageous over the conventional RCC slab system. This alternative slab system with AAC block and steel grid eventually helps to reduce the use of concrete and make the construction environment friendly.

Keywords: Conventional Slab, Steel Grid, Composite Structure, AAC Block, ETABS Software

Nota Bene

We would like to thank our erudite members for sharing their professional achievements through the IEI Epitome and making the content more abounding and at the same time inspiring many others to share their accomplishments as well. To streamline the process and make it convenient for the member to give their inputs we would like to obtain the information in a more structured and comprehensive manner. We would request our members to send the details of their achievements as per the appended formats only.

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(xi)	Supporting Documents/links [which are clearly indicative of the incumbent's achievement(s)]	

 # Reporting of Award of stipend/fellowship at PG/PhD level and awards from esoteric events/communities may be avoided.

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FORMAT FOR PATENT / DESIGNS / TRADE MARKS / GEOGRAPHICAL INDICATIONS BY MEMBERS

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(xii) Patent No	
(xiii) Date of filing (DD/MM/YYYY)	
(xiv) Date of Grant (DD/MM/YYYY)*	
(xv) Patentee	
(xvi) Details of Patent	
(xvii) Term for which the above (ix) has been granted	

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(viii)	Membership No (please use the prefix F/M/AM as the case may be)	
(ix)	Title of Paper	
(x)	Name of Journal/Proceeding/Technical Volume	
(xi)	Volume No (Not required for Indian Engineering Congress)	
(xii)	Issue No (Not required for Indian Engineering Congress/Annual Technical Volumes of IEI)	
(xiii)	Theme (Only for Technical Volumes of IEI)	
(xiv)	DOI: (Not required for Indian Engineering Congress/Annual Technical Volumes of IEI)	
(xv)	ISSN	
(xvi)	Date of Publication (Date-Month-Year)	
(xvii)	Co-authors (if any)	
(xviii)	Abstract in full	
(xix)	5/6 Keywords	
(xx)	Supporting Documents/links [which are clearly indicative of the incumbent's achievement(s)]	

 # publications in local seminar, conference and symposia will not be accounted

Nota Bene

FORMAT FOR PUBLICATION(S) BY MEMBERS — BOOKS/ BOOK CHAPTERS

A passport size color photograph (scanned image)

(i) Prefix (Er/Dr/Prof)	
(ii) First Name	
(iii) Middle Name (if any)	
(iv) Surname (Last Name)	
(v) Email and Mobile Number	
(vi) Designation	
(vii) Organization of affiliation	
(viii) Membership No (please use the prefix F/M/AM as the case may be)	
(ix) Title of Book	
(x) Title of Book Chapter	
(xi) Book Chapter Number	
(xii) Publisher Details	
(xiii) ISBN	
(xiv) Date of Publication (Date-Month-Year)	
(xv) Co-authors (if any)	
(xvi) About the book (100-150 words)	
(xvii) Supporting Documents (complimentary copies for IEI Headquarters)/links [which are clearly indicative of the incumbent's achievement(s)]	

** accommodate works published in journals/reputed conference proceedings/books for the last one year*

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Notification for R&D Grant-in-Aid

To promote appropriate technology, assist in building up design & research talents and, most importantly, to help in nurturing potential R&D venture amongst engineering students pursuing Diploma/UG/PG/PhD courses, The Institution of Engineers (India) had instituted the R&D Grant-in-Aid program way back in 2001.

Like every year, the Institution invites applications for the session 2022-2023 for funding industry-oriented R&D projects and research initiatives aimed at improving the life-style of common people from engineering students pursuing full time Diploma/UG/PG/PhD engineering program in AICTE/UGC/NAAC approved Institutions/Colleges/Universities. The application form and guidelines are available in our website **https://www.ieindia.org**. The projects should be carried out under the guidance of faculty members who are Corporate Members of IEI. Membership criteria for student(s), guide(s) and Institution(s) are as follows:

Project Category	Student/Applicant Membership	Guide(s) Membership	Institutional Membership
1. Diploma	Exempted [Membership of Student Chapter is desirable]	AMIE/MIE/FIE	Not Mandatory
2. UG (BE/BTech/ Equivalent)	'Student Member' (SMIE)	AMIE/MIE/FIE	Applicant's Institute should preferably be an Institutional Member with NBA/NAAC Accreditation or valid NIRF Rank
3. PG (ME/MTech/ Equivalent)	AMIE/MIE/FIE	MIE/FIE	Applicant's Institute should preferably be an Institutional Member with NBA/NAAC Accreditation or valid NIRF Rank
4. PhD	AMIE/MIE/FIE	MIE/FIE	Applicant's Institute should preferably be an Institutional Member with NBA/NAAC Accreditation or valid NIRF Rank

The soft copy of the duly filled-up applications (in editable format), as per the pro-forma available in our website **www.ieindia.org**, should be sent through email to **research@ieindia.org** and one printed copy of the same should reach the following address:

Director (Technical)
The Institution of Engineers (India)
8 Gokhale Road, Kolkata 700 020

Applications received in format other than that available on our website will not be accepted. Application should be forwarded through the Guide, Head of the Department or Head of the Institution. Please note that preference will be given to project proposals received from Institutions who are members of The Institution of Engineers (India) and with NBA / NAAC Accreditation or valid NIRF Rank. Kindly go through the guidelines (visit link **https://www.ieindia.org/webui/IEI-Activities.aspx#RnD-Initiative**) carefully before filling up the application.

The grant is not intended for the faculty members who have access to other avenues of research funding. Proposals received will be scrutinized and the recipients of R&D Grant will be informed accordingly.