

*Epitome*



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# Members

in the News

## Mr N P Singh Brar, FIE

Chairman, Computer Engineering Division Board & Chairman, Vadodara Local Centre, IEI

Delivered Lecture during GALA INDUSTRY ACADEMIA INTERACTION MEET - 2020 organised by Charotar University of Science & Technology (CHARUSAT) Anand, Gujarat on 8 February, 2020 jointly with GESIA IT Association, Ahmedabad, Board of Practical Training (BOAT), L&T Infotech, Thomson Reuters, Meditab etc.



## Dr R Venkatesan, FIE

Scientist G & Programme Director, Ocean Observation Systems, National Institute of Ocean Technology - Chennai, Ministry of Earth Sciences, Government of India



On the nomination by Director General India, Meteorology Department, Government of India, United Nations Body, the World Meteorological Organisation, Geneva, Switzerland has appointed Dr R Venkatesan, FIE FMTS FNACE Scientist & Programme Director, National Institute of Ocean Technology Chennai and Former Council member, IEI to be the Vice-Chair of the Study Group on Ocean Observations and Infrastructure Systems (SG OOIS) and a Member of the INFCOM Management Group. Also one of team's invention on rapid mode ocean data collection during Cyclone Amphan was appreciated by WMO.

## Be proud to be a Certified Professional Engineers (PE) and International Professional Engineers (IntPE)

### Professional Engineers (PE) Certification by IEI

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Engineers whose qualification is BE / BTech or equivalent, recognized by the Statutory Authority or Government of India and who are having 5 years or more experience, having membership of a recognized professional society and having maintained continuous professional development at satisfactory level, can submit application in the prescribed format to the PE Cell, The Institution of Engineers (India), 8 Gokhale Road, Kolkata-700020.

For details pls visit the following link :

[https://www.ieindia.org/webui/IEI\\_PE\\_Certification.aspx](https://www.ieindia.org/webui/IEI_PE_Certification.aspx)

### International Professional Engineers (IntPE) Certification by IEI

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Having Bachelor's Degree in Engineering or equivalent recognised by Statutory Authority or Government of India;

Minimum 7 years, professional experience;

Minimum 2 years, professional experience in significant engineering activity;

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Maintained Continued Professional Development (CPD) at a satisfactory level;

For details pls visit the following link :

[https://www.ieindia.org/webui/IEI\\_IntPE\\_Certification.aspx](https://www.ieindia.org/webui/IEI_IntPE_Certification.aspx)

For any further query and assisted please send email to : [pe@ieindia.org](mailto:pe@ieindia.org)

# Publication

## by Members

### Tasher Ali Sheikh, AMIE

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**Title of Paper:** "Capacity Maximizing in Massive MIMO with Linear Precoding for SSF and LSF Channel with Perfect CSI", *Digital Communications and Networks 2019*.

<https://doi.org/10.1016/j.dcan.2019.08.002>



Co-author: Joyatri Bora, Md Anwar Hussain

**Abstract:** The capacity of a massive MIMO cellular network depends on user and antenna selection algorithms, and also on the acquisition of perfect channel state information (CSI). Low computational cost algorithms for user and antenna selection significantly may enhance the system capacity, as it would consume a smaller bandwidth out of the total bandwidth for downlink transmission. The objective of this paper is to maximize the system sum-rate capacity with efficient user and antenna selection algorithms and linear precoding. We consider in this paper, a slowly fading Rayleigh channel with perfect acquisition of CSI to explore the system sum-rate capacity of a massive MIMO network.

For user selection, we apply three algorithms, namely Semi-orthogonal user selection (SUS), descending order-based user scheduling (DOSUS), and Random user selection (RUS) algorithm. In all the user selection algorithms, the selection of base station (BS) antenna is based on maximum signal-to-noise ratio (SNR) to the selected users. Hence users are characterized by having both small scale fading (SSF) due to slowly fading Rayleigh channel and large-scale fading (LSF) due to distances from the base station. Further, we use linear precoding techniques such as zero forcing (ZF), minimum mean square error (MMSE), and maximum ratio transmission (MRT) to reduce interferences thereby improving average system sum-rate capacity. Results using SUS, DOSUS, and RUS user selection algorithms with ZF, MMSE, and MRT precoding techniques are compared. We also analyzed and compared the computational complexity of all the three user selection algorithms. The computational complexities of the three algorithms that we achieved in this paper are  $O(1)$  for RUS and DOSUS, and  $O(M^2N)$  for SUS which are less than the other conventional user selection methods.

**Keywords:** Massive MIMO, User selection, Antenna selection, Complexity, 5G.



### Dr Sunil Kumar Gupta, MIE

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**Title of Paper:** "Effect of Nanoalumina in Epoxy Adhesive on Lap Shear Strength and Fracture Toughness of Aluminium Joints", *The Journal of Adhesion, ISSN: 0021-8464 (Print) 1545-5823 (Online) 2019*.

DoI: <https://doi.org/10.1080/00218464.2019.1641088>

Co-authors : Dharmendra Kumar Shukla, Dhake Kaustubh Ravindra

**Abstract:** Lap shear strength and opening mode fracture toughness of epoxy/alumina nanocomposite adhesives in bonded aluminium alloy joints were determined using a single lap joint, and double cantilever beam and contoured double cantilever beam joints, respectively. Epoxy/alumina nanocomposite adhesives were prepared with 0.5, 1.0, 1.5, and 2.0 wt.% of alumina nanospheres (diameter 23-47 nm) and alumina nanorods (diameter in the range of 10 nm and length less than 50 nm). A significant improvement in the lap shear strength and fracture toughness of nanocomposite adhesives was observed over that of neat epoxy adhesive. Maximum lap shear strength of joints bonded with nanocomposite adhesives was observed at 1.5 wt.% of nanospheres and at 1.0 wt.% of nanorods. Maximum fracture toughness of both types of joint was observed for adhesive having 1.5 wt.% of nanospheres and for 1.0 wt.% of nanorods. However, the fracture toughness of joints having 1.5 wt.% of nanospheres was higher in comparison to the fracture toughness of joints having 1.0 wt.% of nanorods. Lap shear strength and fracture toughness decreased on further increment in the wt.% of nanoalumina i.e. at 2.0 wt.% of nanospheres and, at 1.5 and 2.0 wt.% of nanorods.

**Keywords:** Adhesives with Nanoparticles; Epoxy/Epoxydes; Fracture Mechanics; Lap-shear; Alumina Nanoparticles.



# Publication

## by Members

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**Title of Paper:** "IoT based Real Time Weather Monitoring System", *International Journal of Engineering Applied Sciences and Technology*, 4 (11), ISSN No. 2455-2143, 2020, pp 384-392.

<https://www.ijeast.com/papers/384-392,Tesma411,IJEAST.pdf>

Co-authors: A Subhadra, R Ganesh, K Maheshbabu, K Sai Sandeep

**Abstract:** Here we propose a savvy climate revealing framework over the web. Our proposed framework considers climate parameter detailing over the web. It permits the individuals to straightforwardly check the climate details online without the need of a climate estimating agency. System utilizes temperature, stickiness just as downpour sensor to screen climate and give live announcing of the climate statistics. The framework continually screens temperature utilizing temperature sensor, moistness utilizing dampness sensor and furthermore for downpour. The framework continually transmits this information to the microcontroller, which currently forms this information and continues transmitting it to the online web server over a Wi-Fi association. This information is live refreshed to be seen on the online server framework. Additionally, framework permits client to set alarms for specific examples, the framework gives cautions to client if the climate parameters cross those qualities. In this way the IOT based climate announcing framework gives a productive web based climate revealing framework for users. This framework additionally proposed the dirt moistness observing framework to gauge dampness in soil and updates charts on think speak.



**Keywords:** Internet of Things (IoT); WIFI Module; GSM Module; Temperature Sensor; Humidity by using DHT11 Sensor; Raindrop Sensor; Soil Moisture Sensor; Carbon Monoxide (CO) Sensor, LDR.

**Title of Paper :** "Women Self Security System using AWS and IoT", *International Journal of Engineering Applied Sciences and Technology*, 4 (11), ISSN No. 2455-2143, 2020, pp 359-365.

<https://www.ijeast.com/papers/359-365,Tesma411,IJEAST.pdf>

Co-authors : M Sairam, D Nikhita, G Rajesh, P Shyam Sandesh

**Abstract:** The main aim of the proposed work is to provide security for woman. In case of emergency situations woman will press an emergency, button which will activates the GPS for location tracking and a SMS is sent to the police and family members of woman along with time. This proposal document describes a quick responding, cost protection system for an individual and especially for women using which a woman in distress can call for help just with the press of a button on this smart gadget. Self-defense system for women safety is like a Smart Watch for Women. It has the ability to help women with technologies that are embedded into a compact device. The women carrying this device in a handbag in case of any harassment or when she finds that someone is going to harass, she presses a switch/band that is allocated for her after fabrication, then the band will activate and the location information is sent as SMS alert to a few predefined emergency numbers And soon help is on its way! The system will consist of embedded hardware and software code signed for this dedicated application. The system allows for knowing exact location of the individual, by providing the instant location of the distressed victim to the police so that the incident could be prevented and the culprit apprehended. In case if the caretaker wants to know the present location of the lady, he/she can do so by sending a SMS to the SIM number of the lady which contains a secret password. Then this system responds to such request by sending back a SMS containing location information in terms of Latitude and Longitude. This proposed work is done using AWS and IOT.

**Keywords:** SMS; SIM; Global Positioning System; AWS; IoT

# Publication

## by Members

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**Title of Paper:** “Effect of Surface Alloying on Wear Behaviour of EN-47 Steel”, *Materials Today: Proceedings 21 (2), 2020 pp 1340–1349.*

<https://doi.org/10.1016/j.matpr.2020.01.172>

Co-authors: Sukhpal Singh Chathaa, Buta Singh Sidhu

**Abstract:** Reducing wear would ensure minimize material loss, change over time and labour in different branches of industries. Hardfacing plays a major role in an industry and agriculture in reducing losses due to wear. In the present work three different types of hardfacing electrodes namely H1, H2 and VB were used to enhance the wear resistance of EN-47 steel, used for tillage application in agriculture sector by manual metal arc welding (MMAW) process. The abrasive wear behaviour of bare and hardfaced steel was evaluated by using dry sand rubber wheel tester according to procedure A of ASTM G65 standard. Microstructural characterization and surface analysis of worn out and fresh samples were made by using Optical and scanning electron microscopy. It is found that hardfaced steel (H1, H2 and VB) has significantly shown better wear resistance than bare steel. The wear resistance indices (WRI) of different steel hardfacings i.e. H1, H2 and VB were found to be 1.58, 1.37 and 1.82 respectively. The microstructure of VB hardfaced steel was found laminar dendrites



**Keywords:** Hardfacing; Tillage Tools; Abrasive Wear; Material Loss; Wear Resistance

**Title of Paper :** “Abrasive Wear Behavior of Newly Developed Weld Overlaid Tillage Tools in Laboratory and in Actual Field Conditions”, *Journal of Manufacturing Processes 55, 2020, pp 143–152.*

<https://doi.org/10.1016/j.jmapro.2020.03.040>

Co-authors: Sukhpal Singh Chathaa, Buta Singh Sidhu

**Abstract:** Low alloy spring steel with medium or high carbon is normally used for manufacturing of agriculture and mining tools due to their adequate mechanical properties. In some cases as per end-user requirements these tools do not have enough wear resistant properties, so surface overlying is a good alternative to enhance the wear resistance of these tools. The main objective of this research is to manufacture and test the abrasive wear resistance of newly developed weld overlaid tillage tools with three different types of Fe-Cr-C based hardfacings namely H1, H2 and LH550. Abrasive wear tests conducted in laboratory as per ASTM G-65 standard were compared with the tests carried out under actual field conditions in sandy loam soil. Optical microscopy, microhardness, scanning electron microscopy, EDS analysis and wear tests were performed to identify the relation existing between microstructure, chemical composition and wear mechanism of different overlaid alloys. LH550 hardfacing having 6.72 wt% chromium exhibited higher value of hardness and abrasive wear resistance, which might be attributed to the rod-shaped and fishbone-like morphology of the overlaid material. The wear rate of LH550 overly has been found to be 0.833 g/km and 2.424 g/km (9.49 g/ha) in laboratory and in actual field trials respectively. The wear resistance indices (WRI) for laboratory tests were evaluated as 1, 1.4, 1.66 and 2.1 for bare, H2, H5 and LH550 weld overlaid steels respectively and the WRI for field conditions were found to be 1, 1.01, 1.41 and 1.68 for bare, H2, H5 and LH550 weld overlaid steels respectively.

**Keywords:** Tillage Tools; Spring Steel; Abrasive Wear; Hardfacings; Wear Resistance Indices (WRI)

# Publication

## by Members

**Mr Trilok Kumar Saini, MIE**

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**Title of Paper:** “Prominent Unicast Routing Protocols for Mobile Ad hoc Networks: Criterion, Classification, and Key Attributes”, *Ad Hoc Networks*, 89, 2019, pp 58–77.

<https://doi.org/10.1016/j.adhoc.2019.03.001>

Co-author: Dr Subhash C Sharma

**Abstract:** Mobile Ad hoc Networks are decentralized networks in which participating nodes are mobile, small form-factor, equipped with the wireless interface, and have forwarding capabilities. These self-organized networks extend limited wireless range by the provision of multi-hop arrangements on the fly without any central administrator. In order to facilitate communication in a dynamic multi-hop wireless environment, routing protocols are essential to discover routes between nodes that are arbitrarily located and can move dynamically. Routing protocols are intended to discover the correct and efficient route in a timely manner so that information could be delivered to the desired destination node. Routing protocols are the backbone of the Mobile Ad hoc Networks and are challenging to design. Several works have been proposed on routing, and systematic representation of these proposals is desirable. In this paper, we provide a survey of the wide range of routing proposals in the last twenty years for the mobile ad hoc network. We device many categories and classification criteria untouched in most of the surveys. This survey paper gives a key overview of the protocols, also classifies and arranges the routing protocols for logical illustration. Protocol classification in the paper assists to systematically access a large set of protocols and highlights the research trends in the domain.

**Keywords:** MANET; Ad hoc; Protocol Classification; Routing Strategies



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**Title of Paper:** “Stable Channel Design of Tapi River using HEC-RAS for Surat Region”, *Environmental Processes and Management - Tools and Practices* ISSN 0921-092X ISSN 1872-4663 (electronic), *Water Science and Technology Library*, 91, 2020, pp 25-36.

[https://doi.org/10.1007/978-3-030-38152-3\\_2](https://doi.org/10.1007/978-3-030-38152-3_2)

Co-authors: S M Yadav, Sahita Waikhom, Keyur Prajapati

**Abstract:** Stable channel design plays an important role for the research of stream restoration. Since sediment transport rates are highly variable in observed stream, methods for channel design must study a wide range of transport relationships to define stability conditions. The objective of study is to design stable channel for the reach of the Tapi River located between Sardar Bridge and Magdalla Bridge using hydrodynamic software. Stable channel design has carried out using Copeland method which is a part of Army Corp of Engineer (HEC-RAS) software. In the present analysis, existing sections are compared with the design sections for 2006 flood having magnitude of 9.09 cusecs (25,760 cumecs). For study purpose, Tapi River reach is selected having 31 cross sections. The bed material samples from the study reach were collected and analyzed to determine the actual grain size. This paper presents a detailed design step of cross section using Copeland method including approximating the upstream channel as trapezoidal. Results indicate that the model adequately predicts the bank shape and significant dimensions of stable channels.

**Keywords:** Flood Events; HEC-RAS; Stable Channel Design; Tapi River



# Publication

## by Members

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**Title of Paper:** “Effect of Power and Scan Speed on the Melt Profile and Hardness of Laser-treated HVOF Thermally Sprayed Nanostructured WC-12Co Mixed with Inconel 625 Coatings”, *Advances in Materials and Processing Technologies, 2020.*

<https://www.tandfonline.com/loi/tmpt20>.

<https://doi.org/10.1080/2374068X.2020.1754742>

Co-author: R Padmanabhan and Joseph T Stokes

**Abstract:** The life of a machine part limited by high wear rate can be prolonged by HVOF thermal spray coatings followed by laser treatment. The main hindrance of the HVOF spraying is the porosity of the coatings, which can disturb its performance in particularly erosion/corrosion environments. In the present paper, three coating materials have been arranged. Tungsten carbide cobalt (WC-12Co) of both conventional micro-sized Diamalloy 2004 and super fine nanostructured Infralloy TM S7412, mixed with Inconel 625 (Ni-Cr alloy) Diamalloy 1005, were used to produce hard coatings applied by HVOF thermally sprayed process onto carbon steel 4041 substrates. The substrates were laser treated by changing laser power and scanning speed. The present work investigates the effect of laser power and scan speed on the melt profile and micro hardness on the laser-treated HVOF thermally sprayed coatings. This study of laser treatment and melt profile gives physical insight into the process and provides useful information on the effect of laser power and scan speed. Laser treatment of thermally sprayed coatings could considerably improve the hardness of the laser-treated zone and minimise the porosity of coating.



**Keywords:** Wear; HVOF; Laser Treatment; Scan Speed; Power

**Title of Paper :** Formability Enhancement of High Strength Steel using Modification of Contact with Friction Conditions”, *Advances in Materials and Processing Technologies, 2020.*

<https://doi.org/10.1080/2374068X.2020.1758605>

Co-author: R Padmanabhan

**Abstract :** High strength steels are most widely used in automobile industries due to their superior mechanical properties and light weight. However, the formability is poor compared to conventional steels due to high hardness and carbon content. Process parameter, such as, contact with friction condition between the forming tools and the blank can be modified to enhance formability of high strength steel. In this work, the forming die is coated with Titanium aluminium nitride (TiAlN) and the effect of TiAlN thin film coating on the formability of EN10 131 high strength steel is investigated. Small circular cup geometry is chosen for deep drawing experiments and Taguchi technique is used to design the experiments with different levels of the process parameters. The novelty of this study lies in the use of surface coating on the forming tool to modify the friction conditions that exist between high strength steel blank and the die. TiAlN coating on the die has improved the formability of steel considered. The analysis of variance is carried out to study the influence of process parameters on the maximum punch force and their contribution was computed. Contact with friction condition plays a major role, in addition to the blank diameter, in improving the sheet metal formability. The quality of the deep drawn part, in terms of thickness distribution, is influenced by TiAlN-coated die surface.

**Keywords:** High Strength Steel; Formability; Coating; Deep Drawing; Friction

# Publication

## by Members

**Mr Viral K Patel, AMIE**

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**Title of Paper:** “Development of Smart Sensing Unit for Vibration Measurement by Embedding Accelerometer with the Arduino Microcontroller, *International Journal of Instrumentation Science*, 6 (1), 2017, pp. 1-7.

Doi: 10.5923/j.instrument.20170601.01

<http://article.sapub.org/10.5923.j.instrument.20170601.01.html>

Co-author: Maitri N Patel

**Abstract:** In this paper, we have described a novel smart sensing unit for vibration measurement and machinery condition monitoring. Here we have embedded accelerometer with the arduino microcontroller board. Where microprocessor-based smart sensor shall collect 3-D vibrations; and these stored data in microcontroller can be sent to third party devices (Laptop, PC etc.) for further signal analysis. Analytical approaches have demonstrated that vibration monitoring has tremendous potential in detecting localized defects in the machines. When mounted in proximity of a bearing housing (a general case), these module can collect the Stationary as well as non-stationary signature data of vibration of bearing housing reliably. Since, most vibration sensors are mounted in proximity of bearing housings (based on mechanical impedance considerations); bearing fault detection techniques can be implemented for online bearing condition monitoring. This module can be easily deployed for different rotating machines for vibration monitoring purposes. Arduino board is utilized for collecting data from sensor as data acquisition module; which consists of ATmega328P microcontroller having 16 MHz clock speed, hence enabling us to capture high frequency signals from accelerometer.



**Keywords :** Smart Sensor; Vibration Monitoring; Signature Data; Accelerometer; Arduino; LabVIEW

**Title of Paper :** “Development of Intelligent Traffic Control System by Implementing Fuzzy-Logic Controller in LabVIEW and Measuring Vehicle Density by Image Processing Tool in LabVIEW”, *American Scientific Research Journal for Engineering, Technology, and Sciences (ASRJETS)*, ISSN (Print) : 2313-4410, ISSN (Online): 2313-4402, 26 (4), 2016, pp 406-417.

[https://asrjetsjournal.org/index.php/American\\_Scientific\\_Journal/article/view/2480](https://asrjetsjournal.org/index.php/American_Scientific_Journal/article/view/2480)

Co-author : Maitri N. Patel

**Abstract :** In this paper, we have described a whole new approach of rationalization of existing traffic control systems by means of Fuzzy logic based control system and Vision sensors based vehicle counting method. As Conventional traffic control systems are inefficient because they provide fixed time-delay though no vehicle is present in that lane. So it results in congestion of vehicles on the adjacent side. And it generates the Noise and Air pollution, which is undesirable and not favorable. In an Intelligent traffic control system (ITCS), vision sensors will measure the number of vehicles on arrival as well as on queue side, and fuzzy logic rule based system will provide the rational time-delay, which is dependent on vehicle density on both arrival and queue side. So it will give zero delays if no vehicle is present in that lane. So ITCS works with intelligence given by the Fuzzy logic system.

**Keywords:** Fuzzy Logic; Vision Sensor; Rationalized Delay; Adjacent; Rule.



# Publication

## by Members

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**Title of Paper:** "Global Warming and Climate Change", 107th Indian Science Congress, 3-7 Jan, 2020, Agricultural University, GKVK, Bengaluru, Karnataka.

**Abstract:** Climate change is the outcome of global warming. A continuous warming of environment on daily basis over last mere 500 years has resulted in this disaster out of excess human activities upon nature with technological advancement s. By now the conditions are too severe and scientists are keeping themselves busy and hurried to find out any clue for the same to check this undesirable calamity. Though our scientists have established some facts responsible for global warming, it is not complete. For this reason the monster of global warming is approaching at too fast rate on the earth as it was not predicted by the scientists. Even today they are unaware of the technological reason that is contributing more to global warming other than their familiar facts.



The fact that global warming is happening due to emission of green house gases is true and it is contributing only less than 50% of the net effects and this is an indirect method of global warming. The major factor that is responsible more than 50% of the net effect is a direct method and that is waste heat coming out of different industrial processes at factories and at homes. This waste heat being rejected from the process find no way but enters the atmosphere and warms the ambient air directly by raising its temperature.

A bright example of direct heating of ambient air is waste heat from thermal power and nuclear power plants. In these power plants only 40% of the heat generated in steam generator and nuclear reactors is converted into electrical energy, and rest 60% of energy is simply rejected into environment. This rejected heat is chiefly responsible for a substantial part of global warming. Also installations of domestic and industrial refrigerators and air conditioners whose numbers have multiplied many folds these days act as heat pumps to raise ambient air temperature. Since scientist have not considered these effects for global warming, at present the warming rate is far more than it was predicted by them.

Since global warming is man made with unlimited industrial activities and power generation from fossil fuel sources, this can be reversed and for this the modern man has to cooperate and sacrifice a lot of their luxuries.

**Keywords:** Global Warming; Climate Change; Fossil Fuels; Heat Pump; Reversing Global Warming



### Mr Medikonda Asha Kiran, AMIE

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**Title of Paper:** "A Lightweight Two-factor Mutual Authentication Scheme for Cloud-based IoT", 4th International Conference and Workshops on Recent Advances and Innovations in Engineering (ICRAIE), Malaysia 2019, pp. 1-6.

DoI: 10.1109/ICRAIE47735.2019.9037779

Co-authors : S. Kumar Pasupuleti and R Eswari

**Abstract:** Internet of Things (IoT) is a platform to provide the connection between IoT devices and servers for performing exchange of information. IoT devices play a major role in our everyday life, like homes, offices, agriculture, healthcare, transportation, wearables, industries, etc. Due to limited processing power and memory, IoT devices connect to large resource pools like cloud servers. However, authentication is a major security concern while connecting IoT and Cloud. To address these issues, we propose a lightweight two-factor mutual authentication scheme for Cloud-based IoT. The proposed scheme achieves security requirements such as mutual authentication, the security of a secret key, session key agreement, resists forgery attack, resists an insider attack, resists replay attack and resists impersonation attack. The security analysis proves that our scheme is secure against various known attacks. Performance analysis demonstrates that our scheme is lightweight and suitable for the resource-constraint IoT devices.



**Keywords:** Cloud; Internet of Things; Mutual Authentication; Attacks; Elliptic Curve Cryptography; Biometrics

# Publication

## by Members

### Mr Giridhar Maji, MIE

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**Title of Paper:** “Influential Spreaders Identification in Complex Networks with Improved k-shell Hybrid Method”, *Expert Systems with Applications*, 144, 2020 113092.

doi: <https://doi.org/10.1016/j.eswa.2019.113092>

Co-authors: Ms Amrita Namtirtha, Dr Animesh Dutta, Dr Mariana Curado Malta

**Abstract:** Identifying influential spreaders in a complex network has practical and theoretical significance. In applications such as disease spreading, virus infection in computer networks, viral marketing, immunization, rumor containment, among others, the main strategy is to identify the influential nodes in the network. Hence many different centrality measures evolved to identify central nodes in a complex network. The degree centrality is the most simple and easy to compute whereas closeness and betweenness centrality are complex and more time-consuming. The k-shell centrality has the problem of placing too many nodes in a single shell. Over the time many improvements over k-shell have been proposed with pros and cons. The k-shell hybrid (ksh) method has been recently proposed with promising results but with a free parameter that is set empirically which may cause some constraints to the performance of the method. This paper presents an improvement of the ksh method by providing a mathematical model for the free parameter based on standard network parameters. Experiments on real and artificially generated networks show that the proposed method outperforms the ksh method and most of the state-of-the-art node indexing methods. It has a better performance in terms of ranking performance as measured by the Kendall's rank correlation, and in terms of ranking efficiency as measured by the monotonicity value. Due to the absence of any empirically set free parameter, no time-consuming preprocessing is required for optimal parameter value selection prior to actual ranking of nodes in a large network.



**Keywords:** Influential Spreader Identification; Centrality Measures; K-shell Hybrid; Improved k-shell Hybrid; Kendall Rank Correlation



### Dr Mohammed Haneefa Kolakkadan, MIE

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**Title of Paper:** “A Study on Fresh Properties of Limestone Calcined Clay Blended Cementitious Systems”, *Construction and Building Materials*, 254, 2020, 119326.

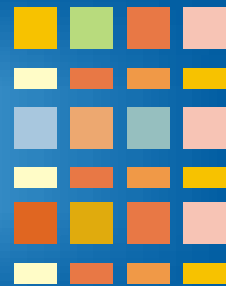
DoI: <https://doi.org/10.1016/j.conbuildmat.2020.119326>

Co-authors : Nithya Nair, Manu Santhanam, Ravindra Gettu

**Abstract:** This paper reports the assessment of rheological characteristics of cementitious pastes prepared with Limestone - Calcined Clay Cement, in comparison with ordinary Portland cement and Portland - Fly Ash cement. The impact on workability retention in concrete is also assessed. Further, a comparison of the performance of different commercially available superplasticizers is done using mortar flow retention tests (done on concrete – equivalent mortars) and slump retention tests on concrete. The results bring out the impact of calcined clays on increased superplasticizer demand, and also show the difficulties in retaining the workability for extended durations.



**Keywords:** Limestone calcined clay cement, Workability retention, Rheology, Concrete equivalent mortar; Retarder



# Publication

## by Members

### Dr Manoj Wagh, AMIE

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**Title of Paper:** "Healing of Generated Cracks in Cement Mortar Using MICP", *Civil Engineering Journal*. 6(4), 2020, pp 679-692.

<http://dx.doi.org/10.28991/cej-2020-03091500>.

Co-authors: Prakash B Kulkarni, Pravin Nemade

**Abstract:** This research is carried out to investigate pre-existing repair cracks in cement mortar using the microbiologically induced calcium carbonate precipitation (MICP) technology. In the study, 20-cylinder mortar samples (45 mm in diameter and 40 mm in length) were split to have cracked width of various sizes. Out of twenty cracked samples, sixteen samples of average crack width ranging from 0.12 to 1.3 mm were repaired using the MICP method, while four cracked samples, with an average crack width ranging from 0.16 to 1.55 mm were soaked under distilled water. The water permeability and split tensile strength (STS) of these repaired mortars were tested. The amount of CaCO<sub>3</sub> precipitated on the cracked mortar surfaces was evaluated. The results indicated that the MICP repair technique clearly reduced the water permeability of the cracked samples within the range of 73 to 84 %; while water-treated samples were too weak to undergo test. MICP-repaired samples had STS ranging from 29 to 380 kPa after 24 rounds of treatment. A relationship between the STS and percentage amount of CaCO<sub>3</sub> precipitated was observed for samples with an average crack width between 0.29 and 1.1 mm, which indicated that STS increased with percentage increase in CaCO<sub>3</sub> precipitated on the crack surfaces.



**Keywords:** MICP; Split Tensile Strength; Cement Mortar; Permeability



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**Title of Paper:** "Parametric Performance Optimization of Three Sides Roughened Solar Air Heater", *Energy Sources, Part A: Recovery, Utilization and Environmental Effects*, ISSN: 1556-7036 (Print) 1556-7230 (Online), 2020.

<https://doi.org/10.1080/15567036.2020.1752855>

Co-authors : Chinmaya Prasad Mohanty, Arun Kumar Behura, Manas Ranjan Singh, Biswa Nath Prasad, Ashwini Kumar, Puneet Verma

**Abstract:** Solar clean energy can be harnessed by several methods using technologies like solar heating, photovoltaic cell, solar architecture, photosynthesis. Solar energy is converted either by active technologies or by passive technologies by the method they capture and distribute solar energy. In view of this, the paper represents the optimization result on Nusselt number and thermal efficiency for 3 sides roughened solar air heater using the hybrid approach of response surface method (RSM) and multi objective particle swarm optimization (MOPSO) algorithm. The values of input parameters are taken according to the experimental values. The value of the output parameters, Nusselt Number and thermal efficiency are found to be in the range of 65–80 and 63–75%, respectively, for the optimum value of the input parameters are Reynolds number, 12000–13000, the relative roughness pitch, 10, the relative roughness height 0.03–0.04 and the rate of mass flow is 0.04 kg/s using MOPSO approach, and the optimum solution is identified by application of maximum deviation theory (MDT) approach. A confirmative test has been conducted to validate the optimum results obtained with an error of 3.39 percentages.



**Keywords:** Reynolds Number; Nusselt Number; Relative Roughness Pitch; Relative Roughness Height; Mass Flow Rate; Collector Performance

# Publication

## by Members

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**Title of Paper:** “Load Balancing by Diversified Quality Factors based Handoff (DQFH) in Wireless Cellular Networks”, *International Journal of Communication Systems (IJCS)*, Wiley Online Library 2020.

<https://doi.org/10.1002/dac.4393>

Co-authors : Dhulipalla Venkata Rao, Madhu Ramarakula

**Abstract:** The long-term evolution (LTE) and long-term evolution advance (LTE-A) communication networks are the buzz of cellular networks. Due to the phenomenal count of users who hangs on cellular networks in regard to the concept of information and communications technology (ICT), the over-sized demand of any network related to ICT experiences the crux of transmission load, which is critical constraint of the cellular networks. Though the contemporary research evincing the benchmark strategies to deal the crux of load on cellular networks, most of these are adapting handoff schemes to optimize the communication through effective load balancing under one or two standard quality metrics. Hence, the contemporary models have critical droppage in performance under the context of multiple quality objectives. In regard to deprive the constraints of the contemporary models, a handoff mechanism to optimize the load balancing in cellular networks under diversified contextual quality objectives has been defined in this manuscript. The method that is portrayed is a search technique that intends to select an optimal target node. The experimental study that was carried has evinced the significance the proposal that scaled against the contemporary methods having similar objective.



**Keywords:** Base Station (BS, Game-theoretic) Model; LTE; LTE-A; Mobile Switching Center (MSC); Observer-cell (OBC); Partaker-cell (PTC); Public Switched Telephone Network (PSTN); Voice Activity Detector (VAD).

**Title of Paper :** “Optimal Load Balancing by Adaptive Data Transmission through Time Vary Scheduling in Wireless Cellular Networks”, *Test Engineering and Management (TEM)*, ISSN: 0193-4120, 82, 2020, pp 16882 – 16891.

Co-authors : R Madhu, D Venkata Rao

**Abstract:** The format of communication between cognitive devices with or without human intervention in cellular networks is sensitive in performance, which is due to the need for enhancing allocation of resource, traffic management & data traffic. Hence, achieving stable quality of service is most challenging, and that often reflects deprived throughput & terminal fairness. In this regard, correlating the requirements and resources has considered as the crucial factor in contemporary research to achieve optimality and stability in quality of service. This manuscript portrayed a novel scheduling strategy to achieve optimal load balancing to achieve the minimal drops in communication, maximum throughput and fairness towards the exchange of data through cellular networks. The proposed method enables Adaptive Data Transmission through Time-Vary Scheduling (ADTTVS) to privilege the optimal load balancing. The experimental study has carried on the proposed and the contemporary models, which portrays the significance of the proposed model compared to the other contemporary methods.

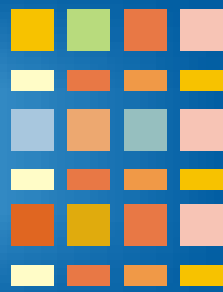
**Keywords:** LTE (Long-term-evolution); ICT (Information & Communication Technology); RAN (Radio-access-network); S-GW (Serving Gateways); MMEs (Management Mobility Entities); UE (User Equipment).

**Title of Paper :** “Poised Scheduling of Flash Crowd Cellular Traffic in LTE and LTE-A for Optimal Load Balancing”, *International Journal of Advanced Science and Technology (IJAST)*, ISSN: 2005-4238, 29 (3s), 2020, pp. 646-660.

Co-authors : R Madhu, D Venkata Rao

**Abstract:** Rapid increase in the demands of services for wireless communication pose novel challenges in forthcoming cellular networks generation design. Here, in LTE (Long term evolution) and LTE-A (LTE-Advanced) networks, effective load balancing of flash crowd cellular traffic at both up and downlinks is a crucial challenge to achieve the effective quality of service with minimal communication (text, audio, and video) drop and maximal throughput. Hence, contemporary researchers have eyed to lighten the importance of load balancing to achieve the quality of service over LTE and LTE-A networks. Poised Scheduling of flash crowd cellular traffic has portrayed in this manuscript, which aimed to achieve the quality of service by optimizing the balancing of the load appeared on target networks of LTE and LTE-A. The simulation-based experimental study anticipated the significance of the proposed model that scaled by comparing with other contemporary scheduling models of the LTE, and LTE-A network traffic.

**Keywords:** QoS; LTE (Long-term evolution); LA (link Adaption); Minimum Intracacy Algorithm; HOL (Head-of-Line) Delay Packets; QEEA.



# Publication

## by Members

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**Title of Paper:** "Impact of Motivational Factors on Project Team Performance", *2nd International Conference on Advances in Mechanical Engineering Sciences (ICAMES-2K20)*, P E S College of Engineering, Mandya, Karnataka, 2020, *Test Engineering and Management*, 83, 2020, ISSN 0193-4120, pp. 5168-5176,

<http://www.testmagzine.biz/index.php/testmagzine/article/view/4447/3788>

Co-author : Dr AN Santosh Kumar

**Abstract:** Motivation is one of the fascinating subjects under organizational behaviour science and thus, the study of motivational factors is one of the vital topics chosen by researchers across the globe today. Also, among many human aspects of project management, motivational factors occupies the prominent place in the list and by adopting right motivational strategy companies can benefit with improved project team performance followed by high degree of customer satisfaction. The subject matter of this research paper "impact of motivational factors on project team performance" is an attempt to understand on specific motivational factors considered by the companies while framing their own performance improvement programmes. A study conducted on this subject matter reveals the fact that, specific motivational factors tabulated by the researcher have an impact on project team performance. This paper exhibits and analyses the results of research survey conducted at select large sector companies in India. Based on this research study results, companies will get an opportunity to review their existing plan and to come out with their own motivational strategies to improve the overall performance of project team.

**Key words:** Motivation; Motivational-factors; Project-management, Project-team-performance



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Co-authors : S S Prasanna Maddila, Hmaied Shaiek, Daniel Roviras



**Title of Paper:** "HPA Linearization for FBMC-OQAM Signals with Fast Convergence-Digital Predistortion", *IEEE 16th International Symposium on Wireless Communication Systems (ISWCS 2019)*, Oulu, Finland.

**Abstract:** The Filter Bank Multi-Carrier with Offset Quadrature Amplitude Modulation has already gained popularity as one of the alternatives to OFDM for next generation beyond 5G broadband wireless access systems. Like any other multicarrier modulation technique, FBMC is prone to non-linear (NL) effects of high power amplifier (HPA). Then, it is essential to mitigate NL effects to achieve energy efficient radio communications. This paper focuses on HPA linearization, and proposes a novel adding signal based digital predistortion with a quasi-optimal convergence rate. The simulation results show that proposed technique can quickly linearize the HPA.

**Keywords :** Beyond 5G; FBMC-OQAM; Nonlinear Systems; HPA Linearization; Digital Predistortion; Recursive Error Correction.

# Publication

## by Members

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**Title of Paper:** “Experimental Investigation of Ice-chamber for Melting of Ice based on Scheffler Solar Concentrator for High Altitude Regions”, *Heat Transfer–Asian Research, Wiley, 49(5), 2020, pp 2423 - 3205.*

DoI: 10.1002/htj.21731 (SCOPUS)

Co-author : Avadhesh Yadav

**Abstract:** This experimental analysis was performed with the aim to melt the ice into hot water at very high altitude regions such as Leh Ladakh. Three different designs of ice-chamber were used to melt the ice with direct heating in minimum time. The radiations were focused on the receiver with the help of 1m<sup>2</sup> Scheffler solar concentrator exposed to the atmospheric situations of NIT Kurukshetra. The Scheffler solar concentrator was fabricated with fiber-reinforced plastic material. The fabrication process is discussed in detail. The results obtained from the design showed that the ice frozen at  $-5^{\circ}\text{C}$  completely melted, converting into water. The maximum temperature of water attained in the ice-chamber with receiver 1 (circular plate with fins), 2 (CPC with fins), and 3 (copper crucible) was  $57.7^{\circ}\text{C}$ ,  $64.3^{\circ}\text{C}$ , and  $67.4^{\circ}\text{C}$ , respectively.



**Keywords:** Direct heating; Fabrication process of concentrator; Melting of ice; Receiver cum ice chamber; Scheffler solar

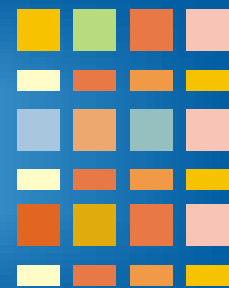
**Title of Paper :** “A Scheffler Solar Concentrator Heat Transfer Model used in Forced-circulation Ice Melting System at High Altitude Regions”, *Environment, Development and Sustainability, 2020.*

<https://doi.org/10.1007/s10668-020-00642-z>

Co-author: Avadhesh Yadav

**Abstract:** The thermal performance of three differently designed receivers has been investigated with the aim to generate hot water by melting of ice in the ice chamber at high-altitude regions as Leh Ladakh, India [ $34.15^{\circ}$  (latitude) North,  $77.57^{\circ}$  (longitude) East]. In this experimental set-up, the solar radiations are concentrated on receiver (rectangular, spiral and conical) by 1 m<sup>2</sup> Scheffler solar concentrator. The receiver is coated with graphite to escalate the absorptivity of solar radiations. The available solar heat at the receiver is transferred to the ice chamber by forced circulation of the heat transfer fluid (Globaltherm Omnitech). The horizontal cylindrical type ice chamber is used for melting the ice into water that can be used for indoor water heating. The experiment is performed in atmospheric conditions of NIT Kurukshetra, India. By the experimental results, it is found that the frozen ice at  $-4^{\circ}\text{C}$  is completely melted into water and the maximum temperature of the water attained in the ice chamber by using rectangular, spiral and conical receivers is  $47.8^{\circ}\text{C}$ ,  $50^{\circ}\text{C}$  and  $53.6^{\circ}\text{C}$ , respectively.

**Keywords:** Scheffler solar concentrator; Horizontal cylindrical type ice chamber; Melting of ice; Forced circulation;



# Publication

## by Members

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**Title of Paper:** “Development of Composite Mechanical Peeler cum Juice Extractor for Kinnow and Sweet Orange”, *Journal of Food Science and Technology*, 2020.

<https://link.springer.com/article/10.1007/s13197-020-04472-9>

Co-authors: Kirti Jalgaonkar, Bhushan Bibwe

**Abstract:** A mechanical peeler cum juice extractor was designed and developed for simultaneous peeling and juice extraction of kinnow and sweet orange fruits. Based on the designed components and prior optimization of operational parameters for peeling of both the fruits, a functional machine was developed. Major components of the machine include spur gear assembly (U 102 mm and U 76 mm), two fruit holders (U 30 mm), revolving shaft with length 570 mm, clearance of the tool for peeling 25 mm and cutting knife with length 80 mm, respectively. This peeler was operated using a motor, gear assembly and the combination of pulleys. The juice extractor was also fitted with a conical hopper having a flattened base to facilitate the juice extraction of peeled fruits. For performance evaluation, fruit rotation speed was considered as independent parameter and was varied at 220, 260, 280, 300, 360 rpm, whereas peeling time (s), peeling efficiency (%), peel remained on fruit (%) and juice loss (%) were taken as dependent parameters. The machine resulted in best performance at fruit rotational speed of 220 rpm (kinnow) and 260 rpm (sweet orange) with higher peeling efficiency and minimum juice loss. The capacity for peeling and juicing operation was 60–90 kg/h (kinnow) and 50–60 kg/h (sweet orange), respectively. This composite peeling cum juice extractor machine can find its applicability in cottage citrus fruit juice processing industries as well as for the domestic juice sellers.



**Keywords:** Composite Mechanical Peeler; Performance Evaluation; Rotational Speed; Peeling Efficiency



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**Title of Paper:** “Control of Generator and Load Side Converters for Stand-Alone Variable Speed Wind Turbine”, *6th International Conference on Advanced Computing and Communication Systems (ICACCS)*, Coimbatore 6-7 March, 2020.

<https://ieeexplore.ieee.org/document/9074210>

Co-authors: Subrahmanya Aditya Vakada

**Abstract:** Primary aim of the paper is to generate the quality of power from the renewable energy resource, the wind system is considered here. In general the system is operated in two mode conditions i. standalone mode ii. Grid connected mode. This paper explains the control of a standalone system using two different control schemes namely a. generator side control scheme b. load side control scheme. Which are helps to regulate output voltage levels and power delivered to load with any disturbances even in the variations caused in the input side. The MATLAB platform is used for the testing control strategy.



**Keywords:** Asynchronous generator; Generator side controller; Load side control; Renewable energy; Synchronous generator; Wind system

# Publication

## by Members

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**Title of Paper:** "A New One Time Password Mechanism for Client-server Applications", *Journal of Discrete Mathematical Sciences and Cryptography. Special Issue : Networks and Cryptography, 22 (8), 2020, pp 1393 - 1406.*

DoI: <https://doi.org/10.1080/09720529.2019.1692447>

Co-authors: Atul Chaturvedi and Neelam Srivastava

**Abstract:** OTP (One Time Passwords) are very important in today's scenario in various applications like in financial transactions, e-commerce etc. They are used for enhancing the security of data communication. Many security applications are based on the strength of OTP. Any prediction in OTP generation can create serious threats to information security. Many new methods have been presented by researchers for OTP generation in the past decade. In this paper, we present a new authenticated OTP generation procedure between client and server. We also provide illustration with complete security analysis in order to prove its utility in various applications. Our procedure is implementable very easily and has embedded authentication and randomness.



**Keywords:** Authentication; HMAC based one time password (HOTP); One Time Password (OTP); Secure hash algorithm (SHA); Time based one time password (TOTP).

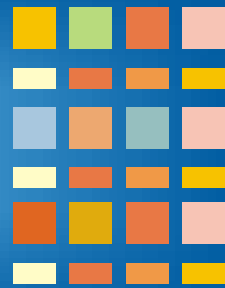
**Title of Paper:** "A Unique Key Sharing Protocol Among Three users using Non-commutative Group for Electronic Health Record System", *Journal of Discrete Mathematical Sciences and Cryptography. Special Issue : Networks and Cryptography, 22 (8), 2019, pp 1435 - 1451.*

DoI: <https://doi.org/10.1080/09720529.2019.1692450>

Co-authors: M K Misra, Dr Atul Chaturvedi, Dr S P Tripathi

**Abstract:** We know that the importance, need and utility of EHR (Electronic Health Record) system is increasing rapidly in the modern world. The developed countries like USA, Canada has adopted this system years ago but still they are facing security issues in that system. The situation is very poor for developing countries like India where data breaching news are very common in EHR system. One can imagine the situation that Indian government is accepting data breaching cases with associated authentication problems and helpless to develop secure EHR system. EHR information is very sensitive and communication over insecure wireless communication channels increases the vulnerability. Here we are going to propose an authenticated key agreement protocol among three users (doctor, hospital and patient) using conjugacy search problem (CSP) and braid decomposition problem (BDP). We discuss the required security analysis of the protocol and prove that the proposed protocol passes the security parameters assuming that the BDP and CSP are hard in braid groups.

**Keywords:** Authentication; Braid decomposition problem (BDP); Conjugacy search problem (CSP); Electronic health record (EHR); Key agreement.





# Publication

## by Members

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**Title of Paper:** “Sustainable Strategies for Cost Effectiveness in Spinning Mills”, *International Journal of Multidisciplinary Educational Research*, 9, 4(8), 2020. E-ISSN: 2277-7881, pp. 113-121.

[http://ijmer.in/issues/volume9/volume9-issue4\(8\).aspx](http://ijmer.in/issues/volume9/volume9-issue4(8).aspx)



**Abstract:** Spinning is the vital operation process in textile sector. It is the primary industry supporting yarn to the export Market. Usually it requires massive investment and labour employment. The public awareness and the growing perception about the environment have forced the textile industry to produce environmentally friendly products. For this reason, nowadays many companies and organizations focus on the environmentally friendly way of production. In order to create a sustainable textile, the main change factors have been linked to eco-materials so less and harmless waste, reusing/recycling, lesser usage of energy, water and chemicals and ethical issues in production processes. This article emphasizes the environmental effects of textiles in detail and contributes to cleaner production and sustainability in the textile spinning industry.

**Keywords:** Cleaner Production; Environmentally Friendly; Sustainability; Spinning Mills.



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**Title of Paper:** “A Modular Three-Dimensional Scenario-Based Numerical Modelling of Groundwater Flow”, *Water Resources Management*, 34, 2020, pp 1913 - 1932.

<https://link.springer.com/article/10.1007/s11269-020-02538-z>

**Co-authors:** Shishir Gaur, S B Dwivedi, P K S Dikshit



**Abstract:** In this study, development of groundwater model for Varanasi city and near around area was prompted to understand the groundwater dynamics and future groundwater resource scenarios in the region. The model was developed for the area of 2785 km<sup>2</sup>, where aquifer thickness varied up-to 150 m. The model grid consisted of 210 rows and 210 columns with each cell size of 250 m × 250 m. To realize the different type of underground formations, model was built for five layers with recharge entering the aquifer from surface infiltration through the overlying confining unit and from seepage through riverbeds. The maximum part of the model domain is surrounded by the Ganga River, which was taken as a hydrologic boundary for the model. Model simulations were made to quantify groundwater flow within the alluvial aquifer as well as flow into and out of the system. The groundwater model was developed for the transient state condition for the year of 2006 to 2017. Several criteria were used during model development and calibration to determine how fine the model simulated conditions in the aquifer. Model calibration was done on the values of hydraulic conductivity and recharge rates. A root-mean-square error analysis was performed during calibration to serve as a criterion to minimize differences between observed and model computed water levels. Further, calibrated model was used to analyze different scenarios to understand the future scenario of water resources.

**Keywords:** Groundwater Modelling; MODFLOW; Ganga River; Water Demand

# Publication

## by Members

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**Title of Paper:** "Comparative Studies of Adsorption of Chromium(VI) Ions onto Different Industrial Wastes", *American Society of Civil Engineers Library, Journal of Hazardous, Toxic and Radioactive Waste*, 24 (3), 2020

DoI: 10.1061/(ASCE)HZ.2153-5515.0000517

**Co-author:** R R Dash, C R Mohanty, A M Patel

**Abstract:** Chromium is found in different drinking water sources in many countries. Higher levels of chromium in drinking water are carcinogenic to consumers. Chromium removal can be achieved by employing various technologies, but not all are cost-effective to meet drinking water standards. In this work, Cr(VI) removal using three different industrial solid wastes, namely, fly ash, red mud, and dolochar, were explored and compared. Scanned electron microscopy was used to obtain the images of adsorbents both before and after adsorption. Adsorption experiments were executed using batch and column modes. The effect of pH (2–10), adsorbent dosage (5–35 g/L), contact time (5–180 min), agitation speed (90–210 rpm), and adsorbate concentration (5–150 mg/L) on the adsorption for all three adsorbents was studied in the batch experiments. At a pH value of 2 and an adsorbate dose of 25 g/L, chromium removal was found to be maximum for all three adsorbents. After a contact period of 120 min, it was found that the adsorption of chromium reached equilibrium for all three adsorbents. Dolochar was found to be the most effective one among the three adsorbents. Of the various adsorption isotherm models, the Langmuir isotherm appeared to be the best fit ( $R^2 > 0.99$ ). From the fixed-bed column study at a bed depth of 10 cm, the breakthrough times were computed as 147, 193, and 219 min for fly ash, red mud, and dolochar, respectively. Similarly, the exhaust times were observed as 651, 780, and 631 min for fly ash, red mud, and dolochar, respectively. These results indicate that these industrial wastes can be utilized as low-cost alternatives to commercial adsorbents for the removal of Cr(VI).

**Keywords:** Adsorption; Cr(VI); Dolochar; Fly ash; Red mud



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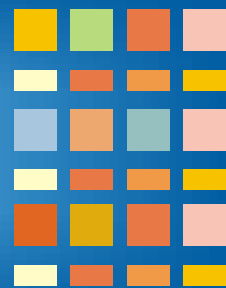
**Title of Paper:** "A Novel CFFOPI-FOPID Controller for AGC Performance Enhancement of Single and Multi-area Electric Power Systems", *ISA Transactions*, 100, 2020, pp 126–135.

DoI: 10.1016/j.isatra.2019.11.025

Co-authors: Kirti Jalgaonkar, Bhushan Bibwe

**Abstract:** The modern power system (PS) is an intricate manmade control system. Automatic generation control (AGC) executes an imperative contribution in PS operation to preserve its frequency and tie-line power flow within a tolerable range following continuously varying load demands. Hence, a wholesome and expert controller for AGC is obligatory to deliver superior power to the end users. The objective of this article is to design a cascaded fuzzy fractional order (FO) PI-FOPID (CFFOPI-FOPID) controller as a novel control strategy for AGC problem solution in electric PS. The controller parameters are determined employing a recent stochastic imperialist competitive algorithm. The controller assures the convergence of deviation in area frequency and tie-line power under load disturbances to zero in minimum definite time. Single and interconnected multi-area thermal PS models are utilized as test systems to authorize the efficacy of the method. Results analysis reveals the advantage of CFFOPI-FOPID controller over various prevalent controllers. The models are also explored with appropriate generation rate constraint. Robustness test validates controller's robustness at large changes in system parameters, random change in power demand and additional imperative nonlinearities.

**Keywords:** Multi-area Electric Power System; Optimal Fuzzy Controller; AGC; GRC; FO Controller; Cascade Controller



# Publication

## by Members

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**Title of Paper:** “Convergence Analysis of Accelerated Proximal Extra-gradient Method with Applications”, *Neurocomputing* 388, 2020, pp 288-300.

<https://doi.org/10.1016/j.neucom.2020.01.049>

**Co-author:** K K Shukla

**Abstract:** Proximal algorithms are popular class of methods for handling sparsity structure in the datasets due to their low iteration costs and faster convergence. In this paper, we consider the framework of the sum of two convex functions, one of which is a smooth function with a Lipschitz gradient, while the other may be a non-smooth function. The usages of such non-smooth functions for identifying complex sparsity-structures in datasets in form of non-smooth regularizers has been an active research direction in the recent past. In this paper, we present the convergence analysis for the extragradient-based fixed-point method with an inertial component, based on which recently a new accelerated proximal extragradient algorithm is designed. In addition, extending the application areas of this algorithm, we applied it to solve (i) the logistic regression problem with complex  $\ell_1$ -based penalties, namely, overlapping group lasso and fused lasso frameworks, and (ii) a recently proposed structurally-regularized learning problem for representation selection where the objective function consists of a reconstruction error and structured regularizers as combination of group sparsity regularizer, diversity regularizer, and locality-sensitivity regularizer. With the help of extensive experiments on several publicly available real-world datasets, the efficacy of the inertial-based extragradient methods has been demonstrated for solving the extended lasso and representation selection problems of machine learning.

**Keywords :** First-order proximal methods; Sparsity-inducing regularizers; Extragradient-based fixed-point iterations



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**Title of Paper:** “Securing Color Image using Combined Elliptic Curve Crypto-system and Hill Cipher Encryption Along with Least Significant Bit -steganography”, *International Conference on Inventive Computation Technologies (ICICT-2019), Lecture Notes on Networks and Systems, 98, Springer Cham, pp 351 - 361.*

<https://www.springer.com/gp/book/9783030338459>

DoI [https://doi.org/10.1007/978-3-030-33846-6\\_40](https://doi.org/10.1007/978-3-030-33846-6_40)

**Co-authors:** S Sharan; Panchami S Nair; Devi S Sankar

**Abstract:** Security of information is becoming main criteria while transferring information through communication networks. Nowadays images are used as information source; therefore its security from unauthorized or unintended access is important. Image encryption play an important role in protecting images from hacking and stealing while sending over an unsecured channel. The proposed method is a combination of encryption using Hill cipher algorithm along with Elliptic curve for enhanced security. Elliptic curve cryptographic method is used to make the system to asymmetric from the less secured symmetric key encryption technique; hill cipher algorithm. In our proposed method we use both grayscale images as well as color images regardless its size. Steganography of actual image with a cover image before encryption is an advantage. The cover image is selected as it mocks like an informative to unauthorized access. Least Significant Bit (LSB) steganography method is used here as it provides more security than any other methods.

**Keywords :** Image encryption; Visual cryptography; Hill cipher steganography; Elliptic curve cryptography



# Publication

## by Members

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**Title of Paper:** “Additives for Scum Reduction in Biogas Plant: A Simplified Testing Methodology”, *International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, 8 (11), 2019, pp 1798 - 1801.*

<https://www.ijitee.org/wp-content/uploads/papers/v8i11/K17750981119.pdf>

Co authors : Rahul Barjibhe, PT Nitnaware, Parag B Jawanjal, Darshan Suryawanshi

**Abstract:** Scum formation is a major operational problem in anaerobic biodigester. A simple, convenient and inexpensive testing methodology for scum reduction has been developed during span of project. In these research work the effect of canola oil, coconut oil and ENO studied on scum and foam reduction. Canola oil is found out to be the promising and most suited for reducing level of scum compared to the ENO and Coconut oil.



**Keywords :** Scum; Anaerobic; Canola Oil; Methane; Methodology

**Title of Paper:** “Effect of Canola Oil to Reduce the Scum Formation”, *International Journal of Engineering and Advanced Technology (IJEAT) ISSN: 2249–8958, 9 (1), 2019, pp 7136 - 7139.*

<https://www.ijeat.org/wp-content/uploads/papers/v9i1/A1813109119.pdf>

Co author : Rahul B Barjibhe

**Abstract:** The scum is a colligation of slow degrading substrate formed on topmost portion of digester with its gas, metastable liquid and foam contents it impacts seriously on biogas plant economically, environmentally and biologically. Scum formations hamper the yield of biogas generation, methane contents, slows the degradation process and stops the burnable biogas formation the operational plant performance drops rapidly. The experimentations were conducted with canola oil, natural Coconut oil and ENO to evaluate the defoaming potentials on lab scale model. The research concluded that the canola oil is best chemical additive which reported better defoaming potential of 32% at peak, higher yield of biogas, improves methane contents and stabilizes the Ph for better biomethanation.

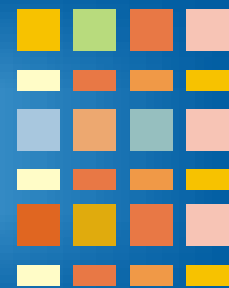
**Keywords:** Canola Oil, Additives; Defoaming; Methane content

**Title of Paper:** “Investigation and Improvement of Content of Methane in Biogas Generated from Municipal Solid Waste”, *6th International Conference on Energy & City of the Future, Pune, 2019, E3S Web of Conferences, 170, 04002, 2020.*

[https://www.e3s-conferences.org/articles/e3sconf/pdf/2020/30/e3sconf\\_evf2020\\_04002.pdf](https://www.e3s-conferences.org/articles/e3sconf/pdf/2020/30/e3sconf_evf2020_04002.pdf)

Co author : Rahul B Barjibhe

**Abstract:** The methane yield and overall biogas generation reduce drastically in the winter and summer season. The Biogas plant operators reported better results with the co-digestion of the municipal solid waste (MSW) with cow dung in changing weather conditions. In this research work the quality and content of methane in biogas generated from biogas plant is improved by co-digestion of MSW, cow dung along with the urine with better carbon to nitrogen (C/N) Ratio. We took number of experiment using different ratio of MSW and additives to improve biogas. Rigorous experimentations concluded that the co-digestion of the MSW, cowdung and urine in the proportion of (55:35:10) with equal amount water in a portable bio digester for anaerobic digestion results into better methane production with maintaining C/N ratio and reducing time duration for flammable biogas production.



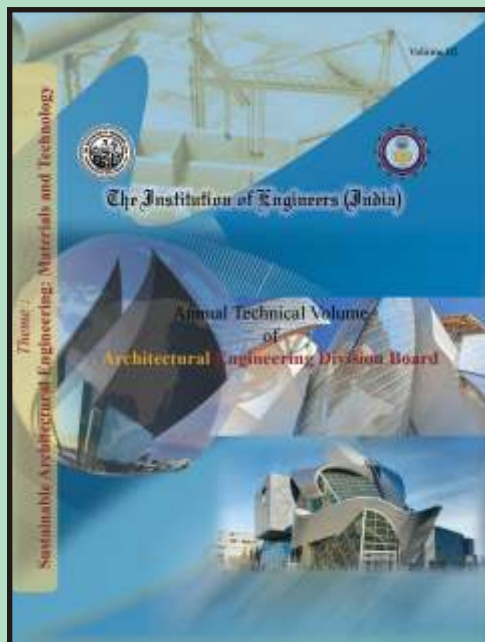
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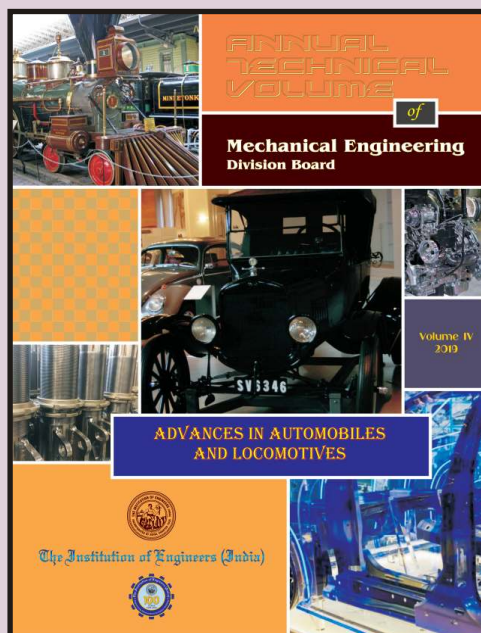
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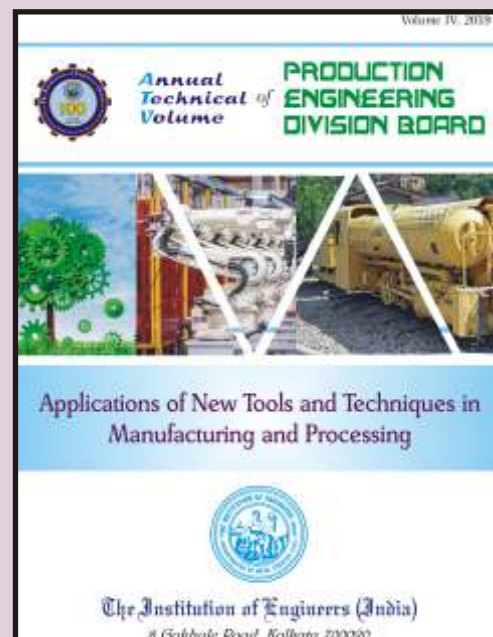
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