Proceedings of

# CCSN 2020

**9th   International Conference on**

# Computing, Communication and Sensor Networks

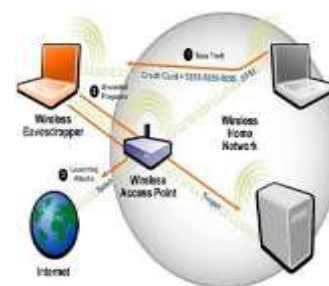17th and 18th of October, 2020

# CCSN 2020

9th international conference on

Computing, Communication and Sensor Networks

October 17th and 18th 2020

Venue: Online conference

Proceeding Book with abstract of papers

Published date: 17th October 2020

Published by: Dulal Acharjee,

Director, Applied Computer Technology,

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Inaugural Song:

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**Prayer**
Translated in English
By
Hillol Ray
http://www.iwvpa.net/rayh
http://www.iwvpa.net/rayh/index-hra.php

Desires are all yours,
You are the universal star-
You do your own works, mom,
People say, I do them from a far!!

You stuck elephant into clay,
And push a handicap to ascend hill-
To some, you offer "Brahmo" feet,
And make others descend downhill!!

I am a machine, you are the machinist,
I am the home, you are the homemaker-

I am the chariot, you are the charioteer,
You drive as you like, and I am a happy taker!!

"Milestone"
June 25, 2019
Garland, Texas, USA

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Editorial

On behalf of the Applied Computer Technology Kolkata, and International Association of Science, Technology and Management, the organizing committee of CCSN2020 is delighted to invite you to the 9th international conference on Computing, Communication and Sensor Networks. The conference will be held virtually for two days on October 17th and 18th 2020.

In the light of current exceptional circumstances, CCSN2020 has been re-envisioned as a virtual conference, for the safety of our community and to offer an inclusive experience. The virtual format will provide an opportunity for our community to continue to present their research and collaborate with their peers across the globe.

About 30 papers were received and 17 were selected for presentation in the areas of wireless technology, application of  LoRa and IoT for environment monitoring, Mine Communication, Artificial Intelligence Methods, Machine Learning, Development of an alert system for monitoring underground mines, RNN Model, applications of various types of Sensors, algorithms for stochastic simulation, Software Defined Network and Security Issues, FinFETs for Ultra Low Power VLSI, Internet Of Drone Things, ZF CSI technique  etc:

The CCSN2020 conference will convene experts in the field of Computing, Communication and Sensor Networks for technical communications through presentations and online discussions, providing a fantastic opportunity to network with like-minded professionals from around the world.  The online conference will feature invited talks and keynotes, and will give you the opportunity to exchange efficiently.

We look forward for the active participation of all our delegates and participants in the CCSN2020.

With due thanks and best wishes to all our team including the Chief Guest, other invited speakers, Chair persons, Authors, participants etc.  for sparing their valuable time in making the event a success in this typical pandemic period of COVID19.

These proceedings are prepared with the abstracts of all papers for the delegates of the conference and as printed/PDF versions. After the conference is completed, most of the papers will be forwarded for possible publications in different Journals or as Book Chapters/books for possible publications.

The Editors
CCSN2020

9th International Conference on
"Computing, Communication and Sensor Networks", CCSN2020
Dates: 17h to 18th October, 2020, Online, India.
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**Agenda of Inaugural Session**

10:50-10:55 Program conductor, Dr.Ankita Pramanik, Asst.Professor, IIEST, West Bengal will take mike and give her introduction and say something about CCSN2020. And she will call all guests on the Dais (Online).
…………………………………………………………..

1. Prof. J K Mandal, General Chair, CCSN2020, and Professor, University of Kalyani, West Bengal
2. Prof. Piotr Bilski, Professor, Faculty of Electronics and Information Technology, Vice-Director in charge of science, Warsaw University of Technology, Poland.
3. Sri P M Prasad, Chairman cum Managing Director, Central Coalfields Limited(Central Undertaking company), Jharkhand
4. Prof. B Majhi, Director, IIIT, Kancheepuram, Chennai, Tamil Nadu. And Professor, department of CSE, NIT Rourkela, Odisha,
5. Prof. Jerzy Szymanski, Kazimierz Pulaski University of Technology and Humanities in Radom, Poland.
6. Prof. Singam Jayanthu, Professor, dept. of Mining Engineering, NIT, Rourkela, Odisha.
7. Prof. Dulal Acharjee, Chairman of CCSN-2020 and Director of Applied Computer Technology, Kolkata
8. Dr. Debashis De, Professor, MAKAUT, West Bengal
9. Prof. Kamrul Alam Khan, Professor, Jagannath University, Dhaka, Bangladesh

All guests will take their seats on the dais(Online).
10:55-11:00 Inaugural Song by : Ms.Debjani Bhattacharya and group.

Then Program conductor will invite all guests to deliver their talks one by one:

11:00-11:05AM: Welcome speech by Prof. J K Mandal, General Chair, CCSN2020
11:05-11:10 Prof. Piotr Bilski, Professor, Faculty of Electronics and Information Technology, Vice-Director in charge of science, Warsaw University of Technology, Poland.
11:10-11:15 Speech by Prof. Dulal Acharjee, Chairman, Ccsn-2020 and Director, Applied Computer

Technology.

11:15-11:20 Prof. B Majhi, Director, IIIT, Kancheepuram, Chennai, Tamil Nadu. And Professor, department of CSE, NIT Rourkela, Odisha,
11:20-11:25AM Prof. Jerzy Szymanski, Kazimierz Pulaski University of Technology and Humanities in Radom, Poland.
11:25-11:30AM Prof. Kamrul Alam Khan, Professor, Jagannath University, Dhaka, Bangladesh
11:30-11:35AM Dr., Debashis De, Professor, MAKAUT, West Bengal

11:35-11:40 Speech by Prof. Singam Jayanthu, Professor, dept. of Mining Engineering, NIT, Rourkela, Odisha.

11:40-11:45 (Digital Proceeding book will be opened by clicking on Mouse by the Chief Guest; Prof. Dulal Acharjee will open it from control room of conference.)
11:45-11:55 : The Chief Guest: Sri P M Prasad, Chairman cum Managing Director, Central Coalfields Limited(Central Undertaking company), Jharkhand

11: 55-11: 57AM ** Declaration of 'Vidyasagar' and 'Lotfi Zadeh' Awards
11:57-12:00 Vote of Thanks:

Invited Talk:

# Application of LoRa and IoT for environment monitoring Vis a Vis Environment management Plan for Mining Areas

**Singam Jayanthu [1] , Singam Jayadarshana [2] , Tapas Kumar Patra [3], and [4] Ipsit Misra**
[1]Professor, Mining Engg Dept., NIT Rourkela,and Member of EIA-OSPCB-Odisha, India
[2]Intern-and [4]Lab-Director -CoE-AI-Odisha-India, [3]Asst Professor – ECE-CET-Bhubaneswar, India

Environmental pollution has been a major concern and posed stern challenge to the mining community to get acceptability by the society as a sustainable mining practice. Awareness of daily levels of air pollution is also very much important to the citizens, especially for those who suffer from illnesses caused by exposure to air pollution living near the mining areas. Therefore, in spite of many applications of Information and Communication technologies (ICT) now-a-days; instrumentation including various sensors and meticulous applications of Wireless Sensor Network, IoT etc has been a grey area of research for the team of transdisciplinary translational industry oriented projects. Ambient air quality has been monitored at various locations in the core and buffer zones of mining areas mostly through conventional systems, indicating the scope of further application of latest trends of ICT in mining industries including environmental monitoring. Generally, the parameters monitored are Suspended Particulate Matter (SPM), Respirable Particulate Matter (RPM), Sulphur Dioxide (SO2), Oxides of Nitrogen (NOx) and Carbon Monoxide (CO). Permissible Limit of corresponding parameters (µg/m3) in residential area are 200, 100, 80, 80 while it is 600, 300, 120, and 120 for industrial/mine areas. Studies are being conducted by transdisciplinary group of NIT-Rourkela, College of Engg and Technology (CET) Bhubaneswar and Centre of Excellence in Artificial Intelligence (CoE-AI) for application of various ICT to mining industries. The present paper highlights some of the studies conducted on LoRa, IoT with various environmental monitoring sensors emphasizing wide application of such sensors and ICT for the environmental pollution studies in mining areas.

The usage of Wireless Sensor Networks has become essentially important in recent years because of their ability to manage real-time data for various novel services. Two major technological advances would improve such networks: efficient communication between nodes and a reduction in each node's power consumption. The present paper analyses how event-based sampling techniques can address both challenges. Unlike for short ranges connectivity the candidate protocols are ZigBee, 6LoWPAN and low power Wi-Fi are used, For long connectivity the candidate is LoRaWAN protocol. Different parameters like Temperature , humidity, carbon-monoxide , ozone air quality (NO2 ,CO2 , Benzene, Smoke- transforms individual air pollutant levels into a single number that shows a simple and lucid description of air quality for citizen), and heat index) will be designed (using DHT11, MQ135, MQ 307A, MQ 131) and then interfacing it with LoRa module for long range communications using event-based sensing techniques for power consumption. The location of test site, LoRa transmitter section, and trend of Received Signal Strength Index (RSSI) with distance between the Receiver and transmitter are shown in Fig 1, 2 and 3, respectively while testing at NIT-Rourkela. Study of various propagation models indicated the need of further studies in various seasons in different mining areas to develop and design of suitable propagation model and wide application of LoRa and IoT in future.

*Keywords: Air quality monitoring, Environmental monitoring, LoRa Module, Coal mines*
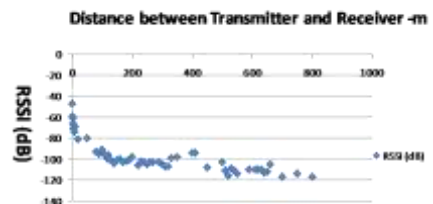


Fig 1: Location of test at NIT-Rourkela   Fig 2:LoRa Transmitter Section          Fig 3:RSSI Vs distance between T and R

Invited Talk:

# Erbium doped materials for the development of optical fibers and sensors

C.K.Jayasankar

Professor,
Department of Physics, Sri Venkteswara University,
Tirupati-517 502.India

Lanthanide ($Ln^{3+}$)-doped transparent glasses, glass-ceramics and phosphors have been used for a variety oftechnological applications such as optical fibers for communications, optical sensors, bio-labels, waveguide lasers, solar cells, laser diodes, etc., due to their characteristic features such as intense and sharp fluorescence with high emission cross-section and longer lifetimes, ability to tune the emission from infrared to visible regions by exploiting the down-conversion, up-conversion, cross-relaxation and energy transfer process. Erbium doped glasses and glass-ceramics found to be quite useful in optical fiber amplifiers for communication, fluorescence intensity ratios for optical sensors and up-conversion process for visible lasers and infrared detectors. In this direction, our group carried out extensive work on $Er^{3+}$:matrices for the development of fiber amplifiers, optical sensors and upconversion lasers which will be discussed and reviewed in our talk.

# Optoelectronic properties of InSbNBi: A 16 band k dot p Model Study

Indranil Mal and D. P. Samajdar

Department of Electronics and Communication Engineering,
PDPM Indian Institute of Information Technology,
Design and Manufacturing, Jabalpur, India

**ABSTRACT:**

We have calculated the electronic band diagram of $InSb_{1-x-y}N_xBi_y$ along the most symmetric directions of the crystal by implementing the 16 band **k·p** Hamiltonian. To retain the lattice-matched condition with the host material (InSb), an appropriate ratio (0.14) between the N mole fraction (x) and Bi mole fraction (y) is required. The electronic bandgap can be tuned accordingly for FWIR regime optoelectronic applications by precisely controlling the value of x and y. For $InSb_{0.9772}N_{0.0028}Bi_{0.02}$, a band gap of 68 meV and corresponding operating wavelength around ~18.23 µm is obtained. However, a wide variation of bandgap starting from 170 meV to 0 meV makes InSbNBi a promising and potential semiconductor for advanced thermal vision devices.

Keywords: Multiband k·p Hamiltonian, Valence band Anticrossing , Infrared photodetector.

# SNR Calculation of VLC System for Underground Mine Communication

Ankita Raychowdhury, Ankita Pramanik

Department of Electronics and Tele-Communication Engineering
Indian Institute of Engineering Science And Technology,
Shibpur, West Bengal, India-711103

**ABSTRACT:**

Underground mine is a profitable industry that needs to be monitored continuously. Also the mines need to be technologically smart to improve miner's safety and productivity and also to safeguard the resources. The surface technologies fail to provide desired result in underground mines because of the abrupt and adverse nature of the mine environment. A new technology:  Visible Light Communication (VLC) is showing promising results in underground communication. VLC system offers low cost, long life span, reliability, security, as it is based on light emitting diode (LED) technology. To implement the system in underground mine, channel characteristics and path-loss effect, signal-to-noise-ratio (SNR) needs to be determined. If the SNR is below the threshold limit, the system cannot be implemented. SNR performance of VLC system in underground mine scenario has not been studied deeply yet, as per the best knowledge of the authors. In this paper, a unique system design has been done based on zone division to calculate SNR performance in underground mine utilizing line-of-sight (LOS) characteristics of VLC system. MATLAB simulation has also been done. The simulation results show that the observed signal strength is strong at the center of each zone.

Keywords: Underground Mine, Visible Light Communication (VLC), Location tracking, SNR.

Keynote Talk:
# Artificial Intelligence Methods in Diagnostics of Analog Systems

## Prof. Piotr Bilski, Ph.D & D.Sc.

Professor, Faculty of Electronics and Information Technology,
Vice-Director in charge of science, Warsaw University of Technology, Poland.

Despite the digital technology revolution that shaped the whole world, analog systems are still critically important for the well-being of the society and its operations. Such objects as electrical machines, mechanical apparatuses, or electronic circuits are in the constant use and require monitoring to determine their state. Timely detecting faults would prevent from serious damages of larger structures and avoiding economical losses in equipment and posing dangers for human beings. The mdern diagnostics covers not only computer algorithms, but also cooperation with specialized hardware and sensory networks The topic of the presentation explores the diagnostic domain, which grows with every potential implementation of the analog system. Due to another recent advancement in the computational intelligence methods, there is the wide range of approaches that can be used for the diagnostic purposes.

The presentation is divided into three sections. In the first one, diagnostic principles are introduced, including the fault detection, identification and location, which are the core of the System Under Test (SUT) state monitoring process. Next, the specific characteristics and problems of the contemporary diagnostics are presented, such as operation in the presence of noise, ambiguity groups detection and testability, multiple fault detection, analysis of complex systems with ability to monitor them, and parameter identification. The ability to distinguish between the nominal and faulty system is considered as well. Defining these aspects allows for establishing the specificity of the domain, especially for the Artificial Intelligence (AI)-based approaches. The importance of the models for extracting knowledge about the characteristics of the SUT is also presented.

The second section covers the overview of the AI-based methods that are widely used for the diagnostic purposes. First, requirements for the fault detection and identification are covered. Then, the subdomains crucial for the task (such as machine learning and expert system paradigms) are discussed. The most important aims of the methods' operation (classification, regression and prediction) are briefly introduced. Next, the most notable groups of algorithms are presented. These include rule-based approaches (such as decision trees), Artificial Neural Networks (like Multilayered Perceptrons or RBF networks), statistical approaches (such as Naïve Bayes Classifier) and distance-based methods (including k Nearest Neighbours). The more sophisticated algorithms able to operate in the uncertainty conditions (such as Support Vector Machines) are presented. The process of designing the AI-based module for the specific diagnostic task and adjusting it to the specific SUT is briefly described. The importance of machine learning in extracting knowledge about the analysed object is stressed as well.

The third section covers particular examples of the SUT diagnostics. Specific objects are introduced, selected to present various applications, problems and tasks presented to the intelligent module. Based on the electronic circuit, electrical machine and mechanical system, various problems and solutions are presented, using different AI-based methods. The conducted experiment allow for determining issues related with the SUT and discover advantages and disadvantages of the specific intelligent approaches. The important aims of their operation include computational efficiency (which may decide whether the algorithm is applicable to the embedded diagnostic system), accuracy in detecting faults and ability to support the human designer in the future decisions regarding the diagnostic module architecture.

AI applications in the diagnostics are widely spread and allow for the automated monitoring of even complex systems important from the technical and societal point of view. The presented overview allows for determining the current state of the art in the algorithms' implementation and possible future directions of advancement.

# Improving the Prediction of Traffic Flow in the Airport System Using Machine Learning

Esha Agrawal, Prof. Chandrakant Navdeti

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Nanded, Maharashtra,

Abstract

An airport is a multipurpose infrastructure network. Reliable use of airport facilities and infrastructure is important for the successful operation of traffic flow controls. Most of the time cause of emergencies indicates that there is an inadequate capacity of airspace planning, especially at the largest airports. Predicting airport acceptance capacity is a complex activity in dynamic airspace. This paper provides a model of machine learning for forecasting potential trends in terminal area traffic flow. proposed model helps to prevent accidents and for safety analyses. It uses historical airport operational data. This model is based on a machine learning algorithm and some data analysis features. Clustering is applied to different airline data to identify air traffic in the terminal area ahead, data analysis features are extracted based on generated knowledge multi-way machine learning classification application is used for future prediction of airport acceptance capacity in the form of the terminal. Predictability design for increased flow rate forecasting and eventually better control of traffic.

Index Terms—Airport capacity, clustering, machine learning, forecasting.

# Development of an alert system for application against incidence of fire hazards, water inrush and strata failure in underground hard rock mine: An experimental trial

Dr. F. Sarkar[1], Dr. P.K. Adhikari[2]

[1]Corresponding author:  Dr. Falguni Sarkar,
Assistant Professor, NIT- Rourkela,
[2]Uranium Corporation of India Limited, Narwapahar, Jharkhand, India.

**ABSTRACT:**

In the present mining scenario disaster management is foremost imperative issue which affects Mine workers life and socio economical condition significantly. Major disasters in hard rock mine may occur due to fire, water-inrush and strata collapse. Early warning system or mine hazards alert system is an essential need for fast mitigation of the hazards to protect life of miners. Present day alert systems are individually designed to detect single hazards separately, however a composite alert system to cater all the major hazards such as Fire, water inrush and strata failure in combination are not available. In this paper, development of a low cost audio-visual as well as SMS based alert system for application against incidence of fire breakout, water inrush and strata failure in underground mine has been deliberated. The designed system was tested by a prototype model made for the purpose and efficacy of the system was also examined at a stope in hard rock underground Mine.

# An Analytical Survey on RNN Model for Eloquent OCR Processing with Minimum Output Errors

Jaya Darshana Singam ,   Priti Sahoo

Center of Excellence - Artificial Intelligence Lab
Bhubaneshwar, India

## ABSTRACT:

This Optical Character Recognition is a technique where the scanned documents or images are converted into an editable form. The process that is involved in the conversion includes many steps, and the accuracy of recognizing right context is been a challenge till today, especially when the images are the handwritten once. To recognize the handwritten material, the aspects which add-on to the whole approach generally includes, inappropriate font sizes, distance from the image center, number of strokes, ink color, background color, pixel size, etc., due to which the built setups face issue to give an appropriate result. In order to progress the context-recognition ability, lot of innovations are still going on, on NLP (Natural Language Processing) in which, RNN (Recurrent Neural Network) is an approach that is type of a DL (Deep Learning) Technique, is used for making the use of sequential information, stores pre-processed data, and are majorly used for speech and text analysis. This paper covers the analysis of the results carried out from the RNN Model that is designed using LSTM (Long Short Term Memory) architecture with various libraries. Keywords—RNN Model, LSTM, OCR, NN, DL, Text Accuracy, Digit Accuracy, Text and Digit Recognition.

# New Concept Cylindrical Magnetoelectric Magnetic Field Sensor

Karol Kuczyński[1], Adrian Bilski[2], Piotr Bilski[3], Jerzy Szymanski[1]

[1] Kazimierz Pulaski University of Technology and Humanities in Radom, Faculty of Transport, Electrical Engineering and Computer Science
[2] University of Social Sciences in Lodz
[3] Warsaw University of Technology, Faculty of Electronics and Information Technology

**ABSTRACT:**

The paper presents the results of experimental investigation of the magnetoelectric effect in the new concept magnetoelectric field sensor with amorphous glass ribbon. The possibility of output voltage measurement of the sensor in the function of DC magnetic field $H_{DC}$ is also considered.

**Keywords:** Magnetoelectric effects, Magnetostriction, Magnetometers, Amorphous magnetic materials, Piezoelectric materials

# Long-term Forecasting of Rainfall for Brahmani River Basin

M.Uma Maheswar Rao[1] , Nibedita Adhikari [2] , K.C. Patra[3]

[1] Department of Civil Engineering, NIT Rourkela, Odisha 769008, India
[2] Department of Computer Science Engineering, BPUT Rourkela, Odisha 769008,India
[3] Department of Civil Engineering, NIT Rourkela, Odisha 769008, India.

**ABSTRACT:**

Climate change is one of the most threatening issues with wide-ranging impacts in the twenty-first century. Rising temperature, increased frequency as well as magnitudes of extreme weather events, rising sea levels, and a range of other impacts are some of the indications of climate change. Rainfall is the central parameter around which other climatic variables such as temperature, humidity, solar radiation, wind speed and others are influenced. To understand the impact of climate change there stems the need for accurate prediction of rainfall. Here, an attempt is being made to predict the future climate scenarios through ARIMA modelling, and compared with other prediction tools. The accuracy of rainfall forecasting has a great importance for country like India, whose economy is largely dependent on agriculture. The current research tries to predict the future rainfall successfully for the Brahmani river basin in Odisha, India using recorded data of last 40 yrs. The prediction accuracy is tested through various performance indicators such as the Sum of squares of deviation(SSD), Mean square deviation(MSD), Root mean square deviation(RMSD), Normalized root mean square deviation(NRMSD), and Absolute normalized mean bias deviation(ANMBD).

Keywords: Climate change, LR, NLR, ARIMA, NRMSD, SSD, ANMBD, MSD and RMSD

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# Random maps and sequences based on algorithms for stochastic simulation of adsorption processes

Olga Jakšić[1] , Zoran Jakšić[1] , Koushik Guha[2] , Ivana Jokić [1] , Miloš Frantlović[1]

[1]University of Belgrade, Institute of Chemistry, Technology and Metallurgy - National Institute of the Republic of Serbia, Center of Microelectronic Technologies
[2] National Institute of Technology, Silchar, INDIA

**ABSTRACT :**

Random maps and sequences are crucial for applications related to digital message encryption or natural terrain simulation. Contrary to the digital domain, the true randomness is still the advantage of natural phenomena. This paper deals with the possibility to use the simulations of intrinsic noise, in particular the simulations of fluctuations in adsorption – desorption processes, as a source of random numbers in sequences or maps. The proposed method is based on the stochastic simulation algorithm (SSA) developed for reacions in chemical kinetics and built in random functions of GNU Octave software environment. The obtained pseudo random numbers are tested in three different ways: through simple visual analysis and two statistical tests (John Walkers test suit and Zur Aougavs test suite.) The results show that the intrinsic noise simulations could be used for the generation of random maps and sequences which is beneficial for digital message encryption and digital networking. This also opens a path toward a full hardware random number generator based on the described physical processes.

Keywords: Adsorption, Desorption, Fluctuations, Noise, Random number generator, SSA, Stochastic simulation algorithm.

Invited Talk:

# Software Defined Network and Security Issues

J K Mandal

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Jkm.cse@gmail.com

Software defined network is Restructuring the current network infrastructure for improved network management. It is not a new technology-rather reshaping the current network. Control and data planes are decoupled from the traditional forwarding devices.  Software-Defined Networking (SDN) is an emerging architecture that is dynamic, manageable, cost-effective, and adaptable, making it ideal for the high-bandwidth, dynamic nature of today's applications. SDN architecture decouples the network control and forwarding functions enabling the network control to become directly programmable and the underlying infrastructure to be abstracted for applications and network services. The OpenFlow protocol is a foundational element for building SDN solutions. Features are no longer limited to what the vendor provides. Its a  community development technology and longer life of products.

Various security issues are there in SDN. BRS and Block Chain based security proposals are enhancing the security.

# Electrochemical conversion of CO2 into useful chemicals and PKL electricity

K.A.Khan[1] , M.A.Mamun[2] and Sharif Mia[3]

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[3]Department of Chemistry, Jagannath University, Dhaka-1100, Bangladesh
[3]Department of Physics, Jagannath University, Dhaka-1100, Bangladesh

## ABSTRACT:

A study has been conducted regarding electrochemical conversion of CO2 into useful chemicals and PKL electricity. It is found that the experimental technique of CO2 production device for use in electrochemical cell. Here, the chemical reaction was: NaHCO3 + HCl = NaCl + H2O + CO2. The produced CO2 goes out through a tube. It is also found that the produced CO2 was supplied to a PKL Electrochemical cell for getting electricity with long time duration. It is also found that the pH level of PKL extract remains almost constant during electricity generation. The produced CO2 mixed with the H+ and formed HCO3, which maintains the constant pH level of the PKL extract during PKL electricity generation. Using this technique performance of PKL electrochemical cell has been studied. A comparative study has also been conducted between CO2 based and non CO2 based PKL electrochemical cell. The studied parameters are self discharge capacity, discharge capacity with load, internal resistance etc. Mallic acid increased during night time. Performances are better for night time collected PKL than the day time collected leaf. Reactant ion ( H+) increases in the night time. Cell voltage (Ecell ) increases in the night time. pH of the PKL extract decreases in the night time. This work has not been done before yet. This work will help the sustainable PL electricity generation in near future. Key words: CO2 production, electrochemical conversion, PKL electricity, Useful Chemicals, CO2 based PKL electrochemical cell, Galvanic cell.

# Behavior of Silicon Carbide Membranes for MEMS Based CMUT with Influence Factors

C. Lalengkima, Reshmi Maity, S. Chattopadhyaya, N. P. Maity

Department of Electronics and Communication Engineering
Mizoram University (A Central University), Aizawl – 796004, INDIA

**ABSTRACT:**

This paper presents the behavior of silicon carbide (SiC) based CMUT when subjected to changes in device parameters. It has been shown by recent studies that SiC is an excellent membrane material for fabricating CMUTs due to its high Young's modulus, low residual stress offering high tensile strength, and resilient membranes. Here main objective of the study is to understand the characteristics and design parameters optimize the CMUT performance. A SiC-based CMUT with a membrane radius of 55 µm and 2 µm thickness is proposed and characterized using a mathematical model where it is found that it features a device capacitance of 0.1627 pF, coupling factor of 0.383 and a collapse voltage of 78.06 V at 40V bias. At the collapse voltage, the device offers a coupling factor of 0.702 which exhibit the high efficiency of the device. This paper also reports a solution to the conflict between whether or not the membrane radius must be large or small by increasing the thickness of the membrane and maintaining a very low effective gap thickness in the order $10^{-9}$ meters. Balancing between the membrane radius and its thickness along with the effective gap can optimize the device sensitivity, energy conversion efficiency, and therefore, its overall performance.

**Keywords:** CMUT, ultrasound, ultrasonic transducer, capacitive sensor, SiC membranes, capacitance, coupling factor, collapse voltage.

# Performance Comparison of III-V and Silicon FinFETs for Utra Low Power VLSI Applications

Ankit Dixit, Dip Prakash Samajdar, Vibhuti Chauhan and Navjeet Bagga

Department of Electronics and Communication Engineering, PDPM Indian Institute of Information Technology Design and Manufacturing,
Jabalpur-485001, India

**ABSTRACT:**

In this paper, the device performance of a three dimensional (3D) FinFET is investigated and a suitable comparison is performed with employing a conventional Silicon and III-V materials like InAs and InGaAs in the channel region. We have discussed the DC and RF characteristics of the triple gate FinFET of 22nm technology. III-V materials have witnessed a superior DC performance in terms of saturation current with negative threshold voltage. In addition, analog and RF performance parameters of FinFET such as channel charge concentration, gate & body capacitances are also been discussed in the paper. III-V material based FinFET is having lower gate capacitance over its silicon counterpart and in turn III-V material shows its better candidacy for future low power applications.

Keywords— InAs, InGaAs, III-V FinFET, DC and RF Performance, Gate capacitance

Invited Talk:

# Internet Of Drone Things

Dr. Debashis De

Professor, Department of CSE,
Maulana Abul Kalam Azad University of Technology,
West Bengal

The **Internet of Drone Things** (IoDT) is envisioned as the future direction of **Drones** backend via the **Internet** of **Things**, Smart Computer vision, Cloud Computing, advanced wireless communication, big data, and high-end security techniques. Internet of Things is a crucial research empire in the current era which enables a wide diversity of applications. One of the emerging classes of technology in recent age dominate the universe of IoT is the concept of the Internet of Drones Thing (IoDT). The following work fundamentally emphasizes the key concepts of the Internet of Drones architecture in the context of the Edge computing perspective. A state of the art "EdgeDrone" concept has been engineered where the standard message transfer strategy of IoT and the opportunistic Ad-Hoc network have been amalgamated. Parameters like message transfer latency, overhead ratio, message delivery chances under several QoS values and resource usage, energy performance for the protocol have been analyzed. A hardware testbed has been implemented with the JavaScript platform along with the simulation which has been executed after tuning the performance of the protocols.

# Legislative Text Analysis from Judicial Case Reports using Machine Learning

[1]Souvik Sengupta, Vishwang Dave

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[2]Divyasree Technopolis 124,125 off old airport road,
Kadubeesanahalli, Yemlur, P.O Bengaluru, Karnataka

**ABSTRACT:**

This paper aims to automate the process of legislative text analysis from judicial case reports to identify appropriate sections of laws applicable to the cases. We propose a methodology that includes supervised Machine Learning (ML) approach and Natural Language Processing (NLP) methods and demonstrated our idea on archived case studies of Indian Income Tax Act of 1963, with applicable law sections and subsections, available at 'LegalCrystal' [4] data repository. Since it is a multi-label classification problem, where multiple law sections are often applied on one case, we employ one versus rest wrapper over the conventional ML models like Logistic Regression, Naïve Bayes, Decision Tree and Support Vector Machine. The proposed methodology includes necessary preprocessing and word embedding of texts, pipelining of transformers and ML models and evaluation of the trained models. We analyze the performance of these different ML models by fine-tuning the hyper-parameters and observe a highest F1 score of 0.75 for Support Vector Machine. Although this work is limited to cases involving income tax laws, the proposed methodology is adaptive to any other law sections.

**Keywords:** Natural Language Processing; Machine Learning; Multi-label Classification; Legal Text Analysis.

# Vivaldi Antennas for Wideband Communication Systems: A Review

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## ABSTRACT

As the demand for broadcast and wireless communication technologies is increasing day by day, the necessity of planning a new type of antenna with features like broader impedance bandwidth and highly directive radiation pattern has increased. Directional antennas are mostly used in applications to enhance the wireless systems' capacity and to reduce the effect of co-channel interference and multipath effects. Wideband antennas are used in different applications like Satellite communication, RADAR, microwave imaging systems, remote sensing systems, GPR detection, and medical applications. On the other hand, wideband antennas are used in broadband communication to replace the need for multiple antennas for diversified applications due to its features like less complexity, lower power consumption, and a more compact footprint. Vivaldi antenna is one of the suitable candidates for a broadband directional wireless communication system.

**Keywords:** Antipodal Vivaldi antenna (AVA), AVA array, balanced antipodal Vivaldi antenna (BAVA), corrugations, dielectric director, parasitic element, slots

# An Efficient ZF CSI technique for optimal tradeoffs between Spectral and Energy Efficiency in Massive MIMO Technology using nonconvex optimization.

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**ABSTRACT:**

In this article, the relationship of energy efficiency (EE) and spectral efficiency (SE) for Inter-Cell Interference Coordination (ICIC) in massive multi-user MIMO.is investigated A common Receive Space Modulation algorithm (RSM) is initiated which has a quick combination, less division, and can get indurated for basic values. Massive MIMO systems generally offer the chance of multiplying the SE by two or three orders and also enhancing the (EE) energy efficiency by two orders of magnitude. This is realistic with linear processing, for example, MRC or ZF at the BS. The performance of the EE-SE tradeoff algorithm could improve the SE and EE in Massive MIMO technology.

**Index Terms:** 5G cellular systems, Spectral Efficiency, Energy efficiency.

# 3R economy of the PKL electrochemical Cell

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**ABSTRACT:**

The term 3R means Reduction, Recycle and Reuse. It has been taken an abandoned portable Zn/Cu based electrodes for a PKL module which was used before 8 years ago. The module was made by a glass plate and which had six compartments. The plates from the compartment of this box can be replaced easily and for this reason it is called portable electrodes PKL module. The module possessed six chambers and each chamber contained four pair of Zn and Cu-plates. In each chamber all the Zn-plates were connected in parallel connection and similarly all the Cuplates were also connected in parallel connection. The all chambers were connected in series connection. All the Zn-plates were new and all the Cu-plates were 8 years old. The electrolyte (PKL extract) was also 8 years old. The maximum open circuit voltage (Voc) was found 5.71 volt, the maximum short circuit current (Isc) was found 0.95 A. Most of the results have been tabulated and graphically discussed.

Keywords: 3R economy, Open circuit voltage, short circuit current, PKL extract

# Selective detection of amino acid by *Lawsonia inermis* leaf extract-mediated copper nanoparticles

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**ABSTRACT**

In this study, we reported a simple, eco-friendly synthetic protocol of copper nano-particles from $CuSO_4$ salt featuring extract of henna (*Lawsonia inermis*) leaves along with assessment of their abilities for detection of amino acid selectively. UV-Vis spectroscopy was used to monitor the production of colloidal nanoparticles in reacting solution at regular time intervals. Analytical tools like X-ray diffraction (XRD) and high resolution transmission electron microscopy (TEM) were used to discover microscopic structure and crystalline phases of leaf extract-mediated particles. Finally, we evaluated the amino acid detectability of these biogenic copper nanostructures and tried to decode the actual mechanism responsible for this rapid detection.

**Keywords:** 'Green' copper nanoparticles, *Lawsonia inermis* leaf extract, UV-Vis spectroscopy, HRTEM, XRD, Amino acid detection

# Research and development of Phase Converting Transformer: A review

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**ABSTRACT:**

Recently MULTIPHASE (more than three phase) attracted attention of many researchers due to applications of multiphase drive in space and naval system. It has a proved superiority over three-phase power in terms of generation, transmission and utilization. This extensive review work is first of its kind to serve the researchers if one wish to extend multiphase research. In general two methods available for Multiphase power production from a readily available three phase power viz. using semiconductor converters and using special transformers also called passive or static Transformation. Static transformation technique of producing multiphase power has superiority over power electronics based converters for fixed frequency applications, e.g., it is more reliable, more economical, and more efficient and has lesser THD as compared to power electronic converters. However, it is not suitable for variable frequency transformation. The aim of this paper is to analyze multiphase power conversion from three-/two-phase, re- view the different static multiphase transformation techniques. Moreover, different methods of two-/three-five and two-/three-seven phase static transformation are also discussed in details.

Keywords: Phasor, Multiphase, Static Transformation, Transformer.

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## 9th International Conference on Computing Communication and Sensor Networks.

### 17th - 18th October, 2020, Kolkata, W.B. India. (Online conference)

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| | Keynote Speaker |
| | **Prof. Piotr Bilski**<br>Professor, Faculty of Electronics and Information Technology,<br>Vice-Director in charge of science,<br>Warsaw University of Technology, Poland. |
| | Chief Guest |
| | **Sri P M Prasad**<br>Chairman cum Managing Director,<br>Central Coalfields Limited<br>(Central Undertaking company),<br>Jharkhand, India. |
| | Special Guest: |
| | **Prof. Banshidhar Majhi**<br>Director,<br>IIIT, Kancheepuram, Chennai<br>E-mail: director@iiitdm.ac.in<br>Ph: +91 44 2747 6302 | Room<br>(And Professor, CSE, NIT, Rourkela, Odhisha) |
| | Invited Speaker: |
| | **Prof. C K Jayasankar**<br>Professor, Department of Physics,<br>Sri Venkteswara University,<br>Tirupati, Andhra Pradesh, India. |
| | Invited Speaker: |
| | **Prof. Jyotsna Kumar Mandal**<br>Professor, CSE, University of Kalyani<br>Kalyani, West Bengal, India.<br>Email: jkm.cse@gmail.com<br>Past President of CSI Kolkata region.<br>At present, General Secretary of IETE, Kolkta region. |
| | Session Chair |
| | **Prof. Jerzy Szymanski**<br>Faculty of Transport, Electrical Engineering and Computer Sciences<br>Kazimierz Pulaski University of Technology and Humanities,<br>Radom, POLAND |

| | |
|---|---|
| | Session Chair<br><br>**Prof. U C Pati**<br>Professor<br>Department of Electronics and Communication Engineering, National Institute of Technology (NIT),<br>Rourkela, Odisha, India. |
| | Invited Speaker<br><br>**Prof. Debashis De**<br>Professor, department of CSE,<br>Maulana Abul Kalam Azad University of Technology<br>Haringhata, West Bengal, India |
| | Conference Chairman<br><br>**Prof. Dulal Acharjee**<br>Chairman, CCSN2020 and<br>Director, Applied Computer Technology, Kolkata<br>http://actsoft.org, dulal@actsoft.org, dulalacharjee@gmail.com , and<br>President, International Association of Science, Technology and Management<br>Mobile: 8240120380, 8420582707 |
| | Special Guest<br><br>**Prof.(Dr.) Md. Kamrul Alam Khan**<br>Professor, Department of Physics, &<br>Ex-Chairman (Department of Physics), &<br>Ex - Dean (Faculty of Science)<br>Jagannath University, Dhaka-1100, Bangladesh.<br>Mobile No.: +8801911357447, E-mail: kakhan01@yahoo.com |
| | Invited Speaker<br><br>**Prof.(Dr.) Singam Jayanthu**<br>Professor, Dept of Mining Engineering,<br>(*Former Scientist of CMRI & NIRM)*<br>National Institute of Technology, Rourkela-769 008, Orissa, India.<br>Website-www.nitrkl.ac.in |
| | Co Chair and conference organizer<br><br>**Dr. Ankita Pramanik**<br>Asst. Professor<br>Department of Electronics and Telecommunication Engineering,<br>Indian Institute of Engineering Science and Technology (IIEST),<br>(An Institute of National Importance),<br>Shibpur, Howrah-711103,<br>West Bengal, India. |
| | Session Chair:<br><br>**Dr. Abhishek Das**<br>Associate Professor<br>Department of CSE<br>Aliah University, New Town, Kolkata<br>West Bengal, India. |

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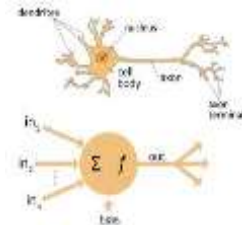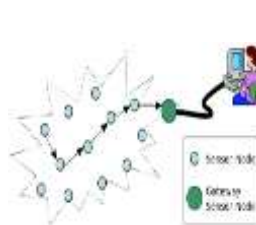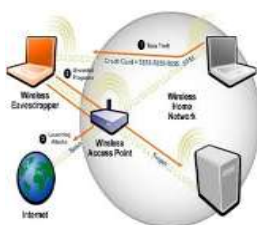Computing, Communication and Sensor Network

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