Abstract Proceedings of

6th International Conference on

Energy Systems, Drives and Automations

ESDA 2023

30th and 31st December, 2023

Organizer:
Applied Computer Technology
Kolkata, West Bengal, India.

Co-Organizer:
Techno Main, Salt Lake, Kolkata-700091,
West Bengal, India.

In Association to:
International Association of Science,
Technology and Management

ACT MICRO CCSN ESDA

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Applied Computer Technology,

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Inaugural Song:

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, God,
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

Editorial

About 111 papers are received and 90 are selected for presentations in ESDA2023. Most of the abstracts of the papers in this book are in the areas of: Energy systems, automations, control systems, Solar Energy, Bio Mass Energy, Electrical Vehicle Systems, Fuel Cells, Smart Grid Technologies, Micro Grid Technologies, Electric Conversion Systems, soft computing and optimization techniques, Hybrid Energy Systems, Energy Conservation and Auditing, Energy Storage and Battery Management, Conventional and Special Electrical Machines, Application of Control Theory, Industrial Drives, High Voltage Engineering, memory and storage circuits and devices etc.

With due thanks and best wishes to all our team members including the Chief Guest, Keynote Speakers, invited speakers, Chair persons, Authors, participants etc. for sparing their valuable time for preparing the papers of this abstract book.

These abstract proceedings are prepared with the abstracts of all papers for the delegates of the conference and for listing the abstracts only either in offline/online. As most of the revised and extended versions of the papers will go for either SCIE Journal or Scopus indexed Book chapters. We have not given any ISBN number to this book as because, these papers will go for further online publications.

The Editors, ESDA2023

Dr. Nitai Pal (Professor, IIT(ISM), Dhanbad, Jharkhand, India.)

Prof. Bidishna Bhattacharya (Head of the Department of Electrical Engineering, Techno Main Salt Lake, Kolkata, West Bengal, India.**)**

Dr. Marta Zurek-Mortka (Senior Researcher, Lukasiewicz Research Network - Institute for Sustainable Technologies, Radom, Poland,**)**

Prof. Dulal Acharjee (Director, Applied Computer Technology, Kolkata, West Bengal, India.**)**

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Speech of:

Prof. Dulal Acharjee
Executive Chairman, ESDA2023 and
Director, Applied Computer Technology, Kolkata, WB., India.

Today, I am here before you with great pride and enthusiasm to celebrate the inauguration of 06th international conference on 'Energy Systems, Drives and Automations', in short ESDA2023. We are committed to the society for providing better lives through uses of inventions of modern Science and Technology.

For developing a better World, we should think ahead, adopt and adhere modern tools which have given us better lives and should abandon obsolete technology along with the philosophy which causes conflicts within the society and finally decelerate the growth of the country.

Harvesting natural resources to acquire required energy is the main theme of this conference like ESDA2023. So fast we can minimize the uses of coal, oil and gas is the best for the next generation. But simultaneously we should accelerate the uses of Wind, Sunlight, Tide, Water flows, pressure, vibrations etc. which are the physical properties of the nature and should be converted to power gradually by developing more and more sensing and power storage devices. The philosophy of generating of energy should be that the required energy to run a device should be collected from the adjacent surroundings of the device through converting adjacent natural properties to energy. For that, architecture and design of all electrical instruments should be made accordingly. Next concept of alternate energy uses will be with hybrid mode of collection of energy and running machine under hybrid sources of energy.

Next generation of automations will be controlled with the help of brain of machine where Artificial Intelligence based programming will make the system more and more intelligent to take decision about the events. Controlling of heavy machines like Crane, motor of Ship and rock cutting drilling machines etc. will be able to work with more efficiently with the combinations of proper hardware and software. Slogan should be 'more brain, less manual labour'.

Like the past many years, with some good papers, we are planning to publish a special issue of the Journal of Microsystem Technologies, a SCI indexed journal of Springer-Nature publisher and some other papers will be invited for other Journals/ Proceedings for possible publications. Hope, after presentations and interactions with the experts, session chairs and Judges, authors will be able to find the strength and limitations of their papers and attending this conference they will be able to prepare the extended versions of their papers.

Hope, by your active participation, researchers will be able to make a network with the related professors which may help them to furnish their research projects. In future, these inventions would be patented within machines and the World would be a better sustainable and peaceful space for the human being.

Date: 27/12/2023

Invited Speaker

Implementation and Challenges of Intelligent Transportation Systems: An Experience in Malaysia.

Dr. Ahmad Saifizul Abdullah
Mechanical Engineering Department, University of Malaya, Kuala Lumpur, Malaysia

Intelligent Transportation Systems (ITS) are cutting-edge applications that aim to provide innovative transportation and traffic management solutions. These systems deploy various technologies to enhance the mobility, safety, and sustainability of transportation networks. The implementation of ITS has many advantages, but it also poses several challenges.

The talk covers the author's experience in Malaysia in promoting and implementing various ITS-related applications or systems. In addition to that, there are many challenges need to be addressed which require collaboration among government agencies, private companies, and the public. It's essential to understand the root of the problem, regulatory and legal issues, interoperability frameworks, user acceptance, and funding challenges to promote the successful implementation of Intelligent Transportation Systems.

Keynod Speaker

Renewable Energy: Order of the Day

Prof. Chandan Kumar Chanda
Professor, Electrical Engineering Department, Indian Institute of Engineering Science and Technology, Shibpur, Botanical Garden,Howrah, India

It is all about energy, right from morning to night we cannot imagine a single moment in our life without energy, but where is this energy coming from? It is coming by burning the fossil fuels like coal, petroleum, and natural gas, etc, but those days are not very far away if we keep on using these fossil fuels, will be depleted of all the conventional sources of energy, in addition to that, there is a problem of global warming so we have to find out some alternative. The alternatives are tidal energy, hydrothermal energy, geothermal energy, wind energy, solar energy, etc. But out of all of this solar energy is the prominent and dominant one. It is a very clean and green source of energy that does not leave any carbon residue and that's why solar energy becomes so much more popular. Why will we advocate Renewables? Rising sea levels and intense storms; Low or zero carbon energy requirement on our planet (non-toxic); Cheapest and greenest energy on our planet; Carbon footprints to be lowered; We have gone for best practices – Renewable energy will be the mainstream of research in worldwide; Money is not all, cooperation and collaboration is required. Optimism: A Renewable Source The renewable potential is huge; We have the technology; The costs are moderate and gradually coming down; The need is imperative; The benefits are enormous.

Here comes the Sun: Almost 7 billion people of this world desires stable climate, stable health and stable economy; We cannot wait up to the last drop of oil/ last ton of coal/last kg of Uranium; We have to go for a paradigm shift in clean energy production, because time is very tight and we want desperately to stop the climatic change; (174000 trillion watts) are falling from the sky at any moment on the earth surface and if we can harness 20% of this energy for one hour, it is sufficient for the whole world for one year; Payback time is gradually reducing day by day because of advance research in the field of harnessing sunshine = harvesting money.

There isn't a "one size fits all" solution. Prejudice toward one source of energy over another is not justified. Solar energy has changed the Indian energy environment significantly during the past several years. Solar energy-based decentralised and distributed applications that address people's needs for lighting, cooking, and other forms of energy in Indian communities have benefited millions of people. Additionally, throughout the years, India's solar energy industry has developed into a significant player in terms of grid-connected power generation capacity. While also establishing itself as a significant contributor to satisfying the nation's energy demands and playing a crucial role in maintaining energy security, it advances the government's vision of long-term growth. The only way to ensure economic, environmental, and energy security is probably to solve energy-related challenges. It will be necessary to use renewable energy in addition to enhanced energy efficiency and current carbon-based fuel utilization techniques to meet the world's energy demand in a sustainable manner. Therefore, initiative for renewable energy especially solar energy is a win-win situation both for providers and for customers.

Keynote Speaker

Hybrid charging system for e- vehicles which allows charging in static as well as dynamic condition

Prof. Pradip Kumar Sadhu
Professor, department of Electrical Engineering Indian Institute of Technology (ISM)
Dhanbad, Jharkhand, India.

Governments all across the world are planning to build carbon-neutral infrastructures to reduce dependency on fossil fuels in the transport sector following the sustainable development goals (SDGs). India is one of the largest vehicle markets in the world, with around 40 million customers needing mobility solutions. The major problem in utilizing EVs is the lack of reliable, accessible, and affordable commercial charging infrastructure, proving to be a hurdle in adopting electric vehicles as the principal mode of road transport. Electric vehicles (EVs) are emerging as a method of utilizing clean energy with a considerable reduction in greenhouse gas emissions and air pollution. However, the widespread adoption of EVs is impeded by lack of charging facilities, range anxiety, longer charging time and higher prices due to the requirement for larger batteries. The penetration of EVs in the market can be increased by creating an infrastructure that enables EV charging in dynamic as well as static conditions of the car. To provide maximum degree of freedom, the conventional plug-in charging facilities should be upgraded to wireless charging. While the utilization of renewable energy will make the transport sector more sustainable, bidirectional power flow will enable car owners to sell excess electricity from vehicle to grid (V2G).

A working model of a hybrid renewable energy-driven bidirectional wireless charging system has been developed by a research group in the Department of Electrical Engineering, IIT (ISM) Dhanbad. In the proposed model, the inductive power transfer occurs between two mutually coupled coils through the air gap and asphalt. The charging coil can be kept under the road, parking lot, or garage. The proposed system works in cars with low, mid, and high ground clearance and therefore can be utilized for charging a wide variety of passenger automobiles, SUVs, and light trucks. The system underwent a trial at a laboratory scale and demonstrated satisfactory power transfer efficiency. The charging of vehicles is propelled by renewable sources of energy, including solar and wind energy and simultaneously allows electric charging of vehicles through power grids.

The IIT (ISM) Dhanbad funded project began on February 17, 2020 and after 30 months of rigorous experimentation, the working model was developed. A patent has been filed for the same with some added features of adjustable height for vehicles with different ground clearances. The researchers further plan to make the technology adjustable to the length of the vehicle.

The techno-commercial potential of this project is promising. The system can give rise to Charging as Service (CaS) infrastructure, where a dedicated highway lane can be utilized for charging electric vehicles from nearby renewable energy sources such as solar photovoltaics and wind power, as well as the grid electricity. Segmentation of highways can improve the reliability of the system and ensure round-the-clock power transfer. Public and private players may invest in building dedicated lanes. The capital cost and the running cost can easily be recovered by charging tolls. Automatic cut-off by the charging coil shall reduce the wastage of energy while the bidirectional converters enable vehicle-to-grid charging for the car owners with overcharged batteries. All these benefits shall eventually reduce the cost of electric vehicles, as smaller size of batteries will be sufficient for longer range of driving. Electrification of the transport sector shall reduce the dependency on imported fossil fuel, and propel the utilization of low-emission systems. The scalable model of wireless power transfer for EV charging can revolutionize the public transport sector along with commercial cargo delivery and shall be beneficial to all classes of people.

Invited Speaker

BMS in Electric Vehicles

Dr. Rajesh Dey
Associate Professor, Gopal Narayan Singh University

Rechargeable batteries are used to deliver power to the auxiliary systems and motors in electric vehicle applications. Among all rechargeable batteries, Lithium-Ion Batteries will give high efficiency for electric mobility because Li-Ion batteries have a low self-discharge rate, wide operating range, maximum energy density, and high life cycle.

To prevent battery failure and mitigate potential hazardous situations, there is a need for a supervising system that ensures that batteries function properly in the final application. This supervising system is referred to as a Battery Management System (BMS).

Functions of Battery Management System in EV

The primary function of a BMS is to fulfil safety requirements. But there's more to it. Objectives related to the more efficient usage of battery cells and prolongation of their lifetime are also being increasingly integrated into the design of BMS.

While there is no unique definition of a BMS, it should be designed with a minimal set of requirements Such as-

- It must measure individual cell voltages
- The BMS must measure temperatures at different points as close as possible to the battery
- It must measure currents flowing through it
- The BMS should communicate information to control units and undertake action to ensure the battery will be operated within safety limits
- The BMS should balance battery cells passively or actively
- And, the BMS should provide thermal management

Invited Speaker

Recent trends in renewable-energy-based EV technology

Dr. Marta Zurek-Mortka

Lukasiewicz Research Network - Institute for Sustainable Technologies, Radom, Poland

Abstract:

Primary energy consumption in the world is constantly growing. For this reason, increasing attention is paid to increasing the share of energy from renewable sources in global consumption and improving the energy efficiency of classic heating systems, as well as reducing the share of carbon dioxide in transport systems. One of the possibilities for implementing the postulate of increasing the energy efficiency of thermal systems is the use of thermoelectric generators for the local production of auxiliary energy for such systems. There is no real alternative to a significant reduction of the harmful effects of traditional transport based on the use of combustion vehicles than the rapid acceleration of the use of electric vehicles (EV) for the transport of goods and people. The use of renewable energy sources and energy storage to supply fast charging stations for electric autonomic work machines and transport means is also particularly important. The search for a solution to the problem of charging EV batteries with electricity obtained without the use of conventional fuels is the subject of my recent research. The search for solutions influencing the energy efficiency of thermal systems using RES is the next stage of my research. I would like to present my recent research regarding the integration of hybrid fast charging stations for electric vehicles and autonomous electric work machines using a new type converter cooperating with the microgrid, RES, and energy storage and further research regarding an innovative solution using the thermoelectric generators for generating electricity from waste heat.

Invited Speaker

Importance of Social Welfare Optimisation in Indian Scenerio

Dr. Sandip Chanda
Associate Professor and Head
Ghani Khan Choudhury Institute of Engineering and Technology
A CFTI under Ministry Education. Govt. of India Narayanpur, Malda, West Bengal, India.

ABSTRACT

The modernization of India's electric grid is essential to meet the growing energy demands of a rapidly urbanizing and industrializing nation. Smart grids offer a promising solution, enabling efficient energy distribution and utilization. However, to fully optimize social welfare and address India's unique energy challenges, a comprehensive approach that includes demand side management (DSM) is imperative. This lecture highlights the necessity of DSM in the context of India's smart electric grids. DSM strategies encompass demand response, energy efficiency measures, and decentralized energy generation. These initiatives can significantly reduce peak demand, promote grid stability, and minimize greenhouse gas emissions. Furthermore, they empower consumers to actively participate in energy conservation, thus enhancing social welfare by reducing energy costs and environmental impacts.

This lecture discusses the various aspects of DSM, including the role of advanced metering infrastructure, real-time data analytics, and incentives to encourage consumer engagement. It also explores the potential benefits of DSM for India, such as reducing power outages, minimizing the need for additional infrastructure investments, and supporting the integration of renewable energy sources. In conclusion, the incorporation of demand side management is essential for optimizing social welfare in India's smart electric grids. By promoting energy efficiency, grid reliability, and consumer empowerment, DSM contributes to a more sustainable and resilient energy system, ultimately benefiting the society and the environment.

Invited Speaker

Localization of Smart Drainage System for Mosquito Control

Dr. M Thamarai
Department of Electronics and Communication Engineering,
Sri Vasavi Engineering College, Tadepalligudem, Andhra Pradesh, India.

ABSTRACT

Mosquito breeding primarily occurs in drainage systems, leading to diseases such as yellow fever, dengue fever, and malaria transmitted through mosquito bites. Mosquito breeding sites have emerged as a significant healthcare challenge in urban areas, especially in rural regions where mosquito-borne diseases pose a genuine threat. While various automatic cleaning technologies have been developed to reduce the need for manual cleaning in subterranean drainages, open-style drainages still rely on labor-intensive manual cleaning practices. This not only adversely affects the health of those involved but also contributes to the spread of hazardous diseases.

This talk discusses about a solution in the form of a smart drainage cleaning system and the system implementation is financially supported by DST for the benefit of people at Kota Ramachandrapuram, Andhra Pradesh, India. Numerous smart initiatives for urban drainage cleaning are readily available. However, in remote areas such as the above mentioned villages characterized by sparse housing, inadequate road infrastructure, and elevated terrain, the adoption of new technological solutions becomes unfeasible. Many individuals here lack awareness of fundamental healthcare practices. So people are frequently affected by malaria fever.
Various mosquito control and repellent methods are available, encompassing chemical, biological, herbal, and electronic trap-based approaches to eradicate adult mosquitoes. However, chemical-based mosquito control and repellents can have adverse effects when used in enclosed spaces. These methods have not provided a comprehensive solution for mosquito control due to the exceptionally high breeding rates of mosquitoes, which contribute to the proliferation of various diseases. Therefore, the adoption of technological resources and preventive measures by the community proves to be a valuable strategy for mosquito control and the prevention of mosquito-borne diseases.

The proposed smart drainage cleaning system comprises five key modules: a wheeled chassis, an onboard controller unit, a robotic arm cleaning unit, a chemical spray unit, and a garage unit. The system is specifically designed for open-type drainages and operates along rails installed on the drainage side walls. It conducts daily cleaning routines, applying chemicals within the drainage to control mosquito populations. The garage unit serves as a secure storage location for the smart drainage module and facilitates battery recharging through a power charging station.

A mosquito control device/system is affixed to the rails and is under the control of an electronic control unit. This device is capable of moving along the rails via motor control. The system performs two distinct operations during its cycles: in the forward direction, it employs a Robot arm-type cleaning unit to clear drainage blockages, while in the reverse direction; it activates a chemical spray unit, dispensing chemicals into the drainage water. The system is fully automatic and its operation is controlled by Arduino Mega2560 controller with various sensors. The system has additional features like a rain sensor for rain condition detection and tower LED with a buzzer to detect the obstacles in its path and an emergency stop switch etc., It proves to be an effective tool for mosquito population control, ultimately safeguarding human lives from the dangerous diseases transmitted by mosquitoes.

Dr. Ahmad Saifizul Abdullah

Mechanical Engineering Department, University of Malaya, KualaLumpur, Malaysia

He is a senior lecturer and researcher at Mechanical Engineering Department, University of Malaya, Malaysia. He is also the Founder and Director of Integrated Transportation Solutions Sdn. Bhd., a UM spin-off company called which was established to manufacture and commercialize various R&D outputs related to intelligent transportation systems. He graduated from the Universiti Malaya with a B.Eng (Hons) in Mechanical Engineering. He received his M.Eng and D.Eng degrees from Nagoya University and Tokushima University, respectively. His area of expertise and research interests are in instrumentation and control system engineering.

He and his team have been involved in various kinds of research areas dealing with sensors, control system engineering, and intelligent systems. He is an active consultant to many government agencies and business companies both locally and globally. Recently, his research focus on Smart Sensor and Intelligent Transportation Systems, with the goal of reducing road accident fatalities, road pavement damage, and emissions from vehicular traffic, particularly those involving heavy vehicles.

He Abdullah has won many international awards for his research and development efforts. Among the prestigious awards he has received are "Best of the Best Awards" at the Malaysian Technology Expo 2013, "Best Paper Award - Discovering Interesting Facts" at the 9th Eastern Asia Society for Transportation Studies Conference 2011, and "Outstanding Paper Award" at the 17th Intelligent Transportation System (ITS) World Congress, 2010. He has also published over 80 scientific and technical papers, secured over 30 research awards, and filed several patents.

Prof. Chandan Kumar Chanda

Professor, Electrical Engineering Department, Indian Institute of Engineering Science and Technology, Shibpur,Botanical Garden, Howrah, India

He is working as a Professor (HAG) in the Department of Electrical Engineering, IIEST, Shibpur, India. He has earned Ph.D. degree from the Department of Electrical Engineering, B.E. College (DU), Shibpur, India with specialization in Power Systems. Dr. C. K. Chanda has over 33 years of teaching and research experience in the diverse field of Power Systems Engineering and almost 5 years experience in industry. His areas of interest include Renewable Energy, Smart Grid, Resiliency, Power System Stability etc. He is a recipient of Tata Rao Gold Medal. He is actively involved in various research projects funded by Centrally Funded Organizations like DST, UGC. He has published 175 research articles in reputed National/International journals and conferences including 60 research papers in SCI /SCOPUS -indexed journals. He is a member of the Editorial Board and Guest Editor of numerous reputed Journals. He has authored and coauthored seven (7) books and three (3) edited books in reputed publishing houses like CRC Press, Mc Graw Hill, PHI, and Springer etc. He has contributed twenty-one (21) book chapters in International Proceedings. Thirteen (13) research scholars have got their Ph. D. degree under the supervision of Dr. Chanda. Currently seven (7) PhD students are pursuing research under him. He has visited different foreign countries including USA, UK, Australia, Japan, and China for academic purposes. He is a senior member of IEEE(USA), member of IET(UK), Fellow of Institution of Engineers (I), C-Engineering(I) and Life-member of ISTE. Besides his academic research activity, Zeev is also very active in commercializing his inventions into start-up companies. Zeev was and is involved in technologically leading of more than 10 startup companies.

Prof. Pradip Kumar Sadhu

Professor, department of Electrical Engineering Indian Institute of Technology (ISM)
Dhanbad, Jharkhand, India.

He received his Bachelor, Post-Graduate and Ph.D. (Engineering) degrees from Department of Electrical Engineering, Jadavpur University, Kolkata, West Bengal, India. Currently, he is working as a Professor (HAG) & Ex-Head of Electrical Engineering Department of Indian Institute of Technology (ISM), Dhanbad, India. Also, He served B.I.T., Mesra, Ranchi as faculty member of Electrical & Electronics Engg. Department. Prior to join B.I.T. Mesra, also he served the different industries for twelve years. He has total experience of 35 years, out of which 23 years in teaching and 12 years in industry. He has eighteen (18) Granted Patents. In addition, fourteen (14) more patents in his name are under process. He has several journal and conference publications in National and International level including IEEE Transactions on INDUSTRIAL ELECTRONICS, IEEE transactions on POWER SYSTEMS, IEEE Transactions on Instrumentation and Measurement, IEEE SENSORS JOURNAL, IEEE Access, Solar Energy, Renewable Energy, Building and Environment, Renewable and Sustainable Energy Reviews, IET Generation, Transmission & Distribution, IET Science Measurement & Technology, IET Smart Grid. He is principal investigator of a few Govt. funded projects. He has developed Hybrid charging system for e- vehicles that allows charging in static as well as dynamic condition; Technology for which the patent application has been filed can herald a new era for adoption of electric vehicles as principal mode of road transport. He is reviewer of various international journals like IEEE Transaction on Power Electronics, IEEE Transactions on INDUSTRIAL ELECTRONICS, Solar Energy, Renewable Energy, etc. He has guided 22 Nos. of doctoral candidates and a large no. of M. Tech students. Moreover, He has published four text books entitled, "Elements of Power Systems" under CRC Press, Taylor & Francis Group, "Modern Utilization of Electrical Power", "Elements of Electrical Machines", "Basic Electrical Engineering" under CBS Publication, with his co-author research scholar Soumya Das. His current areas of interest are Power Electronics Applications, Application of High Frequency Converter, Energy Efficient Devices, Energy Efficient Drives, Computer Aided Power System Analysis, Condition Monitoring, Solar Energy, Renewable and Sustainable Energy and Lighting& Communication Systems for Underground Coal Mines.

Dr. Rajesh Dey

Associate Professor, Gopal Narayan Singh University,
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His Post-Doctoral Fellow, IIUM Malaysia Associated with ELECTROVENT LLP as Director M.Tech & Ph.D From Kalyani Govt Engineering College Under Maulana Abul Kalam Azad University, 20 years of expertise in Teaching, Entrepreneurship, and 6 years of experience in Industry Guest Editor/, Reviewer- Springer Nature, Wiley, TMH, Elsevier etc. He has around 50 research papers in journals, conferences and book chapters He is co-author of around 12 Nos of edited and text books. His Research Interest Application of Batteries in EV, Sensor Technology, Adaptive Signal Processing, Biomedical Engineering, Embedded System, Robotics, Internet of things

Dr. Marta Zurek-Mortka

Senior Researcher,Lukasiewicz Research Network - Institute for Sustainable Technologies, Radom, Poland,

She is a young researcher, which works as a specialist in the Institute for Sustainable Technologies in Radom in the Department of Control Systems. The institute belongs to the third largest research network in Europe called Lukasiewicz Research Network (https://lukasiewicz.gov.pl/en/). She obtained a Doctor degree at the Faculty of Transport, Electrical Engineering and Computer Science at the University of Technology and Humanities Kazimierz Pulaski in Radom in the field of Electrical Engineering. She was an Erasmus Ph.D. Student at the Faculty of Electrical Engineering at the University of Ljubljana in Slovenia in 2019-2020. She is a Member of the Mazovia ICT Cluster, the Polish Association of Electrical Engineers, and a Member of the Expert Board of the European Commission and National Centre for Research and Development in Poland. She is also a Member of the Organizing Committees of International Conferences in Poland and India. The scientific interest includes among others electromobility, renewable energy, power electronic converters for electromobility and Renewable Energy Sources (RES), minimizing electromagnetic disturbances generated by power electronic converters, hydrogen technology. At the present, she is working on an innovative solution related to the use of thermoelectric generators for the production of electricity from waste heat. She is an author and co-author of over 25 publications in English and Polish language in Energies, ASTES Journal, elektro.info, and Springer, and also co-author of 4 patent applications. She participates in many national and international conferences and seminars, mainly organized in Asia.

Dr. Sandip Chanda

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He is a B.E from Jadavpur University in Electrical Engineering. He completed his M.Tech Degree in Electrical Engineering from applied Physics Department of Science College, Kolkata and he was awarded Ph.D.(Engineering) form IIEST, Shibpur (Formerly Shibpur B.E. College) in 2015. Dr. Chanda has 18 years of Teaching experience including 13 years of research experience in the field of Electrical Power System. He has worked 2.5 years as Principal and 8 years as head of Electrical Engineering Department of reputed engineering colleges. He has published 46 journals and conference papers in Elsevier, springer, IEEE and in other reputed publications. He has also published 4 books on Smart Grid Research and 4 book chapters available in IET digital library and other reputed publications. Currently he is working as Dean of faculty welfare and Head of Electrical Engineering in Ghani Khan Choudhury Institute of Engineering and Technology, Malda, a CFTI under Ministry of Education, Govt. of India. His research area includes Power system Optimisation, Smart Gird, Renewable Energy Sources and Micro Grid.

Prof. (Dr.) M.Thamarai

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Sri Vasavi Engineering College, Tadepalligudem, Andhra Pradesh, India.

She received a Ph.D. degree in Digital Image processing from Anna University Chennai in 2014. She is working as a professor in ECE department at Sri Vasavi Engineering College, Andhra Pradesh. She has participated and published papers in many National and Internal Conferences and also published 40 papers in National and International journals. Her research interests are Digital image processing, Video coding, Machine Learning, Deep Learning and VLSI implementation of Image processing algorithms. Also interested in Embedded system and robotics.

Paper Id.: 03

Chalcogenide Semiconductor Technology: Present Status and Future Prospects

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Department of Mathematics, School of Basic and Applied Sciences, Adamas University, Kolkata, INDIA

Abstract: Today's electronic devices market depends on wide band semiconductors with the members of chalcogenide compounds. They are chemicals which contain group 16 elements led by oxygen and followed by anion elements, like selenium, sulfur, selenium, tellurium, and others. On the other hand, second components include cations, like, zinc, beryllium, copper, and others. At present, chalcogenide compounds are used for infrared optical windows with strong refractive index. They are used in different optical sensors, especially in photodiode, photo sensor, optical transmission. Obtainable in crystal-like, and nano-crystal-like forms, chalcogenides are noted for their superior electronic, optical, and semiconducting properties. We have discussed present utilization and prospects of this semiconductor. It has been observed that chalcogenides with Cu as another cation component are good to use due to their less toxicity. Even though it is in nanocrystal form. Other chalcogenides are comparatively toxic, for example, cadmium and lead. But they are effectively used in biomedical applications. On the other hand, some applications in photovoltaics are supplemented with copper chalcogenides. They are efficient in clean energy transformation as they efficiently work on photocatalytic activity. In this paper we have reviewed evolutionary applications of chalcogenide compounds in different domains.

Keywords: Semiconductor, Chalcogenide, photonics, Thin film, band gap

Paper Id.: 04

Modeling, Proposal and Investigation of Perforated Membrane Based Micromachined Transducer

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Abstract: Capacitive Micromachined Ultrasonic Transducers (CMUTs) have potential applications in non- contact, non-destructive examiner of thin metal films, gas flow metering, high intensity ultrasonic therapy and non- invasive medical imaging. Elements with sealed cavities have difficulty in stabilising the biasing point; hence perforated membranes can come to a rescue. COMSOL Multiphysics is used for modelling and studying the physical behaviour of vented elements which compared by analytical model. Changes in the resonance frequency are obtained with the device structural parameters and membrane materials. It is observed that varying the perforation dimensions can let us achieve the desired performance.

Keywords: CMUT, Ultrasonic Sensor, Resonance Frequency, COMSOL Multiphysics.

Paper Id.: 06

Modeling and Performance Analysis of an Electric Vehicle using Matlab Simulink

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Abstract: Electric vehicles (EVs) have gained prominence as a sustainable solution to the challenges of traditional internal combustion engine vehicles. This research employs MATLAB as a powerful computational tool to comprehensively analyze and enhance the performance of EVs. The study focuses on the critical power components influencing EV efficiency, namely, aerodynamic power, gradient- related power, and rolling resistance. These factors, linearly dependent on various parameters, significantly impact energy consumption. The primary objective is to maximize the net power available for propulsion while minimizing energy consumption. Achieving a higher net power output enhances overall EV performance and accelerates the attainment of peak speeds. Our multidisciplinary approach encompasses engineering, physics, and computational analysis to optimize these power components. By dissecting and refining these elements, we aim to contribute to the advancement of efficient and sustainable electric mobility solutions. This research not only furthers our understanding of EV performance but also underscores the imperative of enhancing efficiency for a greener and more energy-conscious future in transportation.

Keywords: Aerodynamic drag coefficient, Electric vehicle, Road gradient, Rolling resistance coefficient.

Paper Id.: 08

Design of Smart Protective Devices for Precision Agriculture Using Internet-Of-Things

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Abstract: Agriculture sector plays an important role in the overall development of Indian economy. Agriculture can be modernized by combining established practices with cutting-edge technology like the Internet of Things (IoT). The IoT-based devices can be tested and evaluated by analysing the detected data and then transmit it to the user. IoT-based sensor networks can be used to supplement farmers' present traditional methods and increasetheir productivity as a solution. The main objective of this work is to forecast the progression of fire by tracking a variety of indications, including temperature, smoke, ultrasonic, and flame signals. This paper proposes a smart and protective IoT-based agricultural system (namely Smart Tech-Fire) which will alert the farmer when fire occurs or any living animals attack at the farm at strange hours. In this work the flame sensors, smoke sensors, and temperature sensors are installed in farms to locate smoke, identify flame, and detect fire attacks. Thus, the goal of this effort is to develop a smart precision agriculture through the use of automation and IoT technology. Our proposed Smart Tech-Fire device is cheaper and simple to handle compare to existing similar designs.

Keywords: Agriculture, IoT, Fire Detection, Node MCU, Flame Detection sensor, Ultrasonic sensor, Buzzer, Cloud platform

Paper Id.: 09

Optimizing Electric Vehicle Performance, Range and Parameter Estimation through NEDC Urban and Suburban Analysis using MATLAB

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Abstract: This research paper focuses on electric vehicle (EV) driving range and parameter estimation, with a specific emphasis on analysing the New European Driving Cycle (NEDC) urban and suburban drive cycles. By meticulously examining these drive cycles, we obtain critical data on the precise moments when an electric vehicle transitions between constant velocity, acceleration, and deceleration phases. Leveraging this information, we explore the comprehensive estimation of essential parameters for electric vehicles. The study commences with anin-depth analysis of the NEDC urban and suburban drive cycles, dissecting the intricate relationship between vehicle speed, power demand, and time progression. We highlight the moments when EVs maintain constant velocity, accelerate, or decelerate, as these phases significantly influence power consumption and driving range. Our research underscores the importance of obtaining precise parameter estimations for electric vehicles. We investigate various techniques for parameter estimation, including battery capacity, energy consumption rates, and powertrain efficiency. These estimations are fundamental for enhancing EV performance and ensuring vehicle owners have a realistic understanding of their range capabilities. Additionally, we present empirical experiments in diverse driving conditions, emphasizing the real-world relevance of parameter estimation techniques. These experiments contribute valuable data to refine our understanding of EV driving range and performance in differentscenarios. The research also emphasizes the role of predictive modelling, data analytics, and advanced technologies in real-time parameter estimation, offering the potential for precise and convenient range predictions, thereby enhancing user confidence.

Keywords: New European Driving Cycle (NEDC), Urban Driving Cycle, Suburban Driving Cycle, Power Demand, Battery Capacity, Energy Consumption, Driving Range.

Paper Id.: 10

A Review on Internet of Things based Energy Management System in Indian Smart Buildings

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Abstract: India's residential sector should create energy-efficient techniques to reverse the country's rapidly risingenergy consumption, given that smart building energy depletion is expected to increase by over eight times. Oneway to reduce cooling and heating loads and satisfy India's climate ambitions is to create more organized smart buildings. The study's goal is to evaluate a building's energy efficiency about its orientation and location (Indian cities). The Energy Management System for smart buildings uses data from IoT devices to optimize energy use. The system gathers data from different Internet of Things devices, like motion, temperature, and smart appliance sensors. It also gathers information on occupancy patterns, weather conditions, and energy consumption. After preprocessing, the gathered data is used to train an algorithm for energy optimization. The model can reduce environmental impact and save costs by optimizing energy usage in a residential building and projecting future energy demands. The suggested algorithm qualifies as a "smart building" since it can serve as the basis for creatingan efficient SEMS with IOT.

Keywords: IoT, BMS, Energy Consumption, Energy Saving, HVAC.

Paper Id.: 11

Investigation of Static and dynamic Analysis of a MEMS Accelerometer based Cantilever Beam

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Abstract: In this work microelectromechanical system (MEMS) accelerometer-based cantilever beam is proposed. Through AC and DC analysis here observed the different parameters. By using all the elements appropriately and applying all the input values the finite element method (FEM) simulation has accomplished appropriately and developed the proper output in both AC and DC analysis. We achieved the variation of resonantfrequency by changing the values of length and width but there will no change in resonant frequency with changing the thickness. In DC analysis, attained the diverse output values x, y, z, rx, ry, rz by changing the inputs.Also, here the resonant frequency vs magnitude and resonant frequency vs phase in linear as well as logarithmic scale have been analysed.

Keywords: MEMS, Accelerometer, FEM, Resonance Frequency, Static Analysis, Dynamic Analysis.

Paper Id.: 12

Investigation of MEMS based Capacitive Ultrasonic Transducer with and without Perforations

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Abstract: In this paper, a study of Capacitive Micromachined Ultrasonic Transducer (CMUT) is done when there is a perforation or aperture in the structure. The comparison is done for with and without perforations regarding capacitance, displacement and frequency. A regular CMUT is taken along with CMUT having perforation right in the centre of the device a perforation on two sides and also, a device with four identical perforations on the sides is also simulated. The change in the behaviour of the devices is studied and compared by varying the radius of the hole from 1 μm to 4 μm. All the FEM simulations are done using COMSOL Multiphysics and compare it by proposed analytical model.

Keywords: Ultrasonic Transducer, Membrane, Displacement, MEMS, Frequency, COMSOL Multiphysics.

Paper Id.: 13

Predictive Modeling of State of Charge in Electric Vehicles through Vehicle Dynamics Analysis and Parameter Optimization

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Abstract: This research paper presents a comprehensive investigation into the intricate relationship between the State of Charge (SOC) of electric vehicles and various critical parameters affecting their performance. Leveraging the principles of vehicle dynamics, we developed a MATLAB code to simulate the SOC characteristics of an electric vehicle under dynamic driving conditions. The study focuses on a specific velocity, corresponding to the maximum speed of the vehicle, as a key operational point. By systematically varying individual vehicle parameters such as tire mass, overall vehicle mass, frontal area, drag coefficient, air density, wind velocity, and road gradient, we meticulously observed thecorresponding impact on SOC. Each parameter was adjusted independently, while keeping the remaining factors constant at specified values of velocity. This approach enabled us to discern the nuanced effects of each parameter on the SOC, providing valuable insights into the intricate interplay between vehicle dynamics and energy management. To establish a quantitative relationship, linear regression analysis was employed to model the SOC as a function of the varying parameters. The results not only reveal the sensitivity of SOC to changes in specific vehicle characteristics but also contribute to the development of predictive models for SOC under diverse driving conditions. Furthermore, by optimizing these parameters to maximize SOC, we obtained a set of optimal values that enhance the electric vehicle's energy efficiency and performance. This research serves as a valuable resource for designing electric vehicles with improved energy management strategies, offering a pathway toward the development of more sustainable and efficient electric transportation systems.

Keywords: State of Charge (SOC), Vehicle Dynamics, MATLAB Simulation, Predictive Modelling, Optimization, Vehicle Parameters, Linear Regression Analysis, Battery Performance.

Paper Id.: 14

A New Combinational Circuit Approach Using Improved Diode Free Adiabatic Logic Families

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Abstract: Primary objective of the paper is to demonstrate efficacy of recently proposed adiabatic circuit called Improved Diode Free Adiabatic Logic (IDFAL), even when subjected to several combinational logic circuits. The IDFAL circuit uses two-phase timing and a complementary split-level sinusoidal power supply. Extensive analyses were carried out for various combinational circuits using the IDFAL at 45 nm, the Berkeley Low Power Predictive Technology Model (LP PTM V2.1). Since adiabatic logic works best at low frequencies, the analyses were performed at 100 KHz and 400 KHz operating frequencies. Simulations were supported with Cadence Virtuoso in an analog circumstantial with spectre simulator. We compare each circuit design using the IDFAL against traditional CMOS andsome recent popular existing adiabatic literatures: clocked CMOS adiabatic logic (CCAL), two-phase clocked adiabatic static CMOS logic (2PASCL), two-phase adiabatic dynamic CMOS logic (2PADCL), adiabatic dynamic CMOS logic (ADCL), diode-free adiabatic logic (DFAL), and quasi-static energy recovery logic (QSERL). In comparison to the existing adiabatic design techniques, the simulation results showed that the IDFAL has the lowest power delay product (PDP) and energy delay product (EDP).

Keywords: ADCL, Adiabatic, CCAL, DFAL, EDP, IDFAL, Power Analysis, PDP, QSERL, 2PADCL, 2PASCL.

Paper Id.: 15

Optimized Model Designing and Analysis of a Micro Lever for the MEMS based Resonant Accelerometer

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Abstract: Micro leverage mechanism of a MEMS based accelerometer is very well known among the researchers for transuding low impact force into higher one. Due to the dimensional limitation the micro lever is supposed to be operated under the planar motion only. In this paper, among the optimized deigns, one potential structure is chosen based upon the behaviours of the exposure of different g's. Here, a technique based on resonant frequency is introduced to solve this bottle neck so that, get alarm before the major effects of the earthquake. Hence, the role of the micro lever is authentic due to capability of amplification. The parametric analysis of each part of the micro lever has been operated since the mechanics of the device is dimension dependent. The distance between output and pivot portion also impacts the lever working which also has been discussed. Further the parametric analysis of the various parts of the micro lever has been designed and simulated to see the impact on a higher amplification.

Keywords: MEMS VBA, Micro leverage mechanism, Compliance mechanism, Single stage second kind lever, pivot.

Paper Id.: 16

Investigation and Analysis of Parameter Extraction of MEMS Accelerometer Based Early Earthquake Warning System

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Abstract: The following paper examines the early earthquake warning system with an examination of its length,width, and thickness utilizing micro electro mechanical technology. Boundary conditions are employed to complete the proof mass dimensional analysis. 124 kHz was shown to be the natural frequency using the FEM model. We discovered that thickness is the most distinctive parameter throughout the whole simulation, a change in thickness does not alter the natural frequency. The simulation model validates the moment of inertia and electromechanical models. Obeying the displacement curve's order and biasing the vibrating beam's X, Y, and Zdisplacement with range.

Keywords: Electrode biasing, Natural frequency of the beam, deformed shape, Mode of the beams, MEMS, FEM.

Paper Id.: 17

A Comprehensive Approach to Design, Modelling, and Simulation of a Stand-Alone System Integrating Hybrid Solar PV, Battery, and Diesel Generator Components- ACase Study on Shinshicho Primary Hospital, Ethiopia

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Abstract: Solar photovoltaic (PV) technology has emerged as a formidable solution in mitigating the adverse effects of greenhouse gas emissions and environmental degradation, prevalent challenges stemming from the reliance on non- renewable energy sources. Recognizing the urgency to address these issues, hybrid PV/diesel power systems have garnered attention for their potential in enhancing power generation systems, particularly to elevate the efficacy of local Health Centre services. In the pursuit of sustainable energy solutions, off-grid hybrid systems have emerged as a promising avenue, catering to the electrification needs of rural areas. These systems encompass a multifacetedapproach, addressing concerns of reliability, sustainability, and environmental preservation. Leveraging advanced tools such as HOMER modelling, the design and simulation of hybrid off-grid systems, alongside the evaluation of existing diesel generator (DG) power supply, have become imperative. This paper embarks on a comprehensive exploration with the overarching objective of designing, modelling, and simulating an off-grid power system tailored for the Shinshicho Primary Hospital. Nestled in the heart of Shinshicho Town within the Kembata Tembaro Zone, this healthcare facility stands as a focal point for community well-being. The proposed hybrid system integrates solar PV, diesel generators, and battery storage, offering a robust and resilient energy solution. Throughout the optimization process, a primary load demand of 276 kilowatt-hours per day and a peak load of 40 kilowatts were pivotal considerations. The intricate balance of these parameters was achieved through meticulous planning and the integration of cutting- edge technologies. The financial landscape of this hybrid system reveals an initial capital requirement of $160,500, complemented by operational and maintenance costs amounting to $14,824. Over the projected 20-year lifespan, the total net present cost (NPC) is estimated at $216,155. With these economic parameters in mind, the cost- effectiveness of the selected hybrid system is underscored by a CEO (cost of energy) of 0.187 dollars per kilowatt- hour. This metric not only highlights the economic viability of the proposed solution but also positions it as a sustainable and financially prudent choice for meeting the energy needs of Shinshicho Primary Hospital. As we delve into the intricacies of this hybrid power system the potential for transformative change in the healthcare sector becomes evident, underscoring the broader impact of sustainable energy solutions on community well-being.

Keywords: HOMER, solar PV system, Diesel generator, stand-alone, Hybrid system, system simulation, economicanalysis, CO2emission,

Paper Id.: 18

Integrating Sensitivity Analysis and Machine Learning for Predictive Modelling of ElectricVehicle Driving Range

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Abstract: This research investigates the driving range of an electric vehicle (EV) through a comprehensive sensitivity analysis, exploring the impact of various parameters such as vehicle mass, rolling resistance coefficient, battery capacity, battery discharge efficiency, motor efficiency, and mechanical transmission efficiency. MATLAB simulations were conducted, generating a series of figures depicting driving range variations at a constant velocity. The study employs linear regression in machine learning to establish relationships between driving range and the identified parameters. The predictive model is assessed using mean square error to quantify its accuracy. By leveraging machine learning techniques, this research aims toprovide a robust framework for predicting EV driving range under diverse operating conditions. The generated figures reveal intricate patterns and trade-offs inherent in different parameter configurations, offering valuable insights into the design and optimization of electric vehicles. The subsequent application of linear regression establishes quantitative relationships, allowing for accurate predictions of driving range based on key parameters. The mean square error analysis provides a measure of the reliability of the predictive model, highlighting its potential for real-world applications. This integrated approach, combining sensitivity analysis and machine learning, contributes to the advancement of EV technology and supports informed decision-making in the design and operation of electric vehicles. The findings not only deepen our understanding of the complex interplay of factors influencing driving range but also provide a practical tool for engineers andresearchers in the ongoing pursuit of sustainable and efficient electric transportation systems.

Paper Id.: 20

Enhancing Decision-Making Through Master Data Management for Leveraging Soft Computing and Optimization Techniques

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Abstract: This research explores the impact of integrating Master Data Management (MDM) with soft computing and optimization techniques on organizational performance. By incorporating fuzzy logic, neural networks, and genetic algorithms into the MDM framework, data accuracy improved by 20%, significantly reducing duplicationand enhancing error detection. Optimization algorithms also reduced data integration time by 30%, boosting decision-making speed and operational efficiency. Financially, operational costs associated with data management decreased by 15%, attributed to improved resource utilization and streamlined data governance. Additionally, there was a 25% increase in customer satisfaction due to enhanced data-driven personalization. Optimization methodologies also contributed to a 10% increase in resource utilization efficiency. These findings showcase the transformative potential of merging MDM with computational techniques, delivering empirical evidence of benefits across data quality, decision-making, cost efficiency, customer satisfaction, and resource allocation.

Keywords: Master Data Management, MDM, Soft Computing, Optimization Techniques, Data Quality, Decision-Making, Fuzzy Logic, Neural Networks, Genetic Algorithms, Operational Efficiency.

Paper Id.: 22

Comparative Analysis of Tunnelling Magnetoresistance of Fe/MgO/Fe, Co/MgO/Co and Ni/MgO/Ni Magnetic Tunnel Junctions

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Abstract—This paper presents the impact of the electrode materials on Tunnelling Magneto Resistance (TMR) ratio of MTJ. This study utilizes Quantum ATK simulation tools to conduct a comprehensive comparative analysis of TMR in two common MTJ configurations: Fe/MgO/Fe, Co/MgO/Co and Ni/MgO/Ni. The research paper encompasses the relaxation of the devices and subsequent analysis in both parallel and anti-parallel magnetic alignments. This analysis yields transmission coefficients and spectrum graphs, enabling the calculation of TMR values for both configurations. The findings provide essential insights into the comparative behaviour of Fe/MgO/Fe, Co/MgO/Co and Ni/MgO/Ni MTJs in the realm of spintronics.

Keywords: Spintronics; Magnetic Tunnel Junction (MTJ); Tunnelling Magneto-Resistance (TMR);

Paper Id.: 23

Techno-economic analysis and operational challenges of a standalone integrated renewable energy system

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Abstract: This paper presents a comprehensive analysis of a stand- alone integrated renewable energy system (IRES) for addressing the technical, economic, and operational challenges. In the context, different renewable resource based three configurations viz: SPV/BES, HPP/SPV/BES, and BGG/HPP/SPV/BES are compared in terms of life cycle cost (LCC) and cost of energy (COE) at 0% loss of power supply probability (LPSP). The system is coded in MATLAB© environment for optimal sizing and economic analysis. The findings suggest that the BGG/HPP/SPV/BES configuration provides the most cost-effective results, showcasing a total LCC of $917,000 and COE of 0.22 $/kWh. In response to technical and operational challenges, particularly those related to load frequency control, a MATLAB/Simulink modelof optimal configuration is developed. Introducing a fuzzy logic controller tuned proportional integral derivative (FL- PID) controller, aiming to sustain equilibrium in active power, stable DC bus voltage, consistent output AC voltage, effectively managing fluctuations in solar radiation and load demand. These findings provide vital insights for the successful design and implementation of IRESs.

Keywords: Renewable energy, Techno-economic analysis, load frequency control, MATLAB/Simulink model, FL- PID controller.

Paper Id.: 24

Frequency Re-configurable Two Port MIMO Antenna for Cognitive Radio Applications

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Abstract: In this paper, compact, novel shaped, and efficient frequency reconfigurable monopole antenna is built on a 1.6 mm thick FR-4 substrate. To achieve frequency reconfigurability in the simulation, the lumped element components—that is, resistance, inductance, and capacitance—are employed as switches inside the planned antenna's radiating structure to achieve two single bands and two dual band modes. Moreover, PIN diodes are used in the measurement setup to attain reconfigurability. Every switch has a 1 mm slot set aside for its integration. To achieve frequency reconfigurability, PIN diodes are employed in the measuring process.

Paper Id.: 25

A New Proposed Rectifier for Low-Power RF Energy Harvesting Applications

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Abstract: The goal of this study is to create a unique rectifying circuit for 2.45 GHz harvesting applications. Additionally, it aims to improve the output voltage when compared to the Dickson and Cockcroft-Walton rectifiercircuits. The new proposed rectifier has an excellent output threshold, and maximum output voltage. It achieves a superior power conversion efficiency (PCE) with an improvement degree of 43% in the case of the Dickson rectifier and 47% in the case of the Cockcroft-Walton rectifier. The suggested rectifier circuit is developed and simulated using the Schottky diode HSMS 285C with an input power variation from -20 to 35 dBm.

Keywords: Dickson rectifier, Cockcroft-Walton rectifier, energy harvesting, RF energy, power conversionefficiency (PCE), Schottky diode.

Paper Id.: 27

Design Optimization of Variable Inerter based on Vehicle Suspension Performance Criteria

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Abstract: Inerter, a mechanical two-terminal component that has force proportional to relative acceleration between its two terminals, has recently emerged as a promising suspension element to vehicle suspension systems. However, previous research studies have shown that the suspension improvement offered by a passive inerter is marginal. To address this limitation, this paper proposes a novel design of variable inerter, providing non-linear characteristic. However, the design of such a variable inerter poses challenges, specifically in determining unknown design parameters. With the goal of maximizing the suspension performance improvement, a multi- objective optimization approach is carried out to determine the optimal suspension performance improvement of variable inerter based on quarter vehicle model. The optimization framework involves minimizing vehicle suspension performance criteria, such as vehicle body acceleration and dynamic tire load. Both aspects affect theride comfort and road holding ability of a vehicle to ensure the passengers' safety. The variable inerter is applied to both typical passenger car and heavy vehicle such as truck and the simulation result showed that a variable inerter outperforms passive inerter in both cases. Notably, the performance improvement achieved in heavy vehicles is more substantial when compared to passenger cars. Therefore, the implementation of variable inerter in vehicle suspensions is beneficial.

Keywords: Variable inerter, Non-linear characteristic, Multi-objective optimization, Vehicle suspension system,Ride comfort and handling.

Paper Id.: 28

Modern Low Power FETs and Its Applications

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Abstract: The pursuit of high performance, density, low power and low voltage requirements propels the miniaturization of modern solid-state devices. The transition from microscale to nanoscale device structures is driven by the imperative of miniaturization. Due to the immense scaling-down of conventional Metal Oxide Field Effect Transistor (MOSFET) topologies over the past three decades, researchers have reached the limits of conventional silicon-based Field Effect Transistors (FETs). Consequently, the semiconductor industry is phasing out planar Complementary Metal Oxide Semiconductors (CMOS), embracing new architectures such as Fin Field-Effect Transistors (FinFETs) and Tunnel Field Effect Transistors (TFETs) to prolong Moore's Law in the realm of Nanoscale technologies. This paper examines planar CMOS evolution, scaling challenges, optimization technologies, and the forthcoming nanoarchitectures surpassing planar CMOS limitations. Beyond the 22 nm threshold, emerging FinFET and TFET technologies are scrutinized for their architecture, advantages, and associated manufacturing challenges. This architecture limitation is thoroughly discussed in this manuscript. Furthermore, insights are provided on prospective design structures of FinFETs and TFETs. FinFETs and TFETsare promising devices for ultra-low power applications and are useful in various fields. The 3-dimensional structure of FinFETs and TFETs with sub-threshold slope lesser than 60 mV/decade, makes it preferable for low-power and low-voltage applications.

Keywords: Nanodevice; MOSFET; CMOS; TFET; FinFET; Quantum Well; Nanowire.

Paper Id.: 29

Analysis and Simulations of Silver Interdigitated Electrodes with Natural Rubber Infused Graphene for Capacitive-Based Flexible Pressure Sensor

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Abstract: The development of flexible capacitive pressure sensors has recently drawn significant interest among researchers for emerging wearable electronic devices, monitoring applications and smart systems. However, it still poses a great challenge to design capacitive sensors with high sensitivity. Few studies have reported the use of interdigitated electrode structures in improving the sensitivity of sensors. In this work, graphene-infused natural rubber (NRG) is selected as the sensing dielectric layer owing to its excellent cyclic pressure loading response as well as its high flexibility and conductivity. Here, we reported the impedance response of different graphene content in natural rubber with the optimization of different geometrical parameters of interdigitated electrodes (IDEs). The electrical properties of silver IDEs are simulated using COMSOL Multiphysics software. The impedance properties of NRG and its capability for detecting a wide variety of pressures and bending angles are analysed using a Digilent Analog Discovery impedance analyser. Understanding these properties and how they can be affected is vital in designing highly sensitive capacitive pressure sensors. Simulations were used to show voltage potential, electrical field and capacitance developed between individual digits of electrodes. The impedance analysis was helpful in computing the electrical conductivity of the graphene-infused natural rubber (NRG).

Keywords: Interdigitated electrode, COMSOL, natural rubber, graphene nanoplatelet, pressure sensor, impedance, capacitance.

Paper Id.: 30

Performance Evaluation of Cascaded H-Bridge Multilevel Inverters based on Solar Energy

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Abstract: The last decade has witnessed a notable surge in the use of multilevel inverters, attributed to their ability to produce waveforms with enhanced harmonic profiles. These inverters have found wide application in high voltage and high-power scenarios. Multilevel inverters offer advantages such as lower total harmonic distortion (THD), reduced voltage stress on switching devices, minimized switching losses, and smaller passive filter sizes. They serve in various applications including AC drives, FACTS, and distributed generation. This paper focuses on analysing the performance of 5-level and 7-level cascaded multilevel inverters using the Equal Phase (EP) method across different load conditions. The study calculates the harmonics of cascaded multilevel inverters by substituting solar input for batteries. Results indicate that as the inverter level increases, THD decreases while efficiency improves. The analysis is conducted using Simulink.

Keywords: MLI, THD, MATLAB/SIMULINK, Solar PV.

Paper Id.: 31

Techno-economic Performance Analysis of an Off-Grid Hybrid Power Generation System for Isolated Remote Area of India

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Abstract: The gradual development of smart cities and the concern for bring down the pollution level is promoting electricity generation through off-grid hybrid power generation plant (HPGP). The current investigation aligns with various initiatives undertaken by the Indian Government. In this paper, the techno-economic analysis has been evaluated in software called RETScreen in the village, Chuchat Yakma situated in Leh District in the union territory of Ladakh, India. Panel Generation Factor of Solar PV Array, Number of Solar PV Panels, Size of the Battery and Inverter Sizing for above selected location is obtaining as 3.187, 1187, 3090 units, 147 inverters respectively. The technical and economical analysis performed on RET Screen software for location Chuchat Yakma has provided the optimum solution of HPGP as PV-Battery configuration. Internal rate of return (assets), Net Present Value (NPV), Annual Life Cycle Savings, Benefit - Cost (B-C) Ratio, Debt Service Coverage and Energy Production Cost for this optimal solution is obtained as 2.90%, 30267 USD, 3081 USD / Yr. 1.2, 1.4 and 0.122 USD/kWh, respectively. It is predicted that during operation, HPGP will emit 39.50 ton carbon dioxide (tCO2) as compared to DG only power generating plant, where 564.30 tCO2 will be emitted. The proposed research includes sensitivity analysis and risk analysis for the Net Present Value (NPV) of the project. This involves varying the initial outlay by ±25% in relation to the debt interest rate.

Paper Id.: 32

Galfenol-Based Magnetostrictive Sensors: Comparative Analysis of Various Structures for Efficient Energy Harvesting

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Abstract: Magnetostrictive Material (MsM) having good mechanical properties can efficiently convert the mechanical vibrations present in the environment into electrical energies via the Inverse Magnetostrictive effect. This paper provides an analysis of sensors used for energy harvesting in bending mode focusing especially on Galfenol as the Magnetostrictive Material (MsM). Very few studies are present on the comparative analysis of different structures of Magnetostrictive Sensors and the mathematical approach of the simulated models. This work first deals with the mathematical approach of a cantilever-type Magnetostrictive Sensor, providing an equivalent circuit model for the Magnetostrictive Sensor. The second part of this paper deals with the study that investigated for four different configurations (Cantilever-type, L-shaped, U-shaped, and Double-Galfenol) of Magnetostrictive Sensors. The findings of this work reveal that the cantilever-type Magnetostrictive Sensor outperformed the other sensor configurations in terms of electrical output voltage, distribution of stress, and energy harvesting efficiency. These configurations were simulated using COMSOL Multiphysics 6.1 software.

Keywords: Magnetostrictive Sensor, Galfenol, Villari effect, COMSOL Multiphysics, coil voltage, stress distribution.

Paper Id.: 33

Resiliency Improvement Through Grid Forming Inverter

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Abstract: Natural disasters may result in grid outages which also include critical loads. Thus a resilience enhancement-oriented critical load restoration is required. As transmission lines are exposed to these events, critical loads cannot rely on the grid. Microgrid must be able to deliver power to the critical loads during the event. Here, the critical load restoration is done with the help of a microgrid, by monitoring the disruption in the voltage level at PCC which may cause due to fault or any other disturbances at other parts of the network. An islanding condition arises if the voltage level at the PCC drastically drops, till then the inverters should be able to ride through the low voltage (LVRT).

Keyword: grid forming inverters, grid following inverters, resilience, critical load restoration

Paper Id.: 34

Modeling and Mitigation of Power Loss Due to Dust Deposition over Solar Photovoltaic Modules Near Mining and Industrial Sites

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Abstract: Soiling loss is the power loss in solar photovoltaic (PV) generation systems due to atmospheric solid particledeposition over PV modules. Anthropogenic activities such as vehicle traffic, mining, industrial, and construction work increase the concentration of particulate matter in the atmosphere. The suspended dust particles deposit over the glass surface. The incoming light is partially absorbed, scattered, and transmitted to the PV cells. This work focuses on the mining industry-related dust deposition on solar PV installations in Dhanbad. The atmospheric concentrations near three coal mining areas and two stone-cutting industries are collected, and the average dust deposition rates are estimated. The mass deposition rate is estimated between 0.09 and 0.17 g/m2/week. The cumulative dust deposition accounts for 2.38% to 4.85% soiling loss if the modules are not cleaned for one month. The annual water requirement for cleaning 1 m2 of the solar panels ranges from 6 liters to 15.5 liters to limit the soiling loss below 3%.

Keywords: Photovoltaic system; Soiling loss; Dust.

Paper Id.: 37

PMSG based Micro Hydro Power Generation System fed by variable turbines for supplying electricity to remote areas

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Abstract: This paper presents a permanent magnet synchronous generation (PMSG) based Micro hydro power generation system fed by variable speed turbine for supplying electricity to remote areas. PMSG has been extensively researched for use in wind energy generation system due to its simplicity in control and design. The study presented here is an attempt to use PMSG for variable input hydro-turbine without much control in the turbine side which makes it different from the conventional constant speed turbine. A voltage source converter (VSC) based AC-DC-AC converter is proposed that connects the generator and the load. This is the key component to control and maintain the voltage and frequency constant. The control algorithm of AC-DC-AC converter is so designed to generate the required modulationindex of the PWM which helps to maintain the voltage and frequency and thereby making the proposed system robust and stable. The proposed model is tested under resistive and dynamic loads and the results of the performance analysis is presented. The complete model is simulated in MATLAB Simulink environment.

Keywords: Hydro energy conversion system, variable speed Permanent magnet

Paper Id.: 39

Impact of Soiling and Degradation on the Performance of Floating Solar Photovoltaic Systems in brackish water

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Abstract: In the present era renewable energy drives the future of sustainability, solar energy emerges as a frontrunner, offering clean and green power. While photovoltaic technology boasts various forms, the relatively new floating solar photovoltaic (FSPV) presents a promising avenue. However, the impact of soiling and degradation across diverse weather conditions, particularly in wet and dry saline environments, demands further exploration. This research delves into the thermal effects and output efficiency variations caused by particles accumulating on PV modules under such conditions. Additionally, a techno-economic analysis comparing FSPV and LBPV provides valuable insights into the economic feasibility and potential of this innovative technology. A 5 MW floating solar plant located on the brackish water of Pullicat Lake was simulated using a model that accounted for wind speed, albedo, temperature, and soiling for high accuracy. The simulated payback period and energy output were analysed under various soiling and degradation scenarios, revealing an estimated annual energy loss of 4% and a 5% increase in payback time for the installed solar power plant.

Paper Id.: 40

Clearing Space Debris and Reusing the Dead Satellites by Launching them from the International Space Station (ISS): An Innovative Overview

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Abstract: Due to the increase in amount of space missions for scientific research and exploration the space is also getting polluted by the space debris, that are left over on the space. These space debris may be of different types, like – rocket bodies,outdated satellites etc. This paper deals with the concept of clearing space debris by reusing the satellite parts, and the concept of launching satellites from the International Space Station (ISS). This will eventually decrease the space debris and cost of space missions.

Keywords: Docking, Debris, International Space Station (ISS), International Docking Adapter (IDA).

Paper Id.: 44

Performance Analysis of Battery Charging System Using Solar Photovoltaic Technology

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Abstract: Electric vehicles are considered the future of transportation, revolutionizing from a petroleum-based systemto an electricity-based system with the help of renewable energy. Continuous advancement, quality improvement, and widespread production in photovoltaic technologies have made it one of the most commonly used renewable energy sources in the marketplace. This paper analyses the performance of PV modules connected to a battery. The parameters of temperature and irradiance are fed to the PV array input, which is distributed over the availability hours of the sun. The duty cycle of the converter is adjusted based on the irradiance values to maintain a constant load voltage. To generate 150–160 KW of peak power, the PV array comprises 50 parallel strings, each of which is connected to 15 series modules. An analysis of voltage, current, power supplied, and battery state of charge is conducted to determine how variable solar PV output is in relation to climatic variations in temperature and irradiance. The charging profile andcapacity of battery connected to solar PV can be achieved by varying the ampere-hour capacity of battery. An experimental setup for solar PV power is done to assess the technological-economic viability and improve battery charging, possibly expanding it to an FSPV system.

Keywords: Solar PV, Battery Charging, Performance Analysis, Efficiency, Reliability, Environmental Impact,Sustainability.

Paper Id.: 45

Integrating large scale solar plants in the present grid: solutions and future scope

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Abstract: The rapid increase of energy demand strengthens the insecurity of energy and enlargement of greenhouse gas emission for the last couple of decades. Vulnerability of fossil fuel can be diminished after using Renewable Energy Sources (RER) in micro grid. They are the solution of insufficient fossil fuels which creates the negative environmental impact. Solar PV integration in micro grid provides competent, economical and clean energy as well as it creates the steadiness of the existing grid and enhances the operation. But large-scale integration of solar power plant has to deal with several major issues related to inherent intermittency of solar power, reliability, and power quality and inertia problem. This paper presents a thorough literature survey of all the important contributions on large scale integration of solar power. If these problems are properly handled, their effect will be minimized. So, suitable solutions are also highlighted here.

Keywords: inertia, intermittent, power quality, solar integration.

Paper Id.: 46

A Protection Scheme for the Transmission Line Connecting Large-Scale Centralized Solar PV Plant

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Abstract: The grid connected large-scale centralized solar photovoltaic (LSC-SPVP) plants affect the performance of conventionally used distance relaying-based transmission line protection scheme. In this paper, an improved fault detection, classification and location estimation technique is proposed for such crucial transmission lines using the line end voltage and current measurements. The method utilizes the magnitude ratios of the line end phase currents for detection and classification of the fault. The apparent power delivered to the fault from both ends of the transmission line is used further for the estimation of fault resistance. Using the estimated value of the fault resistance, the incremental impedance, the actual value of the line impedance between the relay and the fault point and the exact location of the fault is calculated. Performance of the protection technique is verified on different fault and non-fault cases simulated on a 50 MW solar PV plant connected test power system using MATLAB/Simulink. The obtained results clearly show that using the proposed method, fast and accurate detection, classification and location estimation of faults can be achieved in LSC-SPVP connected transmission line.

Keywords: Distance relay, Fault detection, Faulty phase identification, Fault location estimation, Fault resistance, Incremental fault impedance, Solar PV plants.

Paper Id.: 48

Realistic Building Energy Management System to Reduce Electricity Bill for the Benefit of Consumer

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Abstract: Day by day demand for electricity and its consumption are increasing which is leading us towards the deterioration of fossil fuels. To overcome these problem scientists are working on various technologies. One of the main reasons of consuming additional electricity is the unconscious consumption by the people. Offering of this paper is that the proposed model will help us to minimize cost of energy consumption and also helping consumer to reduce unnecessary electricity consumption of the apartments or buildings by notifying resident. The main objective here is to minimizing the daily energy cost without affecting the comfort of consumers. The proposed system is an energy management system to monitor and select real-time cost-effective supplier for the benefit of consumer as well as necessary alarm to the consumer for the over or unnecessary consumption of energy which will be extra burden for the consumer. The system also includes a monitoring device which alert the consumer and show a visual notification to the resident when an over consumption situation of energy will occur. This paper aims: reduction of electricity bills for customers. Another social advantage of this system is that the proposed system will give a good impact on environment mainly it has an indirect effect to reduce pollution. It will help to produce less ashes and greenhouse gases and so less pollution occur.

Keywords: Smart Home Energy Management System (HEMS), Smart Building, Energy Management System (EMS), Cost Comparison

Paper Id.: 49

Solar-Powered Passenger Management System A Sustainable Solution for Public Transport Optimization

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Abstract: Public transportation systems, which are critical for urban mobility, frequently struggle to sustain optimal passenger loads. This study proposes a novel technique for monitoring passenger admission and exit in public transportation systems, assuring compliance with predefined occupancy limitations. An automated technique is used to manage instances of manual interventions by conductors or drivers requesting people to disembark owing to overcapacity. The suggested prototype makes use of the Arduino Uno as a central controller to orchestrate the collecting and analysis of daily passenger data. Infrared laser sensors installed at bus entry and exit points allow for real-time passenger counting and precise occupancy status. The Arduino collects this data and provides detailed passenger traffic information across several sites. The obtained data not only serves the immediate objective of enforcing passenger limitations, but it also adds to transportation system optimization. Transport authorities can make educated judgments on vehicle deployment by studying passenger trends, increasing efficiency and reducing overcrowding.

Keywords: IR Sensors, Public Transport System, Monitoring, Seat Occupancy, Arduino, Sustainability, PCS (passengercountingsystem), Solar cell, Monitoring.

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Paper Id.: 50

Tool Wear Estimation On-chip Using Artificial Neural Network (ANN) Model

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Abstract: In micro milling, Tool wear estimation is crucial because it improves job surface quality and process integrity. Technology innovation for the betterment of society is now becoming the daily activity of researchers. The factors such as simple, robust installation are always the concern during the implementation of new technology. Unlike the other Tool wear estimation process where the conventional scale machining is used or in other Machine Learning oriented process where third party software is used for classification of model. In this work Arduino Nano 33 Ble sense is used which has a embedded Machine Learning where classification of ANN model is done. The input to the model is 3-Axis acceleration data from LSM9DS1- 9 axis IMU sensor in the board, which is taken via Bluetooth at various stages of micro milling operation for different Artificially created tool wear lengths. Then the model is used for Tool wear estimation. All experiments were conducted in CSIR Lab.

Keywords: Tool wear, Micro-milling, Artificial Neural Network, Arduino Nano 33ble Sense, Arduino Nano 33ble, IMU sensor TensorFlowLite, TinyML.

Paper Id.: 51

Optimal Allocation of EV Charging Stations in Hybrid Renewable Energy Sources Integrated Distributed System

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Abstract: Electric Vehicles (EVs) adoption is hampered by environmental damage and fossil fuel reliance, as the surge in EV use escalates electricity demand, necessitating increased energy production. In addition to the surge in EV usage, there is a pressing need for EV Charging Stations (EVCS) to facilitate the charging process in the Radial Distribution System (RDS). For the widespread adoption of EVs, it is essential to develop adequate EVCS. The improper placing of EVCS significantly degrades the power quality of the RDS. This paper discusses the optimal allocation of the EVCS in the IEEE 33 bus RDS considering Hybrid Energy Sources (HES). To ensure convenient charging at various locations, the RDS is divided into three areas, with one EVCS and HES assigned to each of these areas. Furthermore, Energy Storage (ES) system is used in this study to mitigate the imbalance created from the HES and enhancing the system's reliability. The main objective of this workis to minimize the 24-hour energy loss of the network. The issue has been tackled by utilizing the Symbiotic Organisms Search (SOS) technique. The obtained result has been validated by utilizing Grey Wolf Optimizer (GWO) and Whale Optimization Algorithm (WOA). From the results, it is observed that the appropriate allocation of EVCS in the RDS consisting HES along with ES enhances the power system performance.

Keywords: Electric Vehicle Charging Stations, Energy Storage, Grey Wolf Optimizer, Hybrid Energy Sources, Symbiotic Organisms Search,Whale Optimization Algorithm.

Paper Id.: 52

PV MPPT based on Fuzzy logic Controller and regulating PV output Voltage for battery Charging Application

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Abstract: Photovoltaic (PV) power Produces Changing Direct Current (DC) power depending on the Tropospheric conditions such as intensity of falling sunlight on PV cell. However, by using the appropriate maximum power point tracking (MPPT) approaches the maximum PV power output can be achieved and thereby regulating the PV voltage by use of suitable DC-DC converter. This paper presents the tracking of maximum PV power and regulation of PV output voltage using fuzzy logic controller (FLC) on MATLAB Simulink (MS) through buck boost DC to DC converter with battery-based dynamics loads.

Keywords: Fuzzy logic controller, Maximum power points Perturb and observe, Photovoltaic Cell, buck boost converter.

Paper Id.: 53

Eco-Culinary Innovation: Solar-Powered Induction Cooking for a Greener Future

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Abstract: The solar induction cooker emerges as a pioneering technology, demonstrating exceptional efficiency and cost-effectiveness in culinary applications. This innovation ensures a noteworthy 90% energy transfer efficiency to the food, a substantial improvement over the approximately 40% efficiency of gas and 74% of traditional electric systems. This paper explores the domain of solar energy-based induction cooking systems, where solar power serves as the primary energy source. It provides a comprehensive review, encompassing economic analysis, lifecycle assessment, and a comparative study between conventional induction stoves and solar-powered counterparts. The research presented here yields multiple contributions, including the design of a solar-powered induction cooking system, a thorough lifecycle analysis evaluating its sustainability, a comparative study elucidating its advantages over other cooking systems, and the practical implementation of the solar-powered induction cooking system. This study significantly advances sustainable and energy-efficient cooking technologies, with implications for both domestic and industrial culinary applications. The findings presented herein offer valuable insights into the potential of solar induction cooking, paving the way for a more environmentally friendly and economically viable culinary future.

Keywords: Solar Induction Cooking system, Energy efficiency, Sustainable Technology, Economic feasibility, Life cycle economic analysis, Comparative Study.

Paper Id.: 54

Green Internet of Things (IoT) for Sustainable Manufacturing

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Abstract: The manufacturing industry is witnessing an increase in energy requirement or power consumption, waste production and greenhouse gas emissions. It is contributing to global climate change significantly. Even though, leveraging renewable or green energy sources is becoming popular to decelerate the climate change, the adoption is slower than expected. Industries are looking for solutions that will help them become green or sustainable at a rapid pace so that they have less impact on climate changes. This paper aims at providing a guideline on the use to technologies for enabling sustainable manufacturing. The paper has discussed about the objectives of sustainable manufacturing and its various challenges. It has provided the details of green internet of things and how green internet of things can help manufacturing industry become green enabling sustainable manufacturing. It has articulated vivid guidelines and solution approaches for manufacturing industries to adopt green IoT for enabling sustainable development helping the world reach net zero goals.

Keywords: Green IoT, Green Manufacturing, Internet of Things, Recycle, RFID, Sustainability.

Paper Id.: 55

Investigation for Sustainable Development of Micro Agriculture through Hybrid Energy Systems (Solar and Biomass) in Remote Areas of Jharkhand: A Comprehensive Survey

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Abstract: This comprehensive survey explores the potential for sustainable development of micro agriculture in remote areas of Jharkhand through the integration of hybrid energy systems. Focusing on the synergistic combination of solar and biomass energy, the study examines the technical aspects, benefits, and challenges of implementing these systems. The survey examines economic feasibility, environmental sustainability and the role of key stakeholders including the Jharkhand Renewable Energy Development Agency (JREDA). With an emphasis on precision agriculture, this research highlights the transformative impact of hybrid energy solutions on energy access, agricultural productivity, and environmental protection in remote areas of Jharkhand. The findings advocate collaborative efforts between policymakers, researchers, and local communities to realize a greener and more resilient future for micro-agriculture in Jharkhand. This work summarizes the important results of 34 research documents. These are primarily based on three focus areas (i) the potential of micro agriculture inJharkhand, (ii) the deployment of hybrid energy (solar and biomass) based power generation, and (iii) the role ofstakeholders. The review is expected to support upcoming researchers and power engineering practitioners working on operation and planning including hybrid energy (solar and biomass) based power generation and micro agriculture.

Keywords: Biomass, Hybrid Energy Systems, Jharkhand, JREDA, Micro agriculture, Smart Village, Solar.

Paper Id.: 56

High Frequency Induction based Non-Metallic Pipeline Water Heating Arrangement Under the Paradigm of IoT

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Abstract: The present idea focuses on an induction-based water heating system. This system involves the use ofa helical shaped heating coil through which a high-frequency alternating current flows. Inside this coil, a non- metallic water conduit is positioned. Within the non-metallic pipeline, there are metal teeth that are exposed to high frequency flux, resulting in the generation of eddy currents. This eddy current that induces in the metal teethproduce heat generation within the metal teeth. While the turbulent flow of water inside the pipeline passes through the metal teeth it becomes heated by taking the heat generated in the metal teeth. The primary source of electrical energy is derived from a photovoltaic (PV) array, which supplies a direct current (DC) power source. Amirror inverter is employed in this context to generate high- frequency current within the metal teeth. High frequency source is employed to the input of the helical shaped heating coil to make it energy efficient and fasterresponse. The temperature rise data of the water is transmitted to the cloud-based platform Thing Speak, where anyone with access to the channel can monitor it before using the water. The cloud-specific platform Thing Speak carefully regulate the temperature of water and once it is reached, the supply is instantly halted. The entire systemhas been implemented using Matlab Simulink version 2023b.

Keywords: Induction heating, Helical shaped heating coil, PV array, Inverter, Eddy current, IoT.

Paper Id.: 57

PV Based Battery Swapping Fast Charging Station for Small Passenger Transport Electric Vehicles in Rural West Bengal

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Abstract: The prevalence of Electric Vehicles (EVs) is increasing, offering a solution to the energy crisis and presenting an environmentally friendly transportation alternative. Particularly in rural India, notably in rural West Bengal, the uptake of EVs is becoming more pronounced. Battery operated small vehicles (BoSV) EVs for passenger's transport are extensively utilized for excursions, minimal road space usage, and navigation in narrow roads, door-to- door services, and income generation. However, charging BoSVs poses significant challenges, with improper Electric Vehicle Charging Station (EVCS) placement leading to performance issues and grid overload, causing electrical harmonies, poor power factors, voltage instability, imbalance, and power loss. Local power failures in rural India exacerbates concerns. To tackle these issues, a standalone PV-based charging station has been implemented, featuring a full bridge converter for rapid charging, driven by a photovoltaic (PV) energy-based standalone charging station. Swapping stations (SwS) with standardized exchange slots allow easy insertion of extra battery packs within minutes. The system caters to the evolving needs of BoSV electric vehicles batteries, especially for extended journeys, enabling 24/7 charging for Lead-Acid batteries using both DC and AC methods. The project's key advantage lies in its grid independence, saving approximately 5 hours of lead-acid battery charging time. This empowers operators to utilize the time for transporting passengers and goods, thereby enhancing the transport system and improving the quality of life for rural residents in line with sustainable development goals.

Keywords: Battery swapping station, Battery management system, battery operated small vehicles, Sustainable Development Goal, Zero Voltage Switching, Maximum Power Point.

Paper Id.: 58

Optimization of Power Loss in a Distribution System through Optimal Capacitor Placement using Fuzzy Logic

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Abstract: The distribution system is the last link connecting load sites to the high voltage transmission system, making it an essential component of the electrical power system. To raise the power system's overall efficiency, the distribution system's performance must be improved. One important tactic is to place shunt capacitor banks at specific buses in a deliberate manner for both distribution and transmission, including lines and loads. This is a critical step in enhancing the system's voltage profile. The aim of the capacitor allocation problem in electric distribution networks is to optimize the use of capacitor installations to minimize "energy and peak power (demand) loss reduction." As a consequence, this raises the distribution system's power factor. With the goal of improving the voltage profile and reducing line losses in the distribution system, the methodology focuses on determining the best location and size for capacitors. The load flow programme uses the Gauss-Seidel iterative method, and the IEEE 9-bus system acts as the tested. One important factor in reducing system losses is the placement of capacitors strategically. The proper size and placement of capacitors are determined using fuzzy logic, guaranteeing a productive reactive power (VAR) injection at the system nodes. Taking into account the net results, the effect of capacitor placement on profit and power loss reduction is measured. The design and implementation of all the programs required for this thorough method of distribution system performance optimization are done using MATLAB.

Keywords: Gauss-Seidel load flow method, Bus system, Voltage drop, Power Loss, Size of the capacitor, Voltage sensitivity index (VI), Power loss reduction index (PLRI), Capacitor placement.

Paper Id.: 60

Performance Analysis of Parallel Inverter Systems: A Comparative Study of SpaceVector Modulation and Sinusoidal Pulse Width Modulation in Induction Motor Applications

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Abstract: This paper presents a comprehensive analysis of a parallel inverter system comprising two three-phaseinverters, operating alternately with space vector modulation (SVM) and sinusoidal pulse width modulation (SPWM) techniques. The chosen load for analysis is a three-phase induction motor, and the study primarily focuses on comparing the performance of the two modulations techniques in terms of Total Harmonic Distortion (THD) in the output currents. Simulation results reveal that the application of space vector modulation techniqueexhibits superior performance over sinusoidal pulse width modulation in the context of the parallel inverter system. The investigation extends to the system's capability to effectively share the load of the three-phase induction motor. The parallel inverter configuration demonstrates successful load sharing, showcasing its adaptability and efficiency in distributing the workload among the inverters. The assessment of Total Harmonic Distortion in the output currents serves as a critical metric for evaluating the harmonic content and overall qualityof the waveforms. Through THD analysis, it has been established that the space vector modulation technique contributes to a reduction in harmonic distortion, thus enhancing the overall performance of the parallel inverter system.

Keywords: Parallel Inverter System, Space Vector Modulation, Sinusoidal Pulse Width Modulation, Total Harmonic Distortion, Induction Motor Load Sharing.

Paper Id.: 62

Snubber Fault Detection in a Microgrid Inverter Associated with a Solid Oxide FuelCell

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Abstract: Sustainable energy is essential to microgrids because it provides several advantages that improve the general effectiveness, resilience, and sustainability of these small- scale energy systems. In microgrid applications,solid oxide fuel cells (SOFCs) belong to one kind of fuel cell that can be quite useful. Microgrid inverters with snubber circuits are crucial for many reasons, chief among them being enhanced inverter performance, efficiency, and dependability. This paper suggests a three-phase inverter snubber failure (ISF) detection method for insulated gate bipolar transistor (IGBT) inverters connected to SOFCs utilized in a microgrid (MG). A Discrete Wavelet Transform (DWT) based investigation was performed on the output current of the inverter. The investigation considers the root mean square (RMS) measures of the inverter's output current harmonic spectrum's wavelet coefficients. To find a few specific parameters that are most suited for ISF detection, a comparative study is adopted. An algorithmhas been devised for fault detection to identify ISF.

Keywords: Discrete Wavelet Transform (DWT), IGBT, Inverter, Snubber, Solid Oxide Fuel Cell (SOFC).

Paper Id.: 63

A Novel Approach of ECG Signals Classification Using Adaptive Deep Neural Further Study on Linearization of Echo Intensity Sensing Type Ultrasonic Liquid Level Transducer

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Abstract: The echo intensity sensing type ultrasonic liquid level transducer has the advantage of a simpler designcompared to that of the conventional time of flight (TOF) type linear transducer but it has a non-linear characteristic. A further study on a simple linearization technique of this non-linear transducer is described in thepresent paper. The proposed linearized system consists of an additional reference cylinder partially filled with liquid up to the reference zero level. The cover plate of each cylinder carries an identical set of the ultrasonic transmitting and receiving probes. For the transmitting probes supplied from the same excitation source at 40 kHz,the echo intensities of the waves in the two cylinders are measured by two receiving probes and two identical signal conditioner circuits which give the output DC voltage signals non-linearly varying with the variation of liquid level. The proposed linearization circuit utilizes these two signals to give a final DC output signal varying linearly with the variation of liquid level. The characteristic equations of a prototype model of the proposed transducer unit derived in the paper are found to be supported by the results of the repeated experiments.

Keywords: Echo intensity of ultrasonic wave, Linearization system, Liquid level measurement, Op-Amp, Signalconditioner. Ultrasonic oscillator, Ultrasonic receiver, Ultrasonic transmitter.

Paper Id.: 64

Comparative Investigation of Visible to SWIR LASERs for Terrestrial FSO Link Analysis Under Various Meteorological Circumstances

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Abstract: This paper compares coherent optical sources operating in the visible to short wavelength infrared (SWIR) spectral bands at various wavelengths, such as lasers operating in longer-range terrestrial free space optical links under varying atmospheric circumstances. For the link range of five kilo meters, different laser sources have been taken into consideration in this comparison research. For instance, two visible wavelengths (532 nm, 640 nm), two near infrared wavelengths (NIR) (808 nm, 980 nm), and one short wavelength infrared (SWIR) (1550 nm) have all been discussed. Additional characteristics include a 100 MHz data transmission frequency and Return to Zero On-Off Keying (RZ-OOK) modulation technique. Fog, rain, dust, snow, turbulence, and other atmospheric phenomena have a significant impact on the terrestrial FSO link. Thus, in order to retain dependable connection performance and recover the conveniently supplied information in inclement weather, transmitted optical power is a crucial requirement. Other parameters like optical power attenuation, signal to noise ratio (SNR), bit error rate (BER), etc. have been analyzed at the receiver end using proper optics for each wavelength at a distance of 5 km in various adverse atmospheric conditions. From the link analysis computation, it has been revealed that the link margin for 1550 nm, 980 nm, 808 nm, 640 nm, and 532 nm Lasers are about 64 dB, 61.2 dB, 60 dB, 59 dB, and 57 dB respectively for 5 km link range at adverse atmospheric scenario.

Keywords: Adverse atmospheric conditions; Link Margin; Optical power attenuation; Optical Wireless Communication; SWIR; Visibility; Terrestrial FSO link

Paper Id.: 65

GaN-based Inverters for Electric Vehicles: Challenges and Opportunities

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Abstract: Wide bandgap semiconductor devices such as Gallium Nitride (GaN) present promising opportunities to enhance the design of electric vehicle (EV) powertrain systems. The rapid adoption of EVs calls for continued innovation in achieving compact, lightweight and highly efficient inverter systems. GaN devices offer superior switching frequencies, breakdown voltages and thermal conductivity over traditional silicon which can facilitate significant system improvements. However, the extremely fast transistor switching speeds of GaN inverters pose considerable challenges from an electromagnetic compatibility perspective regarding conducted and radiated emissions. The reliability of these emerging devices also requires comprehensive investigation under realistic electrical and thermal cycling. The possibility for problems like dynamic on-state resistance variations, overcurrent failure modes, reverse conduction degradation, and gate driver instabilities necessitate rigorous testing and analysis to instill confidence prior to large-scale deployment in EVs. When successfully mitigated, the advantages of GaN inverters include potential efficiency gains enabling extended driving range, smaller and lighter traction inverters, precise motor control attributes, modularity for scalable and redundant designs, and even integrated charger configurations for bidirectional vehicle-to-grid interactions. The paper provides an extensive exploration into state-of-the-art GaN inverter architectures for EV integration, associated challenges and reliability concerns compared to silicon applications, study of progressive opportunities, failure mode evaluations, and an outlook on continuing innovations in this domain.

Paper Id.: 66

Design and Construction of Pure Sine Wave Single-Phase SPWM Inverter Using IC8038

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Abstract: Earlier in the designing of Sinusoidal Pulse Width Modulation (SPWM) inverter the major drawback was to eliminate the harmonics present in it. In the manuscript, complete elimination of harmonics has been achieved. The paper is based on Sinusoidal Pulse Width Modulation. Inverter is a device that uses DC Source as input and converts it into AC (output). IC8038 is used to generate the sine wave of 50Hz and triangle wave of 300Hz. With the help of Operational Amplifier LM741, the voltages of two wave are compared. The P-Channel Metal Oxide Semiconductor Field Effect Transistor (MOSFETs) with part number IRF9540 and N-Channel MOSFETs IRF540 is used for switching purpose. The MOSFETs are given supply from +12V battery and the gate pulse is given from comparator output. The MOSFETs are configured in the form of 'H' and the name given as H-Bridge. Through the switching instant of MOSFETs, the output from the load of H- Bridge is similar to sine wave including harmonics. To remove those harmonics LCR Filter is used. The output of Filter circuit is pure sine wave of frequency 49.94 Hz. The accuracy in the frequency output is 99.88%.

Keywords: Sinusoidal Pulse Width Modulation (SPWM), Operational Amplifier, Bridge Circuits, Switching Circuits, H-Bridge, LCR Filter.

Paper Id.: 68

Single Dc Source Based 9-Level Inverter with Improved Gain Factor

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Abstract: The development of switched-capacitor multilevel inverters has been driven by the growing need for enhanced power quality and increased power capacity. The newly developed switch capacitor based MLI allow for both voltage amplification and inversion in a single stage, resulting in an increased alternating current output. This study presents a boost-type single-source nine-level MLI that utilizes 3 capacitors and minimum no. of switch which aiming to decrease the number of components. Due to the series-parallel connecting method, the voltages across the capacitors are naturally equalized and contribute to a fourfold increase in voltage from a single source. The maximum voltage stress across the semiconductor devices is restricted to only twice the input voltage. The suggested MLI can be expanded to raise the voltage levels without requiring more dc input, while utilizing a minimal number of components. The inclusion of each extension module introduces two extra voltages increments in the output, while keeping the maximum voltage stress equivalent to that of the 9-level circuit. A comprehensive evaluation of recently constructed single-phase 9-level MLIs is conducted, which includes detailed investigation of the circuit functioning and power losses. This evaluation confirms the excellent design of these MLIs. The 9- level single source MLI's significant properties are verified through extensive simulation and experimental results, specifically, under dynamic operating situations.

Paper Id.: 69

A New and Modified T-Type-based Criss-Cross MLI Integrated for Renewable Energy Sources

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Abstract: High advancements in the arena of power electronics developed a suitable platform to familiarize the different multilevel inverter (MLI) topologies. These MLI topologies comprise different notable characteristics, such as high-quality staircase sinusoidal output voltage, a lowered number of power switches, no filter requirement, etc. In this paper, a new asymmetrical multilevel inverter topology is proposed to reduce the number of the inverter's components with admirable voltage-step creation. The proposed MLI structure provides a high- step, staircase-type, nearly sinusoidal output voltage waveform without increasing the number of power semiconductor switches. Carrier based Sinusoidal Pulse-width Modulation (CB-PWM) technique is employed at a switching frequency of 3 kHz. The operation of the proposed MLI has been discussed in detail. A 17-level inverter is executed; both the MATLAB/SIMULINK as well as the experimental results. The simulation results have been validated by the experimental results for the proposed 17-level MLI for different values of modulationindex.

Keywords: CB-PWM, Power Electronics, MLI, Power Conversion, Reduced Components.

Paper Id.: 70

Salinity-gradient Induced Energy Generation Inside the pH-Sensitive Charged Nanochannel: Impact of Ion Partitioning Effect

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Abstract: In this work, the influence of the ion-partitioning effect enabled by the permittivity difference at the interface is taken into consideration as we investigate the formation of blue energy within the nanochannel havingpH-sensitive polyelectrolyte layer (PEL) under a salinity gradient. By altering the salt concentration of right reservoir (pHR) and permittivity ratio of electrolyte solution to PEL, respectively, we looked into the electric- double layer (EDL) potential field, cationic field, transference number, maximum power generation, optimum power production and its density, conductance, and optimum energy conversion efficiency. It turns out that due of the decrease in screening effect caused by the reduction in cationic concentration, the EDL potential is significantly increased by the ion-partitioning effect. Therefore, we found that PEL permittivity and pHR have a considerable impact on ionic selectivity. For strongly acidic solutions, it implies that power generation decreases at smaller PEL permittivity. Additionally, at both lower and higher pHR values, the maximum energy conversion efficiency decreases as PEL permittivity decreases. Furthermore, the higher power generation density attained in this work supports the novelty of the current energy-generating nanofluidic device when compared to the previously published work.

Keywords: Nanochannle, nanofluidics Electric-double layer (EDL), blue energy generation, ionic transport, ion-partitioning effect.

Paper Id.: 72

Second Law Analysis for Non-Newtonian Fluids Electroosmotic flow in Wavy Microchannel with Finite Ionic Size

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Abstract: We looked into the energy production assessment for heat flow of a non-Newtonian ionic liquid insideof a wavy microchannel, taking into consideration the impact of finite ionic size, under electroosmotic actuation triggered by the applied electric field. The numerical method based on the finite element method gets employed to determine the associated flow, electrical-double layer potential field, and temperature fields. As well, the current model is verified in comparison to the existing theoretical outcomes. Through altering the Brinkman number, thermal Peclet number, steric factor for finite ionic size, Carreau number, dimensionless amplitude, and steric factor for local entropy generation along with viscous, thermal, Joule, and total entropy generation within the wavy microchannel. It is established that an increase in the Carreau number leads to a shear-thinning of the liquid, which in turn raises the total entropy generation. Conversely, an increase in finite ionic size lowers entropy generation. Entropy generation is always decreased when the amplitude of the wavy wall increases. Remarkably, relative to the plane channel, the wavy microchannel consistently show reduced entropy generation. The information gained from this study seems to be pertinent to the production of efficient heat-exchanging devices for electronic cooling.

Keywords: Wavy microchannel, Entropy generation, Electric-double layer (EDL), Forced convection, Electroosmotic flow.

Paper Id.: 73

Fuzzy Based Priority Scheduling in Local Energy Market

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Abstract: The aim of this work is to facilate each consumer of a local energy market with a sufficient supply of electricity at the lowest possible cost. The scheme also guarantees a transparent energy transaction for all the stake holders. In the proposed scheme, the energy unit is asked from the consumer's end. The designed mechanism maythen determine which option is more cost-effective for them and deliver the electricity in a manner based on theirdemand and need priorities. As the validity of scheme is supposed to be verified by real time implementation within the laboratory, some very small-scale available equipment's are used to represent the system.

Keywords: Local Energy Market, Fuzzy based Priority Setting, Blockchain

Paper Id.: 74

Augmented Cooling of Electronics Component inside the Wavy Passage under the Forced Convective Flow

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Abstract: This study aims to investigate how forced convective air flow within a wavy channel cool electronic component. Aluminium foam that is extremely conductive is used to cover the heat-generating component. The current numerical framework takes into account the impact of conjugate heat exchanges of the copper base and convective effect with ambient with plastic cover. Using the Darcy-Brinkman-For chheimer a framework the flow field underneath the porous aluminium foam is implemented. By altering the pore size, the numerical simulations are utilised to look into the flow field, heat flux lines, maximum temperature rise, cooling performance, relative pressure drops, and thermal entropy formation. In addition, a comparison is made between the thermal characteristics of the wavy channel and the corresponding plane channel. It has been seen that the distinct flow topology in the wavy channel, caused by the additional vortices that form there compared to channel with planewall, modifies the associated heat lines. Consequently, for a given flow condition, the usage of wavy wall permitsapproximately a 5K drop in maximum temperature when compared to channel having plane wall. A larger pore size improves cooling performance because the wavy channel experiences a smaller relative pressure drop. Furthermore, the generation of dominating thermal entropy is smaller in wavy channels and decreases gradually as pore size increases. Therefore, the present work's insights are focused on designing cost-effective electroniccooling systems.

Keywords: Electronic cooling, Wavy channel, Forced convection, Porous media flow, Entropy generation,Conjugate heat transfer.

Paper Id.: 75

Perspectives on Solar Photovoltaic Recycling for the Green Manufacturing Sector in India

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Abstract: Solar photovoltaics (PV) is emerging as a reliable and affordable source of low-carbon electricity in India. The rapid installation of PV systems is promoting sustainability. However, unplanned disposal of end-of-life solar PV modules threatens the environment. This paper explores the techno-economic feasibility of Solar PV recycling facilities in India to mitigate waste generation. A recycling facility with a daily recycling capacity of 5 tons PV is explored. The capital cost of 77 lakh Indian rupees is required. The revenue from selling the recycled secondary materials is Rs. 27125/ton. The transport and electricity cost per day is calculated to be Rs. 39,380. The return on investment (ROI) is estimated at 13.75%, with a payback period of 8 years. 66 recycling plants are required to operate 10 hours every day for 20 years to mitigate the disposal of PV modules in India.

Keywords: Solar PV recycling, Solar photovoltaics, Waste management.

Paper Id.: 76

A Novel Vienna Rectifier for Power Quality Improvement of Induction Heating System

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Abstract: This paper employs a novel Vienna Rectifier (VR) to develop and assess a method for lowering harmonics and electromagnetic interference in high-frequency induction heating equipment (IHE). PSIM software was used for the simulation study. High-frequency switches used in IH systems produce unwelcome high-frequency harmonics that can degrade power quality by reflecting back to the power source. In comparison to current models that use active and passive filters, this study suggests an IHE design that uses the VR and shows superior suppression of these harmonics. The study focuses on the use of VR to see the effect on the power quality parameters of IH systems. The study also addresses the use of hysteresis comparators in the design of a VR controller intended for IH system applications.

Keywords: power quality, harmonics, induction heating

Paper Id.: 77

Investigation of a 17 level Switched Capacitor Multilevel Boost Inverter (SC-MLBI) with Reduced Device Count

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Abstract: This research study presents a novel 17 level boost inverter developed based on the switched-capacitor technique. The proposed switched capacitor multilevel boost inverter (SC-MLBI) has boosting ability of output voltage and at the same time it also has capacitor voltage balancing ability. Simultaneously, in order to achieve greater levels voltage output, the cascaded structure of proposed 17 level inverter is devised. Here the operating principle and selection of capacitor in 17 level boost SC-MLBI is described in detail. A low- frequency modulation strategy with optimum switching states has been implemented to switch the inverter. A comparative study with recently reported similar MLIs shows that the proposed boost inverter provides better boosting ability and more cost-effectiveness due to reduced switches. Extensive simulation study in MATLAB/Simulink platform as well as experimental analysis on a laboratory prototype has been conducted to validate the merits, effectiveness, and performances of the proposed 17 level boost inverter.

Keywords: Boosting Factor, Capacitor voltage balancing, Multilevel Inverter, Output Voltage level, Reduced components, Switched-Capacitor

Paper Id.: 78

Deep Plant Guard: A Plant Disease Detection Framework

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Abstract: In the evolving realm of agriculture, accurate and prompt identification of plant diseases is essential to ensure robust crop outputs. For this, we introduce Deep Plant Guard, which is an innovative framework that combines Model Agnostic Meta Learning (MAML) with severity assessment. It leverages DeepLabV3's exceptional segmentation capabilities to locate diseased plant areas while simultaneously determining the specific disease type and its severity. Deep Plant Guard is empowered by Bayesian task augmentation-MAML with multi-scale spatial attention, enabling rapid fine-tuning, even with limited data. A composite loss function synchronizes segmentation and classification during training. After meta-training, Deep Plant Guard excels in adapting to new tasks, providing detailed segmentation masks and vital insights into disease type and severity. Evaluation results, using datasets like Plant Village, Plant Doc, and a new plant disease dataset, demonstrate impressive metrics with 99.1% accuracy, 99.5 sensitivity, and 98.7% specificity, addressing disease typology and severity assessments effectively.

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Keywords: Plant disease detection, segmentation, DeepLabV3, meta-learning, severity estimation.

Paper Id.: 79

Design of a Small Size UWB Antenna with Quad Notch Band using TVDS EBG Structure

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Abstract: A small size microstrip fed ultra-wide bandwidth (UWB) antenna with quad band notch characteristics has been described in this paper. Band notch characteristics are achieved by loading dual number of two via double slot electromagnetic band gap (TVDS EBG) structures. The size of TVDS EBG structure is less compared to other conventional EBG cells. Detailed parametric study, surface current distributions, input impedance and equivalent circuit model are used to analyze the operating principle of the notch band in the proposed antenna. The proposed design is implemented practically and measurement results are portrayed to compare with simulations results that agree reasonably well. Proposed design provides impedance matching from 2.91 to 11.62 GHz (for 2≤VSWR) with successful suppression of WiMAX (3.3 – 3.7 GHz), WLAN (4.91 – 5.35 GHz, and 5.63 – 5.82 GHz) and X-band ITU (8.03 – 8.50 GHz). The measured far-field radiation patterns are stable and group delay is almost constant in the whole operating frequency band. Thus the small size antenna may be an excellent candidate for UWB applications.

Keywords: UWB; EBG; Quad notch band; WiMAX; WLAN; X-band ITU

Paper Id.: 80

Comparative study of Strategic Bidding on IEEE-30 Bus system using Genetic Algorithm and Opposition based Genetic Algorithm

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Abstract: In today's power sector industry, generating company follows various process and principle to receivethe best strategic bidding optimum data at any period of trade. Hence bidding strategy is a very appealing and motivating task. It is an intricate, complex challenging part to maintain the demand and supply fulfilling the generation by maximizing the profit of the participants involved within the market. This paper discusses on a proficient bidding data technique for the maximization of profit of the system using Opposition based Genetic Algorithm (ObGA). This paper produces the bidding model with the appropriate bidding data coefficient for an IEEE-30 bus system in order to compare the Genetic Algorithm with an Opposition learning Genetic Algorithm to provide the difference obtained with the new learning suggesting the technique that gains a reasonable profit, evaluating and implementing the efficiency of the proposed model using the opposition learning optimization.

Keywords: Power market; Bidding Strategy; Profit Maximization; Genetic Algorithm; Opposition Learning.

Paper Id.: 81

Performance Analysis of Machine Learning Algorithms for Estimation of EV penetration

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Abstract: The escalating threat of global warming poses a formidable challenge to sustainability, necessitating atransformative shift in the transportation sector. A pivotal solution lies in transitioning from conventional fuel- based vehicles to Electric Vehicles (EVs), not only to curtail global warming but also to unlock significant social and economic benefits. However, this transition is far from straightforward and consists of many challenges, witha major concern being the accurate estimation of the EV population on our roads. Many parameters influence EV adoption, making it crucial to gauge the potential number of EVs on the road. To address this, our study delves into the depth of machine learning (ML), conducting a performance analysis on techniques such as Random Forest, Decision Trees, Support Vector Machines (SVM), Neural Networks, and K-Nearest Neighbour to estimate the EV population. The models are trained and tested around 10,000 datasets. Evaluation metrics, including the coefficient of determination and root mean square error. The study concludes that Random Forest and SVM perform superior to other models, achieving R-square values nearer to 1 with less error.

Keywords: EV population, Machine Learning, Random Forest, Support Vector Machines, Neural Networks, andK-Nearest Neighbour.

Paper Id.: 82

Automated Fish Farm: A Comprehensive Approach to Automated Feeding, Water Quality Monitoring and Biodiversity Conservation

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Abstract: Global population growth intensifies pressure on food resources, emphasizing the need for sustainable food production. India, ranking third in global fish production, and being fourth-largest fish exporter, the country possesses over 10% of global fish diversity. In the fiscal year 2021-2022, 75% of India's fish production originated from inland fisheries, prompting the need for advancements in fish farming. Our project addresses this by establishing a miniature, automated fish farm to enhance safety, efficiency, and reliability, minimizing human intervention. Aquaculture, involving breeding and harvesting of aquatic organisms, leverages IoT, microprocessors, and automation. Using Arduino UNO and sensors, our project ensures optimal water quality by monitoring parameters like temperature, pH, Total Dissolved Solids (TDS), water color, and electrical conductivity. Automation includes an innovative feeder system with motors and servo facilities for a healthy feeding cycle, promoting fish growth without human intervention. Automatic pump systems, guided by real-time water turbidity and color detection, foster a conducive environment for aquatic life, saving time, money, and power. Emphasizing reliable automation, our project employs fully automated sensors, relays, motors, and a fish counting feature for real-time monitoring and control. This approach ensures precision, accessibility, and error-free management of the fish farm, contributing to wildlife conservation, especially for endangered species like Hilsa and Tuna which can later be extended for other wildlife creatures as well in their respective environment.

Keywords: global population growth, sustainable food production, automated fish farm, safety, efficiency, reliability, Arduino UNO, temperature, pH, TDS, water color, electrical conductivity, feeder system, turbidity and color detection, error-free, wildlife conservation

Paper Id.: 83

Linear Regression Model Implementation for Distributed Generation Siting and Sizing

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Abstract: One of the most important things in improving the performance of an electric grid is the placement and sizing of distributed generation (DG) units. Installing the ideal DG size at the ideal locations has been shown to minimise power loss in an electrical network in addition to improving the voltage stability index. This paper evaluates a simple machine learning algorithm's performance in determining the optimal size and location of a distributed generator (DG) for a test system. An altered version of the IEEE-30 bus test network serves as the testsystem under consideration. The commonly used basic LR machine learning technique was used for the study, and it was discovered that the results closely matched the manually obtained output using MATLAB PSAT.

Keywords: Distributed generation; computational intelligence; power distribution planning; static voltage stability.

Paper Id.: 84

A Demand Response Algorithm for Social Welfare Optimization with Scalable Renewable Energy penetration in Smart Grid

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Abstract: Scalable penetration of Renewable Energy sources (RES) is quite challenging for their ability to disorient the operating conditions of the grid and associated higher investment cost of production of electricity. Incorporation of consumer consumption characteristics through demand response planning can be useful for sustaining the grid operation in presence of RES. This paper presents a flexible demand response algorithm form management of RES within the Smart Grid infrastructure for sustainable and scalable RES integration, maintaining optimal benefit for Generation, Transmission and Distribution Companies causing social welfare. The proposed algorithm also demonstrated to ensure maximum utilization of the available resources such as generator characteristics, demand response, Regional Transmission Unit (RTU) data for optimizing load shedding, cost of electricity generation, adhering standard operating condition in power system. To support the algorithm, a methodology has also been proposed in this paper to obtain the incremental cost characteristics of solar and wind plants from practical data for their effective incorporation in the optimal power flow program (OPF) based demandresponse program. The algorithm and methodology produced dependable results during testing with worst possible contingencies of the system. The highly nonlinear objective function forced the choice of an artificially intelligent modified Differential Evolution based Quantum Particle swarm optimization (DEQPSO) technique, for obtaining global solution in a highly loaded and altered IEEE 30 bus system.

Keywords: RES, Social Welfare, OPF, PSO, Smart Grid, Demand Response.

Paper Id.: 85

Performance Analysis of Underlay Full-Duplex Relay biased Cognitive Radio Network

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Abstract: This paper shows a cognitive radio network (CRN) which examines the end-to-end outage performance of secondary user communicating via full duplex relay network through underlay protocol. All secondary transmitter nodes have an energy detector circuit which allows to sense energy from the radio frequency (RF) of the multiple primary users' transmitters. The benefit of using multiple FD relays along with the underlay mode transmission enables to increase the system throughput. We developed a mathematical analysis to jointly allocate power at each transmitting node in such a manner that maximizes outage performance. The interference effect from multiple PUs as well as presence of self-interference (SI) for FD relay network has also been considered. The closed form expressions of secondary outage probability for FD relay equipped CR network have been assessed while accounting for all interference. Finally, through MATLAB simulations, all analytical as closed form mathematicalequations have been verified.

Keywords: cognitive radio, full-duplex relay, joint underlay/overlay, self-interference.

Paper Id.: 86

Integrated PWM Based Charge Controller for Solar Domestic Load

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Abstract: With a demand-supply mismatch of over 12% of the country's total energy consumption, India is experiencing a persistent energy shortfall. In the electrical sector, which is mostly reliant on coal and other non-renewable energy sources, this trend is noteworthy. Only 7.7% of India's 167,077 MW of installed power capacity comes from renewable energy (RE) sources. Wind power is the most prevalent renewable energy source, with solar energy making up less than 0.1% (on-grid plus off-grid) of the installed capacity at the moment. Finding suitable sites for solar photovoltaic (PV) and concentrating solar power (CSP) projects necessitates a thorough knowledge of the solar resources present at different places. The map data may be used to determine the quantity of solar energy that was accessible.

Keywords: Solar Photovoltaic Cell (SPV), Solar Charge Controller circuit, Load & Lead acid battery.

Paper Id.: 87

Application of Robotics for Implementing Methods Like Spraying, Ploughing and Seed Dispensing in Agricultural System

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Abstract: India is an agriculture-based country. Agriculture, with its allied sectors, is undoubtedly, the largest livelihood provider of this country, more so in the vast rural areas. Farmers work day and night without getting concerned about their health. So, we have come up with an idea of reducing their workload considerably by a robot that can plough the soil, spray water and pesticides, sow the seed and give fertilizer not only to agricultural fields but also to any kind of farming. According to us, this will be an efficient robot, both in terms of the production cost and health perspectives, and will be of immense help to a farmer, thus, will help in the development of the agricultural system of India.

Paper Id.: 88

Design of Efficient Low Power Test Pattern Generation Circuit for FPGA-Based BIST Applications

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Abstract: The test pattern generator (TPG) is a crucial component in circuit testing as it generates specific test patterns to stimulate the circuit under test (CUT). Linear feedback shift registers (LFSRs) are commonly used in pseudorandom Built-In Self-Test (BIST) circuits for generating test vectors during testing. However, the presence of redundant and repeated test patterns often leads to excessive power consumption in test circuitry systems. The diverse designs of TPG engines contribute to increased chip area and overall power consumption of the integrated circuit (IC). In this paper, we propose a novel technique called low power modified LFSR circuit for the test pattern generator, which incorporates various considerations and techniques to achieve power reduction. The proposed design focuses on minimizing unnecessary transitions and activity in test patterns, thus reducing switching activity in the circuit. Simulation results demonstrate that this technique significantly reduces overall power consumption and also area during testing compared to other recently proposed methods.

Keywords: built in self-test (BIST), circuit under test (CUT), integrated circuit (IC), linear feedback shift register(LFSR), testpatter generator (TPG).

Paper Id.: 89

Edge Computing based AWS IoT Framework for Real-time Monitoring of Industrial Induction Heating Systems

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Abstract: Process automation is an integral part of Industry 4.0 adoption. Different industries are using Industrial Internet of Things (IoT) to achieve interconnectedness that accelerates process automation implementation. Distributed IoT sensors help data collection that can be processed locally or centrally to achieve smart and effective system monitoring. Industries based on induction heating system are adopting Industry 4.0 through digital transformation as well and any reference to the appropriate framework will be an accelerator in this regard. A case study has been articulated by the authors to establish a monitoring framework of industries that include induction heating systems and capable of processing data on real-time basis. It will help go through transformation digitally in such industries. It is built on AWS IoT Greengrass and AWS IoT Core mainly. The framework will initiate notifications according to the rules set. The dashboards will display the furnace temperature and its power levels for the desired levels of those parameters. Since the data and interpretation are available remotely and centrally, the framework facilitates centralized decision-making as well.

Keywords: Amazon, AWS, Cloud, Edge, Greengrass, IoT, IoT Core, Monitoring, MQTT

Paper Id.: 90

A Case Study of Electromagnetic Exposure for Electronic Appliances Used in Daily Life

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Abstract: The technology used, such as the Global System for Mobile Communications (GSM), whose output power levels are many times higher than those of Code Division Multiple Access (CDMA) in the field, is a key contributor to the strength of this exposure. Additional engineering components, including as duty cycle, frequency, size of antenna, and adaptive or power management, affect the output power levels of mobile phones and other RF discharge appliances. The evolution of latest wireless communication technologies that release radio frequency electromagnetic fields (RF-EMF) is in progress. Radiofrequency-electromagnetic field exposure of human inhabitants is expanding due to the extensive utilization of mobile phones and other telecommunication and broadcasting technologies. The health effects of electromagnetic radiation from electronic devices, including personal grooming tools, desktop computers, laptops, kitchen appliances, mobile phones, televisions, and their towers, are discussed along with the causes of the radiation's effects.

Keywords: Electromagnetic Radiation, RF-EMF, Exposure assessment, mobile phone handset

Paper Id.: 91

Analysis of Machine Learning-Based Real-Time Decision-Making for Rainfall Prediction

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Abstract: The human has always been fascinating towards technology. It's not limited to one field; today its implementation can be seen in the field of medical health, analysis of data, business solutions etc. Machine learning is one such technology of today's era. As stated by the name of the paper, our project proposed an alternative solution for the people of Sikkim (Majhitar, SMIT) to overcome the problem of heavy rainfall which directly contribute towards land sliding, stoppage of emergency services, transportation services, etc. In such kind of Project; availability of pre-historic data is necessary. The data is derived from NASA website [1]. In regards, more the number of years the better the system can perform. And in our case we took 40 years of prehistoric rainfall data. Our system runs on algorithm of Machine Learning; which provides all necessary tools and modules. A total of 11 algorithms were Trained and tested. Finding out the best and suitable algorithm that suits; is the most important. And for the user side, to give the user an interface of the system, console app is developed. So the user at any moment of time can access to the information.

Keywords: Naïve Bayes, Application, Extreme Rainfall, Prediction, Methodology.

Paper Id.: 92

Feasible Evaluation and Implementation of Novel Water Heating System utilizing Solar Energy

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Abstract: A number of technologies have been created recently to use solar radiation to generate electricity for various purposes, such as heat, light, and other necessities due to the rise in energy demand. To achieve higher efficiency by generating higher temperatures, a solar parabolic trough collector is used. The sun's radiation is collected by the parabolic trough collector over a greater surface area and concentrated onto a small focal point, increasing the intensity of solar energy received at that point. In this report, designing the model of PTC, collector aperture area of 2 $m^2$and rim angle of $90^o$is used. Experiments were done on two absorber tubes materials, stainless steel and GI pipe of 21 mm diameter and 2 m long without glass cover. The pipe contains 0.7 litre of water and there is no flow of water, water temperature is measured after 30 minutes of time interval and Manual tracking system is used for tracking the sun. Experiments were carried out in the last week of May 2022 at Jorhat Institute of Science & Technology (JIST) campus, Jorhat, Assam to perform and analysis of solar parabolic through collector using different absorber tube for domestic water heating.

Keywords: Solar Parabolic Trough Collector, Solar collector, Solar Radiation, Thermocouple, Evacuated Tube collector, Inlet temperature, Outlet temperature, Solar Energy.

Paper Id.: 93

Techno-Economic Analysis and Optimal Scheduling of PV-Powered EV Charging Facilities under Various Climate Conditions in India

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Abstract: Currently, the electric vehicle (EV) market is seeing quick and extensive growth in many countries worldwide. Expanding clean energy infrastructure for electric vehicles (EVs) may effectively reduce greenhousegas emissions and enhance air quality in urban areas. Electric vehicles fitted with solar (PV) systems have the potential to emit fewer emissions compared to conventional electric vehicles charged by the utility grid. Therefore, one viable approach to attain sustainable growth in the current electric car sector is to integrate solar power with electric vehicle charging stations. Electric vehicles (EVs) have seen significant expansion in metropolitan regionsof India in recent years. However, the availability of charging stations remains restricted, and most existing stations rely on the utility grid for electricity. This study presents a solar-powered charging station that is connected to the electrical grid. The station is designed to improve the charging of electric vehicles by using a scheduling approach that maximizes the use of solar power, taking into account the varying levels of solar radiation in India. Furthermore, the proposed model considers the effects of seasonal variations on power generation and the connectivity of electric car charging. The SGTCS makes use of the HOMER Grid software forits implementation.

Keywords: Charging facility, photovoltaic, climate, electric vehicle

Paper Id.: 94

Future Smart Kitchen: A Modern Comfortable Packaging

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Abstract: In this paper it has been demonstrated that IoT (Internet of Thing) based solution can be used to improve the safety and utility of home kitchen or Commercial kitchens. Work has been done towards finding an integrated solution for the problems (Fire, smoke, hazards, etc.) that are very common now-a-days and these may lead to accidents and even loss of life. Using various sensors and a IoT controller, the system has been designed for giving the control to the user's mobile so that any kind of accidents can be stopped beforehand. The user will have access to the parameters (Temperature, smoke, sudden movement etc.) in real time. The user will be notified when parameters go out the safe limits. There will also be additions equipment that can be activated remotely in case of an accident to minimize the loss ensuring the safety. The controlling can be transferred based on the requirement and only authorized used it possible. The mobile and IoT connections is possible through Wi-Fi or internet at both ends. The user can control the operations using a app which will establish connection between the mobile and IoT through internet.

Keywords: Digital and Humidity Sensor, IR Sensor, MQ2 Sensor, Flame Sensor and IoT

Paper Id.: 96

Eco Sustain Village: Affordable Solar-Powered Sustainable Development In India

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Abstract: Reducing fossil energy consumption and addressing the greenhouse effect of CO2 are global priorities requiring collaborative efforts. This has spurred the development of new and renewable energy sources as alternatives to fossil fuels. In rural areas of India, energy consumption has risen due to improved quality of life, increased use of electronic products, and the expansion of new heating systems. The Indian government has implemented support and encourage for new and renewable energy applications emphasizing green-village planning projects. Solar energy emerges as a vital resource for rural green-village planning, offering a sustainable alternative to fossil fuels. Through this work, a remote village in West Bengal, where electricity has not yet reached, is proposed to power some daily loads through solar energy. As a result, an eco-friendly sustainable solution is possible without dependence on the grid. After all, this project has shown that the payback of green villages will come in a much shorter time with less investment in keeping with the rural economy.

Keywords: Solar energy, E-rickshaw, Battery, Solar pump, Grass cutting machine

Paper Id.: 97

Economic Load Dispatch of Thermal Generating System using Space Search Algorithm

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Abstract: The major objective of any power plant is to minimize the cost of power delivery In the competitive and deregulated market of operating systems. Plants consist of several units including hydro, thermal, and gas, each with well-defined characteristics which results in different generating costs at varied load levels. Therefore, cost-efficient planning of plants is important to achieve the overall goal of minimizing operational costs. In this paper, the space search algorithm (SSA) is proposed as a methodology for economic load dispatch. The data of six generating units has been taken to which SSA with different load demands is applied. Here both the best solution and worst solution are calculated and compared in each iteration and finally, when the best and worst solution becomes equal, we get the optimum solution.

Keywords: Economic Load Dispatch, thermal unit, space search algorithm, economic cost

Paper Id.: 98

Incipient fault Identification in Underground Cable using boosting Technique

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Abstract: Underground cables are replacing overhead systems nowadays. Electrical stress and aging are the main causes of incipient faults in underground cables. If such a fault occurs as a current spike for a short period, a permanent fault may appear. Incipient faults, are generally accompanied by arc and are uncertain and random. So, for cable health monitoring, incipient faults should be distinguished from various transient events. DWT technique is implemented to analyze the fault current signature and multi- resolution investigation is done to identify the faulty section. This paper presents a tree-based machine learning classifier Gradient Boosting for distinguishing the incipient faults from non-incipient events that occur in underground distribution cables.

Keywords: Economic Load Dispatch, thermal unit, space search algorithm, economic cost

Paper Id.: 99

Improved Capacitance Modelling for Better Sensitivity Optimization of a Circular MEMS Transducer

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Abstract: A highly precise analytical model has been established for estimating device capacitance, electrostatic force, membrane displacement and natural frequency of silicon nitride (Si3N4) insulated capacitive micromachined ultrasonic transducers (CMUTs) that utilizes circular diaphragms made from Silicon Carbide (SiC) based material. The model has been confirmed by associating capacitance and frequency values with the experimental finite element method (FEM) for different geometric specifications. This model has the potential to enhance the precision of the design approach for CMUT devices and other capacitive-type sensors based on MEMS technology, featuring circular diaphragms.

Keywords: MEMS, Ultrasound, CMUT, SiC, Circular diaphragm, Capacitance, Stress, Strain, COMSOL

Paper Id.: 100

Identification and Path Improvement of Transmission Line Faults Using 1d Complicated Neural Networks

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Abstract: This paper focuses 1D-convolution neural networks (1D-CNN) with a snappy adaptive architecture to prevent fault removal complications and categorization into a computational analytics system by introducing a fast and consistent algorithm for fault identification, categorization, and instructions for transmission networks. The proposed algorithm can be implemented directly to source data, eliminating the need for a separate removal step and leading in a more powerful protected approach. The proposed approach related to the 3-phase voltages and currents at the relay location within the transmission line framework is considered as feedback for the recommended 1D-CNN algorithm. In order to provide the training and test data for the anticipated 1D-CNN approach, a 132 kV power transmission line is simulated using MATLAB/SIMULINK software. The suggested algorithm's test precision is contrasted with two additional neural and fuzzy neural network standard techniques. The numerical results of the test show that, in comparison to other conventional methods under several fault situations, the suggested diagnostic device is fast and efficient for categorizing and controlling the discrepancy oftransmission line fault with greater accuracy.

Keywords: Convolutional Neural Networks, 1D-CNN, fault detection, transmission line, artificial neural networks.

Paper Id.: 101

A Novel Rectifying Circuit for RF Energy Harvesting with A Good Impedance Matching Network

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Abstract: This paper proposes an enhanced adjustable impedance matching network for an RF energy harvesting setup. This demand is addressed by the newly developed 1.8 GHz frequency-limited impedance-matched system(M/N) rectifying circuit displayed below. The proposed RF-DC converter consists of a broadband harmonic reduction low-pass filter (LPF), the impedance matching system, a circuit with a rectifier, and a termination load.This approach requires that the circuit have a sufficient RF input power of -35 dBm in order to operate. The gadget could transform radio frequency energy into controlled DC voltage to power various electrical gadgets. The resultsof the simulation show that the device can precisely match impedance to RF power received in the range of -35 to 0 dBm. This impedance matching network greatly enhances the overall performance of the system. Only the results of the simulation are used to examine the effectiveness of the proposed system. Impedance matching networks and rectifier systems can be helpful in the construction of an effective RF energy collection system. Thisstudy suggests an electromagnetic rectifier that can increase frequency bandwidth without sacrificing high efficiency. The proposed rectifier is ideal for feeding RF energy capture applications because it has the ability to accomplish high RF-DC conversion efficiency.

Keywords: Rectifier, Return loss, RF Energy Harvesting.

Paper Id.: 102

An Overview on Basic Model of Piezo-Electric Mobile Charging Shoe

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Abstract: In our modern world of technologies our lifestyles have become very busy and restless, which also gives a simultaneous increase in usage of our portable electronic devices in our daily life. Just like our mobiles and laptops. But these devices consume a lot of energy and get drained up pretty easily because it has many appsand software which uses very much power [1] whilst using them, and in some situations, it puts us in a very hardsituations where we might require a little bit of extra time to communicate and express your device situation. Therefore, it requires a source of power supply in that particular situation which can keep them going on for those extra few minutes. As we know, it is next to impossible to get a charging point anywhere and everywhere, and even we also seen people fighting and standing a queue to get access to the charging port. Nowadays, the concept of renewable energy in human surrounding instigates a renewed interest. The aim of our project is that we deal with a device which is using piezoelectric material [2] that provides an alternate means for powering mobile/portable devices. A piezoelectric substance is one that produces an electric charge when a mechanical stress is applied to it. Things like transferring ambient mechanical energy can be done by a mechanism with piezoelectric materials, usually we can change vibration into electrical energy that can be stored and used to powerother devices [3]. On the other hand, when an electrical field is applied a mechanical deformation is produced. Piezo-film has the ability produce enough electrical density that can be stored in a rechargeable battery for later use for an emergency situation where there is no power supply is present and need your mobile for just few minutes more. Since, it is an energy regeneration device it encourages walking and thus can also be addressed as an electrical health gadget which favours physical fitness. There is one more feature which has been assimilated into this gadget, is a battery bank which is used to store the charge when the phone is fully charged After doing some research and consulting a medical staff, we have discovered that the pressure point of a foot is heel, mid foot, metatarsophalangeal joint, hallux, and the toes [5]. Consequently, piezoelectric crystals are incubated into the sole and the heel of the shoes as they are considered as the maximum pressure points and via brisk moment and vibrations on the crystals, they generate voltage pulses and minute quantities of current.

Paper Id.: 103

An Improved Grid Forming Mode Control and Demand Side Management with Parallel Power Sharing

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Abstract: Installation of micro-grids and their grid integration is increasingly popular in modern power grids. Forthis purpose, inverter-based resources or the use of Distributed Generators (DGs) have been increased rapidly. Grid following mode (GFL) control is used mostly for these DGs to grid integration to control the voltage sourceconverters (VSCs). But during any faults or contingencies in the grid side, the micro-grid should operate in the islanded mode to prove the uninterrupted power supply to the local loads of the micro-grid, hence the converter switches its operation from grid following mode to grid forming mode (GFM). There are several GFM control methods, among all in this paper, an improved droop control method has been introduced for GFM control that accelerates the islanded micro-grid operation with adequate power sharing using efficient active power (P) – frequency (f) and reactive power (Q) – voltage (V) management. A communication link in terms of a centralized controller has been incorporated inside the droop control strategy where the feedback control helps to maintain V– f within its rated limits as well as low bandwidth operation.

Keywords: Droop Control, Grid Forming Control, Micro-grid

Paper Id.: 104

Transmission Line Congestion Management Using Hybrid Water Cycle Moth Flame Optimization

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Abstract: The worldwide electrical market's restructuring over the past few decades has made network congestion inescapable. Congestion in the power system network jeopardizes the power industry's security, reliability, and economics. Congestion management has thus become one of the most important tasks for system operators in deregulated power markets. Using the Hybrid Water Cycle Moth Flame Optimization (WCMFO) algorithm, this research proposes a method for controlling transmission line congestion in the deregulated power system. This research explores generator rescheduling- based congestion control in the centralized power market model. Newton-Raphson load flow is used to keep all the network constraints within their upper and lower bounds. Congestion cost minimization is the main goal of the proposed congestion management (CM) problem; however, when there is no congestion in the system, the goal shifts to minimization of the total expense of generation, and this instance is taken into consideration as a point of reference when resolving the issue in congested states. For various scenarios of congestion driven by a transmission line failure along with an increase in load in the conventional IEEE 30 bus test system, the congestion-control issue has been resolved using the WCMFO algorithm in MATLAB software. Simulation tests and data analysis demonstrate that the suggested approach is capable of determining the minimal congestion cost by successfully removing system congestion.

Keywords: Congestion Management, Congestion Cost Minimization, Hybrid Water Cycle Moth Flame Optimization, Generator Rescheduling, Deregulated Power System, MATLAB.

Paper Id.: 106

Multi-Input Hybrid DCDC Converter Formulation and Analysis in an Integrated Environment

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Abstract: This paper integrates renewable energy with energy storage system using multiple input non-isolated DC-DC1converter (MINDDC) with single output connected to common dc bus. The overall topology consists of a bidirectional DC-DC converter (BDDC) and a boost converter, which improve solar energy reliability and allow current to flow through the battery in both directions. Renewable energy sources like wind and solar photovoltaics (PV) produce intermittent power. Thus, to increase the system's dependability, reserve energy sources like batteries or ultracapacitors might be used in addition to these sources. The technology as a whole can also be applied to dc-micro grids. In this study, a MATLAB/Simulink simulation of a 5kW MINDDC is analysed. Simulation findings validate the overall system performance

Keywords: Lithium-ion battery, Bidirectional DC-DC1converter, photovoltaic.

Paper Id.: 107

Fault Signal Tracking of Underground Cable fault using Hybrid GA PSO Algorithm

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Abstract: Underground cables are replacing overhead systems nowadays. Electrical stress and aging are the main reasons behind incipient faults in underground cables. If such a fault remains as a current spike for a short period, a permanent fault may appear. A major fault in the underground cable is L-G fault. Hence a hybrid GA- PSO algorithm has been implemented for tracking the fault signal. CUSUM has been used for fault detection as well. amplitude, phase, damping factor, and frequency parameters are estimated for classifying various faults generated in the cable.

Keywords: Underground cable, Fault Analysis, GA-PSO algorithm

Paper Id.: 108

Strategic Framework of Sustainable Energy Integrated EV Charging Stations to Enhance Distribution Network Performance

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Abstract: Electric Vehicles (EVs) represent the future of transportation due to their energy efficiency and environmental sustainability characteristics. The stochastic nature of EV loads on the Radial Distribution Network(RDN) introduces power quality issues, increases network losses, and affects the power system parameters. This paper introduces an approach to strategically allocate EV Charging Stations (EVCS) integrated with Sustainable Energy Sources (SES) in the RDN. The focus is on minimizing Real Power Loss (RPL) and improving the reliability indices parameter. The scenarios that include and exclude RS have been considered to analyze the impact of introducing SES in the RDN with different loads. The capacity of SES has also been optimized in this work. The proposed methodology has been assessed by using the IEEE 69 bus RDN. The IEEE 69 bus RDN has been divided into four zones and each zone consists of one EVCS and one SES to ensure widespread charging facilities and improve the network performance. The Backward Forward Sweep Power Flow (BFSPF) technique has been utilized to perform the analysis by considering the variable parameters of the electrical system. The issues have been formulated as an optimization problem and tackled by applying the Symbiotic Organisms Search(SOS) technique. The outcomes have been compared with Grey Wolf Optimization (GWO), Particle Swarm Optimization (PSO), and Whale Optimization Algorithm (WOA) to validate the effectiveness of the optimal planning to allocate the EVCS and SES. The obtained findings suggest that strategically placing EVCS integrated with SES substantially reduces network losses while enhancing the reliability indices and the power system profile. Keywords: Electric Vehicle Charging Stations, Grey Wolf Optimization, Particle Swarm Optimization, Radial Distribution Network, Reliability, Sustainable Energy Sources, Symbiotic Organisms Search, Whale Optimization Algorithm.

Paper Id.: 110

Wireless Power Transfer for EV Charging Application using Half-Bridge LLC Resonant Converter

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Abstract: This paper explores the integration of wireless power transfer (WPT) systems into electric vehicles (EVs) to address the growing demand for sustainable transportation solutions. Focusing on the application of a highly efficient half-bridge LLC resonant converter, the research aims to enhance the reliability and efficiency of EV charging systems through resonant operation. Employing MATLAB as the simulation platform, the investigation meticulously evaluates the performance of the WPT system under specified conditions, including a 230V AC input voltage and 1.1 kW output power. Critical parameters such as resonance frequency, output power, and power transfer efficiency are systematically examined to optimize the overall effectiveness and feasibility of the proposed WPT system within the context of electric vehicle applications. By addressing key technical aspects and utilizing advanced simulation tools, this research contributes to the ongoing discourse on sustainable transportation solutions. The findings presented herein offer valuable insights for the development of more efficient and reliable WPT systems in the pursuit of a greener and more sustainable future for electric vehicles.

Keywords: Wireless power transfer (WPT), Electric vehicles (EVs), Sustainable transportation, Half-bridge LLC resonant converter, MATLAB.

Paper Id.: 111

An Adaptive Minimal Model IMM Estimator for Aircraft Tracking

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Abstract: This contribution proposes an improved variant of the Interacting Multiple Model (IMM) state estimator which has the potential to provide good tracking performance with less number of component models and corresponding component filters. Accuracy of the IMM estimator for tracking aircraft objects performing unknown manoeuvre in an air traffic control scenario is often obtained by choosing a fairly large number of component estimators covering the range of possible unknown manoeuvres by assigning different process noise covariance levels. The proposed improved variant of IMM, called Adaptive IMM (AIMM) employs a limited number of component filters, incorporating a simple dynamic model and adaptively estimating the process noise covariance, enabling improved estimation performance over traditional non- adaptive filters. The performances of the IMM and AIMM estimators are evaluated by a standard aircraft tracking scenario with Monte Carlo simulation. It was shown that the AIMM performs demonstrably better compared to the traditional IMM filters.

Keywords: Aircraft Tracking, Interacting Multiple Model, State estimation, Kalman Filter.

Paper Id.: 112

Finite Element Method based Performance Assessment of existing Electrical Apparatus in the Distribution Network in the backdrop of increasing renewable penetration

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Abstract: Increasing energy demand and impetus on "Affordable and Clean Energy" (Sustainable Development Goal 7) have necessitated the need to harness different renewable sources of energy. Microgrids integrating one or more non-conventional sources of power like solar, wind, and biomass, besides catering to the local loads export surplus generation to the utility grid. Increasing penetration from renewables in the utility grid leads to bidirectional power flow in the distribution network, the components of which had been designed for the unidirectional flow of power. This work focuses on Ansys-based Finite Element modeling and a detailed analysis of the effects of reverse power flow in existing distribution transformers, the electrical assets of distribution systems that are quite expensive and have lifespans of almost 35-40 years. Case Studies of various conditions of power penetration and load demand handled by an 11kV/0.4 kV, 100 kVA distribution transformer installed at Kakdwip islands in Sundarbans, West Bengal, India have been considered. The work seeks to find whether bidirectional power flow affects specifically the longevity of existing distribution transformers and the allowable percentage of power penetration without depreciating the transformers' lifespan. The study may further be extended to other electrical components like line conductors as well. The work will be useful for Distribution Network Operators to assess the performance of various electrical components and apparatus that will experience the two-way flow of power in distribution networks.

Keywords: Ansys, Bidirectional Power Flow, Distribution Transformer, Core Loss, Loss of Life.

Paper Id.: 113

Grid Connected PV-Inverter integrated with Incremental Conduction Method based MPPT Tracker and Power Controller

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Abstract: The generation of pure sinusoidal voltage is very important factor for grid connected PV based inverter. But as inverter is switching circuit, so harmonics are generated. To eliminate this harmonic switching have to be initiated at correct instant. This is done in this paper by power controller and grid voltage controller. On the other hand, though solar energy is abundant in nature, but this varies with temperature and irradiation on PV panel. So, for having maximum power at different condition from PV panel, maximum power point algorithm has been integrated in the present work.

Keywords: Maximum Power Point Tracker algorithm, Photovoltaic (PV) based inverter, filter, input power controller, grid current controller, Phase-locked loop (PLL).

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The Lotfi A Zadeh Memorial Award is given to **Dr. Ahmad Saifizul Abdullah,** from **Mechanical Engineering Department, University of Malaya, Kuala Lumpur, Malaysia.** in 6th International Conference on Energy Systems, Drives and Automations. Venue: On 30th and 31st December, 2023, in Techno Main, Kolkata, West Bengal, India. as Offline mode. Organizer: Applied Computer Technology, Kolkata, West Bengal., India.

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