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ESDA 2022

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 Applied Computer Technology,

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, mom,
People say, I do them from a far!!

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

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

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

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

Editorial

About 95 papers are received and 60 are selected for presentations in ESDA2022. 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
ESDA2022

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Invited Talk:

Renewable Energy: Order of the Day

It is all about energy, right from morning to night we cannot imagine a single moment in our life without energy, but where this energy is 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 these 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 we will 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, co-operation 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; Pay back 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.

<div align="right">

Dr. Chandan Kumar Chanda
Professor (HAG), Dept of EE, IIEST
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Invited Talk:

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

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.

<div align="right">
Dr. P.K. Sadhu
Professor, department of EE, IIT(ISM) Dhanbad, Jharkhand.
</div>

PID-30:

Design and optimization of an off-grid integrated renewable energy system for remote rural electrification in India

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ABSTRACT

Regardless of the number of electrification projects, residents of remote rural India are still lacking access to grid electricity. This can be due to the expensive extension of the national grid at such locations. This problem can be solved by employing locally available renewable energy resource-based energy generation system. Keeping this in view, under the present study, an attempt has been made to develop an optimal off-grid integrated renewable energy (IRE) system to electrify the cluster of twelve villages located in the remote rural area of Munsyari Block, Pithoragarh district of Uttarakhand state, India. For the aforementioned purpose, an off-grid IRE system comprising SPV/MHP/BGG/BES (base case), has been proposed and optimized based on life cycle cost (LCC) using MATLAB software to serve 8760-hour load demand. The simulation results show that the total LCC and cost of energy (COE) of the base case (optimized without considering the load-resource associated uncertainties) are found as INR 68.77 million and 16 INR/kWh, respectively. The proposed system consists of 676 number of SPV panels, 648 number of BES devices, 25 kW of micro-hydro power, 40 kW of biogas generator and 114 kW of power converter. Finally, the performance of IRE system has been evaluated by considering the load-resource associated uncertainties and found that the LCC and COE of the IRE system are increased by about 66% and 75%, respectively, as compared to the base case. The findings of this study may assist decision-makers, analysts, and IRE system designers in identifying location-based design limitations and developing successful IRE system solutions for isolated rural locations.

Keywords: Integrated renewable energy, Solar photovoltaic, Biogas generator, Micro-hydro power, Optimization, Economic analysis, Uncertainty analysis.

PID-23

Design and analysis of a wireless power transfer system with low voltage stress

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ABSTRACT

In this article a class-ø2 type inverter and a modified class-E type rectifier is integrated and applied in a system for wireless power transfer (WPT). The merits of a resonant class-ø2 inverter are lower switch voltage stress and zero voltage switching(ZVS). A resonant class E/F3 rectifier inductively coupled in the receiving stage reduces the peak voltage stress across diode. The system shown here is tuned to achieve maximum overall Efficiency .The proposed class ø2-E/F3 combination WPT system when Simulated in a Virtual Hardware-in-the-Loop setup operating at 50 KHz yielded a dc-dc efficiency of 94.6%.

Keywords: Wireless power transfer (WPT), zero-voltage switching (ZVS), zero-derivative voltage switching (ZDS), Resonant ClassØ2 inverter, Class E/F3 rectifier.

PID-18:

Effect of Thermal Dispersion on Thermo-Hydraulic Characteristics for Flow through Wavy Solar Power Plant with Metallic Porous Blocks

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ABSTRACT

We investigated the thermo-hydraulic characteristics for conjugate heat flow inside the wavy solar power plant having metallic porous blocks considering the thermal dispersion effect. The Darcy-Brinkman-Forchheimer models are used to simulate the flow field inside the porous blocks. The transport variables are solved numerically using a solver based on the finite element method considering physically appropriate boundary conditions. The temperature field, conductive heat flux, average Nusselt number and performance factor has been investigated by varying the thermal dispersion coefficient and Darcy number. We found that the average temperature decreases and conductive heat flux enhances by thermal dispersion near the bottom wall close to porous blocks. While the rate of increase in average Nusselt number and performance factor with increase in dispersion coefficient is seen to be higher at the higher Reynolds number. Also, performance factor is greater than unity for the higher Reynolds number (= 500). The results of this analysis suggest that the proposed system is cost-effective to be used in the solar power plant.

Keywords: Thermal dispersion, Porous media, Conjugate heat transfer, Average Nusselt number, Performance factor, wavy channel.

PID-4:

Novel and Secure Framework for Secure Cryptography for Future IoT Applications

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Abstract: Machine learning that preserves privacy has a lot of advantages and applications: being able to train and predict on data while it's still encrypted unlocks the value of data that was previously inaccessible owing to privacy concerns. However, multiple technological domains, including encryption, machine learning, distributed systems, and high-performance computing, must come together to make this happen. Machine Learning an application of AI provides a high-performance framework with an easy-to-use interface that abstracts away the majority of the underlying complexity, allowing users with only a basic understanding of machine learning algorithms and TensorFlow to apply state-of-the-art cryptographic techniques. In this research studies a novel framework for secure cryptography is presented through which 100% security is achieved with the only limitation of high computation power which can be further overcome by deep learning technology. . This technique is very important and highly secured and can be used in future IoT Application.
Keywords— Artificial Intelligence, Machine Learning, Encryption, Privacy.

PID-5:

An Automatic System for Health Emergency Estimation using Pose Identification

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Abstract—Human pose estimation is a challenging problem that has made significant progress in the last many years due to its variety of applications in various fields such as sports, healthcare, human-computer interaction, legged locomotion, surveillance, etc. In this work, a novel angle-based posture estimation method has been proposed through which health-related emergency conditions can be addressed. This approach works based on calculating the angle between listed MediaPipe landmarks and calculated threshold values to identify pose. This new perspective of pose estimation is very useful in the identification of health emergencies that can arise for a person due to some unforeseen situation like a heart attack, fall etc. Through the proposed solution such events can be automatically traced with the help of a camera capturing a person's live movements. This makes use of MediaPipe available and implemented an algorithm on top of it using python which tracks the activity of a person such as sitting, standing, lying and fall-down. The test runs of the prototype implemented have proved to be very effective and accurate in tracking day-to-day activities and identifying the above-mentioned health emergencies.

Pid-6:

Machine learning algorithms for prioritization of Test Cases

Ms. Sheetal Sharma
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Dr. Swati V Chande
Professor, IIIM Jaipur

Abstract: Regression testing is required to ensure that modifications to computer code do not disrupt current functionality. Executing all tests may be moment and resource-intensive with the widespread adoption of Agile Development (CI) in web applications, which increases the frequency of running software builds. To solve this gap, Test Case Selection and Prioritization (TCP) strategies for improving testing activities by selecting and prioritizing test cases to supply real-time feedback to programmers have been developed. Scientists have recently relied on Algorithm (ML) approaches to build successful TCP (ML-based TCP). These strategies assist in combining knowledge about new tests from incomplete and imperfect resources to produce reliable projections. This paper undertakes a systematic literature review of ML-based TCP approaches, to perform an in-depth study of the state of the art and provide insights into future research directions. To that goal, we examine twenty-nine primary papers published between 2006 and 2020 and identified using a methodical and recorded approach. This work covers five research concerns, including variances in ML-based TCP approaches and global features for training and testing ML models, alternate metrics for assessing techniques, method performance, and repeatability of published findings.

Keywords: machine learning, bugs, open source, decision tree, random forest

PID-07:

Determining Satisfaction Level in Learners Psychometrics Using Deep Learning Algorithm

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ABSTRACT

Satisfaction in learning is an ongoing process irrespective of different parameters such as age, gender, and geographical location of acquiring new understanding, knowledge, behaviors, skills, values, attitudes, and preferences. The research model is tested using a questionnaire survey of 527 responses. Different methods of formative assessment have been developed to incorporate components from models of education, evaluation, and learning to achieve satisfaction levels among learners. In addition to understanding a learner's satisfaction level and how to develop and enhance them, it's important to consider what the learner is doing and their navigational patterns. Computational psychometrics analysis facilitating the translation from raw data to concepts is central to this paradigm, how satisfaction level achieves. In this research study, several factors are considered for psychometric analysis of different kinds of learners and based on different parameters to achieve satisfaction level, many interesting conclusions have been drawn and presented in the result section at the end of the paper.

Keywords: computational, psychometrics, learning system, evaluation system, skills, satisfaction level (SL), parameters, Ludwig classifier.

Pid-8:

Ensemble based Change Detection for Building classification from Very High-Resolution Satellite Images

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ABSTRACT

In recent years, Very High Resolution (VHR) Satellite images have been used with image processing for various classifications. Especially, Class Identification of Buildings due to many disasters is necessary for land analysis and urban monitoring. The automatic method, detects different classes of buildings as Vanishing, Emerging, and Unchanged. But here occurs various information loss, inhomogeneous challenges involved in extracting spectral features from VHR images to identify these classes. A potential solution Deep Learning, specifically CNN model is used to determine classes based on pre- and post-images of buildings in a place at different times. In the proposed model, urban areas satellite imagery with before and after images are used to classify with different colors for each classification of buildings. A framework, Deep Neural Network Change detection (DNNCD) with two CNN models namely, U-Net and ResNet50 is formulated to determine building area, height and tested on two datasets namely XView and Hurricane Damage dataset. The proposed model outperformed the existing methodologies in both Segmentation and Classification with accuracy of 86.1% and false positive rate of 2%. Various evaluation metrics, namely Accuracy, F1 Score, training loss, testing loss are used to determine best model to obtain better results for classification of buildings.

Keywords:VHR Satellite images, building extraction, Image Enhancement, Building Classification, U-Net, ResNet50, Segmentation.

PID-10:

Critical Technical Review on Challenges of Large Scale Solar PV Integration in Power Networks and Research Scope for Power Engineering Practitioners

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Abstract— The modern power markets introduce higher penetration levels of solar photovoltaic (PV) power generation units on a wide scale. Along with environmental and economic advantages, these variable generation units exhibit significant challenges in network operations. The objective is to find critical observations based on available literature evidence reported by several researchers towards large-scale PV integration issues and significant developments in the last two decades: Higher penetration issues, maximum power point tracking, grid integration, and solar PV regulations and policies are chosen as primary attributes of the study. The work summarizes the significant outcomes of 54 research documents. These are mainly based on three focused areas (i) solar PV systems with storage and energy management systems, (ii) solar power generation with hybrid system topology, and (iii) the role of artificial intelligence for large-scale PV and storage integrated market. The review is expected to support upcoming researchers and power engineering practitioners working on operation and planning, including large-scale PV integration.

Keywords— Solar Energy, Solar PV system, grid-connected PV system, hybrid energy system, storage

PID-11:

State Estimation of Smart Power System Networks with PMU Data and Machine Learning Algorithms

Suvraujjal Dutta [1] , Dr. Sandip Chanda [2] , Dr.Papun Biswas[3] Dr. Abhinandan De [4]

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Abstract—This paper presents a novel method to utilize Phasor Measurement Unit (PMU) data for more accurate dynamic state estimation(DSE) of modern power system networks with the assistance of Machine Learning Algorithms. Static State Estimation (SSE) uses the data acquired from Supervisory Control and Data Acquisition system (SCADA) to estimate algebraic variables of power system networks like voltage, current or angle. Dynamic variables such as dynamic load, Distributed Energy Resources (DERs) parameters, parameters of run time faults, generator tripping etc estimation however remains incomplete with SCADA and is possible only with PMU data. As PMU data is obtainable or refreshable in every 1/30 to 1/240 seconds of measurement, faster estimation of states of power system networks is possible if machine learning algorithms can be used to their fullest potential. The methodology of training however of these algorithms are important and is to be determined by the power system engineers. This paper presents a unique methodology to train the machine learning algorithms with the knowledge of dynamic states of the Power System which can further be used at data analytics of power systems for local and global control of the network . The methodology was trained and tested in IEEE 9 bus system in MATLAB Simulink platform by the help of classification learner application and prospective accuracy in results were found.

Keywords— MATLAB Simulink, PMU, SCADA, Machine learning Algorithms, Data Analytics, SSE, DSE

PID-13

An Intelligent Personalized E-Learning System based on Dynamic Learner's Preference

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ABSTRACT

The impression of traditional learning has changed rapidly in the last couple of years. Classroom training is not the only option to learn. Learners find it challenging to select significant learning tutorials most of the time and relatively spend less time on actual learning. Indeed, traditional learning based on the "one size fits all" approach will, in general, help just a single instructive model. This paper zeroed in on improving the viability and nature of the personalized Intelligent E-Learning. The architecture makes a fruitful improvement that facilitates the personalization of learning paths and materials. We proposed a model with consideration of the learner's preference. A personalized search engine saves learners time to find specific learning material. An E-Learning system is beneficial for a commercial organization to overcome critical challenges in training and development for their employees. An experiment/survey was led to assess the performance of this model, and the outcomes are promising.

Keywords: Artificial Intelligence, E-Learning, Traditional Learning, Personalization

Pid-15:

Performance Analysis of Cost Measure Methods to calculate Motion Vector in Motion Estimation Algorithms

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ABSTRACT

Cost is one factor in deciding video compression quality. In intra-frame prediction, it compares two blocks. It also affects the number of computations required for intra-frame block prediction from the previous frame. The amount of computations needed to estimate the motion between two successive video frames will depend on how efficiently the cost measurements are determined. For motion estimation in video compression, cost metrics between two intra-frames are essential. This article compares three block-based motion estimation methods (ARPS, NCDS, SCDS) for compressing video in terms of computations and peak signal to noise ratio (PSNR). This article also examines the impact of the search parameter and macro-block size on cost measure calculation.

Keywords: Cost measures, motion vector, block-based motion estimation, searching parameters, PSNR.

PID-19:

Investigation on Trans-Capacitances in 10 nm Short Channel Trigate-FinFET

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ABSTRACT

A trans-capacitance model is proposed for lightly doped tri-gate (TG) FinFET. The drain current continuity principle and the Ward-Dutton linear charge partition method are used to estimate the charge on the gate, source and drain terminals. Differentiation is done in MATLAB to calculate the trans-capacitances with respect to terminal voltages. The gate with 1nm oxide thickness is kept constant throughout the study. This model has been inspected separately for two different dielectric materials, silicon dioxide (SiO_2) and hafnium oxide (HfO_2). The analytical model's prediction reveals an outstanding agreement with technology computer-aided design (TCAD) simulation.

Keywords: TG-FinFET, Trans-capacitance, MATLAB, TCAD

PID-21:

A Modified Square Shaped Slotted Patch Antenna Based on Defective Ground Structure for Wireless Communication

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ABSTRACT

A modified square shaped slot embedded patch antenna is analyzed for multiband application. To achieve compactness a defective ground structure in the form of meander lines are etched on the bottom surface of the designed antenna. The suggested antenna results in penta band in nature with resonating frequencies 3.86 GHz, 5.75 GHz, 8.75 GHz, 12.85 GHz and 15.20 GHz. High frequency structure simulator (HFSS) software is used to simulate the designed antenna. A low cost substrate FR4 with loss tangent (δ) having relative permittivity 4.4 is used for designing the antenna.

Using finite element method antenna is simulated and optimized using High Frequencies Structure Simulator for good results. The proposed antenna has a dimensions of 3.3x2.4x0.16 cms. Optimized antenna is fabricated using photolithography process, which results in good return loss up to -43.51 dB, with gain around 5.66 dB and also exhibits bandwidth about 34.78%. Experimental results are measured using ENA Vector Analyzer Model E5063A. The antenna finds application in the field of Wi-Fi, 5G mobile communication, ISM (Industrial Scientific and Medical) and RADAR.

Keywords: FR4, Photolithography, Slots and Vector Analyzer.

PID-25:

A Comprehensive Review Based on Conventional and Artificial Intelligence Strategies for MPPT based Solar PV System

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Abstract

Non-Conventional Energy Sources (NCES) are the ideal alternative for generating clean and sustainable energy in this modern era due to its inherent ability. Solar energy is one of the best choices among this family for delivering power and energy demand to the civilization. Maximum Power Point Tracking (MPPT) is a system to extract maximum power from a PV module and deliver it to the load for increasing system efficiency. In this paper, an exhaustive overview of AI (Artificial Intelligence) based MPPT system are encapsulated and scrutinized. A special type of solar PV module from Hyundai has been introduced to understand solar PV module equivalent circuit. Comparison among various MPPT controllers along with different soft computing hybrid technique and their performance also elaborated under copious shading pattern. Notably advantages along with drawbacks of different MPPT methods are compared and studied. Practicable future work regarding MPPT is also framed. Lastly authors tried to emphasize upon MPPT algorithms considering partial shading problem as choosing an efficient technique demands new considerations so as to make confident that they are well organized and show best results in typical environmental conditions.

Keywords:

Maximum Power Point Techniques (MPPT), PV module, Non-Conventional Energy Sources (NCES), Boost Converter

PID-28:

Harmonic Reduction and Power Quality Improvement in Distributed Power Flow Controller by Space Vector PWM

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Abstract-Space vector modulation is an alternative technique for the PWM domain. It is a combination of FACTS system with Distributed series Compensator (DSSC) and UPFC. The DPFC can be considered as a combination of series and shunt compensator without DC link. The zero sequence frequency of 3rd, 6th, 9th harmonics is employed for transmitting reactive power and the active power and transmission line. A new technique SVPWM adopted which reduces the harmonics and the same time improves power quality and increase transient stability.
SVPWM is a phase rotating method which rotates phase with the axis up-to 360^0 and divide the system voltage in 7th sector and accordingly controller logic will operate the switches in different mode. The injecting voltage and current of fundamental and zero sequence component will actively participate to reduce reactive power and harmonics components.

Pid-29:

Performance of a modified impedance source inverter in solar power systems

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Abstract: For a single phase grid-connected solar system, a Z (Impedance)-source inverter is suggested in this work. Z-source inverters use shoot-through(ST) in duty cycle as well as the modulation index(M) to regulate the voltage output as opposed to conventional voltage source inverters, which do not. Shoot-through duty is supported to buck / boost the voltage input by changing the conventional pulse width modulation (PWM) approaches.Power conversion is done in one stage by the Z-source network.Also, an improved Z-source inverter topology is suggested in this research. It has an inherent restriction on inrush current and can significantly lower the voltage stress on the Z-source capacitor compared to earlier Z-source inverter topologies.A sample design in the MATLAB/Simulink environment is modelled,and the design parameters performance are validated..

Keywords: photovoltaic system, single phase Z-source inverter, simple-boost control(SBC), Inrush current, Voltage Stress.

PID-31:

Role of Two-dimensional Electron Gas (2DEG) in GaN/AlGaN Avalanche Transit Time (ATT) Oscillator for RF Performance Boosting: Application in THz Opto-electronics

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Abstract

This article reports opto-electronic switching properties of heterostructure GaN/AlGaN lateral Avalanche Transit Time (ATT) device oscillator. A novel technique has been adopted for the incorporation of the 2DEG effect in two-terminal device. This is achieved through the inherent conduction band offset and subsequent application of Cathode Field Plate in combination with the lateral orientation. A power combining technique is used by designing 3×3 array. The performance superiority of the electrical and optical switches over conventional silicon devices is evidently established and experimentally verified. To the best of authors' knowledge this is the first report on electro-optical performance optimization study in connection with the exotic type GaN/AlGaN two-terminal ATT oscillator.

Keywords: ATT, 2DEG, GaN/AlGaN, heterostructure, high RF-power, opto-electrical switch, strain-engineered, SPMT, SPST, two-terminal

Pid-33:

A Comprehensive Analysis of Model Order Reduction Based on Frequency Domain Approach

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Abstract—The majority of practical system designs are complex from a research standpoint. This often leads to high computational demands for analysis purposes. In this place, model order reduction comes into the picture. This study thoroughly reviews the literature on the model order reduction (MOR) technique. This research concentrates on the MOR of high-dimensional complex systems, and it examines the core theories and shortcomings of standard MOR methods, including the Factor division method, Pade approximation (PA) method, Stability equation (SE) method, Differentiation method, and Routh approximation (RA) method. This study reviewed the frequency domain approach to obtain the reduced order model (ROM). The PA method is a powerful and effective MOR method that aims to retain the essential dynamics of a high-dimensional complex system. It has been widely studied and applied by many researchers in the past few decades. This survey discusses the PA method of obtaining the ROM in detail. Also, step response and frequency response plotted using different MOR strategies are analyzed by taking two different test systems. The integral square error criterion is used to determine the effectiveness of the reduction procedures. Finally, future work on model order reduction for high-dimensional complex systems is discussed.

Index Terms—Model Order Reduction, Pade Approximation, Routh Approximation, Stability Equation Methods

Pid-35:

Prediction of Heart Disease Using Python and Machine learning

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Abstract

In our daily life we can see the cases of heart problem increasing day by day. This is very important for to predict serious diseases in early stages, as early as possible, so that we can save life of person involved in that disease. It is also realized that it is a difficult task to catch this disease in early stage or cure it in the early stage because more accuracy and precision is required for that so that we can catch exact problem. Heart disease cases are increasing day by day once in a month or sometime twice or thrice in a month we listen that one person die because of heart attack. As per WHO, about 18 million people die every year because of heart disease, which is a very large number, and a serious problem. With such diseases our population is also increasing day by day, and it also become problem to check every person and catch disease easily. So, we have to improve technology, which diagnosis the disease in initial stage. In these days many people are consuming fast foods and street foods. These things also come under reason to increase disease or also heart disease because many factors are responsible for heart disease like blood pressure problem, diabetes, Cholesterol etc. If these diseases are controlled, then heart disease can also be controlled. So, we should focus on each factor - from medical treatment to eating hygienic food. This paper is based on heart disease prediction so that we can detect it in early stage by using machine learning and its algorithms. We have taken online data, which has 14 features and 304 instances. Firstly, we analyze and then try to predict heart disease. We have used 4 algorithms to predict it.

Keywords: Heart Disease, Machine Learning, Artificial Neural Network, SVM (Support Vector Machine), KNN, Decision tree.

PID-37

Dependence of Capacitance Profile on Structural Parameters of CMUT with and without Vent

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ABSTRACT

This paper focuses on the capacitive behavior of capacitive micromachined ultrasonic transducer (CMUT). The investigation shows that capacitance has a great dependence on the geometrical structure of the device, specially on the thickness of the membrane and air-cavity, radius of the cavity and if the CMUT is a vented one, then also on the radius of the cavity. With the finite element method (FEM) based model, the variation of capacitance is studied carefully with diverse geometrical parameters. The theorical result is compared with FEM simulation. The result is extremely satisfactory when the membrane thickness is close to $1.5 \mu m$ and air-gap thickness is around 6nm for the CMUT with zero vent. CMUT with single vent at the centre, the result is at its best when the membrane thickness is around $3.6 \mu m$. A new empirical formula for the capacitance of CMUTs with vented cavity has been proposed and justified with the FEM simulation.

Keywords: CMUT, FEM, COMSOL

PID-39

Nine level asymmetrical switched capacitor multilevel inverter fed induction heated autoclave system for medical applications

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ABSTRACT

In this work, a nine level (9-L) asymmetrical switched- capacitor multilevel inverter (ASCMLI) based induction heated autoclave for sterilization is proposed. Due to the several benefits of multilevel inverter such as controlling of voltage magnitude and hence uniformity of heat is maintained at the load side as compared to conventional heating of autoclave. It has two common ground-connected dc voltage sources, which makes it ideal for usage in medical applications. Moreover, the development of a compact autoclave is carried out in this work that has a much reduced running time without sacrificing the quality of its sterilization. Induction heating (IH) method was used to develop a smaller machine and shorten sterilizing time. To validate the performance of the proposed system, experimental and simulated results are compared.

Keywords: Asymmetrical switched capacitor multilevel inverter (ASCMLI), Induction heating (IH), autoclave, pulse width modulation (PWM), autoclave.

PID-40

Energy Estimation of FSPV-based Microgrid for Sustainable Electricity and Water Conservation in Hot Semi-arid Urban Areas

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ABSTRACT

Solar photovoltaics have emerged as an economic source of renewable electricity generation for areas with high solar irradiation. However, the installation of utility-scale PV systems is often disrupted due to the unavailability of land. Less populated areas with a hot, dry climate can mitigate the land-energy conflict as they experience higher solar irradiation. However, in arid areas, the PV systems incur more losses due to dust deposition on PV modules and reduced energy conversion efficiency at higher operating temperatures. The scarcity of water makes the module cleaning procedures more expensive. Floating Solar photovoltaic (FSPV) systems resolve these problems due to their reduced land footprint, higher efficiency, and reduced evaporative water loss. This study evaluates the energy generation capability of a 4.8 MW FSPV-based microgrid in a hot, semi-arid urban area. By utilizing 10% of the available lake surface, the FSPV system generates 8.876 GWh of electricity annually, which meets 41.7% electricity demand of the study area. The system generates 16.7% more power compared to the equivalent ground-mounted PV system. The performance ratio is 82%, and a DC capacity utilization factor of 20.3% is achieved. The FSPV system reduces water evaporation in the lake and saves 43958.54 m^3 of water annually. This compensates for the annual water requirement of 783.214 m^3 for cleaning and dust removal of PV modules. Furthermore, the FSPV-based microgrid reduces annual CO_2 emissions by 2.93 tonnes. This study shall enable engineers, urban planners, and policymakers to develop clean energy-based, sustainable microgrid solutions for urban areas.

Keywords: FSPV, Floating solar, Solar photovoltaics, Urban, Water conservation, Semi-arid, Renewable energy sources, performance ratio.

PID-41

Advancement in the Conventional Winding Temperature Indicator/Oil Temperature Indicator of Transformer Using Internet of Things

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Abstract— Internet of Things (IoT) is an Industry 4.0 Technology that is rapidly getting implemented in the industries and is replacing the conventional and obsolete parts of the machines. In a transformer, the rise in temperature of the winding and the transformer oil, which is the most common coolant, beyond a certain limit signifies that the insulation may be damaged. Conventionally, the protection scheme implied is the Oil Temperature Indicator (OTI) and the Winding Temperature Indicator (WTI).

This project uses IoT to transmit and deploy alarms based on wireless and cloud technologies which significantly increased the efficiency of the protection scheme. The hardware model developed attempts to incorporate the benefits of the IoT and deploy the alarm message and alarm sound in significantly lesser amount of time and enable the required safety measures to be taken as soon as possible.

Keywords—Internet of Things (IoT), Oil Temperature Indicator (OTI), Transformer Oil

PID-42:

A Study and an Analysis of Battery Management System for Electric Vehicle

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Abstract— The battery management system is a critical component of electric vehicle (EV) and hybrid electric vehicle (EHV). The purpose of the BMS is to guarantee safe and reliable battery operation. To maintain the safety and reliability of the battery, state monitoring and evaluation, charge control and cell balancing and functionalities that have been implemented in BMS. Rechargeable batteries are used to deliver power to the auxiliary system and motor in the electric vehicle application. Battery technology has dramatically advanced over a decade and many high-performance batteries are being developed. This work addresses concern for critical task of a BMS i.e., State of Charge (SOC), State of Health (SOH), State of Life (SOL) and maximum capacity of a battery. By reviewing all these methodologies future challenges and probable solutions are possible.
Keywords- Battery management system (BMS), electric vehicle (EV), State of Charge (SOC), State of Health (SOH).

PID-43

SOLITON PROPAGATION AND ITS APPLICATIONS

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Introduction: Solitons in a non-linear dispersive medium refer to pulses that appear to be unaffected by the chromatic dispersion as the non-linear refractive index of the medium nullifies the chromatic dispersion. Therefore, these pulses remain chromatically and temporally coherent over large distances and lead to a very high Bandwidth Link-length product. The fundamental soliton pulses are very important. They have been found in nature over vast applications ranging from heaps of water to biological phenomena. The soliton propagation concept has even been linked to the development of lasers. Thus, solitons are pulse-like non-linear waves that retain their shape while propagating through ideal lossless fibers.

PID-44

A comparison of STATCOM and modified-UPFC 3-level inverters in renewable energy

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ABSTRACT

For the electricity system to remain stable, voltage stability must be maintained. A decrease in reactive power is the primary cause causing stability loss in some regions of the power network. The Flexible AC Transmission System (FACTS) devices can be used to improve the reactive power. This study focuses on using two separate FACTS devices, the Static Synchronous Compensator (STATCOM) and Modified Unified Power Flow Controller -3L Inverter-based, to improve voltage profile issues such voltage sag, voltage swell, and total harmonic distortion at the load side (UPFC). Although STATCOM and UPFC are both FACTS devices that are included in the power system as a kind of compensation, their operational concepts and impacts on the power system are different. This study presents a comparison of power quality based on an investigation of harmonics and voltage sag and swell.

Keywords: Power Quality, STATCOM, UPFC, FACTS, Renewable Energy

PID-45

The Investigation of energy and efficiency for Floating Solar PV System on saline water

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ABSTRACT

Floating Solar Photovoltaic is an emerging type of solar energy that aims to help the environment. Since the technology is new, it isn't easy to examine the long-term performance, effective control, and feasibility studies of FSPV facilities. The calculation of FSPV panel parameters is crucial in evaluating the actual performance, long-term operation, feasibility, and carbon-saving capacity of FSPV systems. This paper presents an analysis of floating solar power plant installed in saline water under salty humid weather and investigates. A 10 MW capacity floating solar plant is simulated on the brackish water of Chilika lake and factors like wind speed, albedo, temperature, soiling is considered for better results. The proposed model is simulated in system advisor model. The payback period and energy outcomes for various soiling condition along with varied degradations are analyzed and found that the total loss in energy outcome is 45 annually with 5% increment in payback time of installed solar power plant.
Keywords: Floating solar Photovoltaics (FSPV), Soiling, Green energy.

PID-46

Parameter Evaluation of Hybrid BIPV Array Configuration Under Various Partial Shading Conditions

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ABSTRACT

One of the best ways to utilize solar energy, which is currently the most abundant, inexhaustible, and clean energy source accessible is through building-integrated photovoltaics (BIPV). The use of building integrated photovoltaic (BIPV) technology for a building's electrical independence offers an elegant and beautiful, financially rewarding, and technically solid option. BIPV technology has a number of benefits, including the production of electricity using renewable energy sources, the modification of traditional wall cladding, daylight lighting, reduced heating/cooling load, etc. It is among the most promising solar energy harvesting devices for urban cities. Solar PV arrays has a problem of heating and creating hotspot during condition of partial shading. the conventional array configuration of series parallel have issue of efficiency deterioration under partial shading condition. Some of the 10 x 10 hybrid designs chosen from a literature review include hybrid Series-parallel & total-cross-tied (S-P & T-C-T), honey-comb & total-cross tied (H-C & T-C-T) and bridge linked & total-cross-tied (B-L & T-C-T). The impacts of these hybrid designs are investigated in this research. The impacts of these hybrid designs are investigated in terms of their topological and performance features. The MATLAB/Simulink software package is used to model the hybrid configurations using the BIPV module available and tested Under various PSCs, the performance of hybrid setups is evaluated by assessing power generation at the global-PP (G-PP), mismatched power loss, and fill factor in each configuration under various PSCs.

Keywords: Building integrated photovoltaics, Bridge linked, Total cross tied, Fill factors, Honey comb, Photovoltaics, Mismatch power, Maximum power point

PID-47

Modeling and Investigation of Immersion based Capacitive Micromachined Ultrasonic Transducer

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ABSTRACT

An immersion based capacitive micromachined ultrasonic transducer (CMUT) is modelled and investigated. Analysis on the displacement and output pressure is done using finite element mesh (FEM) simulations with the help of PZFlex software for different parameters of membrane thickness, gap height and bias voltage applied. From our observation it can be see, bias potential applied must be kept high in order to get a better displacement on the membrane that will result in more output pressure in water immersion medium than air as the coupling medium.

Keywords: MEMS, Ultrasonic, CMUT, Sensor, FEM, PZFlex

PID-48

A Comparative Analysis of Different Methods of SOC Estimation in The Electric Vehicle

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ABSTRACT

With increased awareness in green and clean energy and limited availability of fuel based resources, every country is making the slow but inevitable shift to Electric Vehicle (EV). Battery management system (BMS) play a vital role in EV as performance of the vehicle only goes as far as the capacity of a battery. The key features of BMS are: cell monitoring, battery safety and protection, state of charge (SOC) estimation, state of Health (SOH) estimation, cell balancing, thermal management and charging control. In this paper, we focus our scope to SOC so different methods are compared to find out their advantages, disadvantages and to find the most optimal method available in today's research.

Keywords: Electric Vehicle (EV), Battery, Battery Management System (BMS), State of Charge (SOC).

PID-49

Optimal control of Malicious Codes in a Computer Network by Quarantine   and Isolation   Strategy

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ABSTRACT

 We developed a e-SEIQRS (e-electronic susceptible, exposed, infectious, quarantined, recovered) epidemic model for the transmission and control of malicious codes in computer network. Moreover we found basic reproduction number R0, equilibrium, and stability of the model. It has been shown that if the basic reproduction number is less than one, the malicious codes-free equilibrium is asymptotically stable that is If R0<1 , the infected fraction of the nodes disappear so the disease die out, while if R0 > 1, the infected fraction persists and the feasible region is an asymptotic stability region for the endemic equilibrium state. Numerical methods and MATLAB are employed to solve and simulate the system of equations developed and analysis of the model gives remarkable exposure.

Keywords: SEIQRS e-Model, Basic reproduction number, local and global Stability.

Pid-50

Lesser Switches Multilevel Inverter: An Approach with Different Values of DC Sources

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Abstract- Unparalleled advantages of multilevel inverters (MLIs) such as reduced harmonic distortion, economic, reduced switching stress, and lesser electromagnetic interference have over-shaded the applications of the two-level inverter or the conventional inverter. However, increasing the number of power semiconductor switches increases the stepped output voltage levels. Thus, an increase in the overall power components adds to the economic cost and complexity of the inverter circuit that, in return, challenges the reliability of the inverter. In addition, with the rapid increase in stepped voltage levels, researchers focus on limiting the use of a large number of power components, mainly focusing on the reduction of the power semiconductor switches. In this paper, a new MLI, generalized in structure, is proposed that entails the lesser number of components compared to some recently proposed reduced components MLI. The proposed inverter is applicable for both the symmetric and asymmetric values of required DC sources. The ratio of the voltage levels generated per power semiconductor switch is presented in this paper. The gate pulses as a form of signals are generated using DSPACE1103 controller, and the prototype of the same is developed for 7-level inverter. The experimental results have been presented to validate the simulated results. This paper presents various simulation and experimental results under various operating conditions to prove the performance of the proposed multilevel inverter topology.
Keywords: 7-level inverter, least power electronic devices, cascaded inverters, LS-PWM, generalized multilevel inverter.

PID-51

A New Symmetrical DC Sources based DC/AC Converter with Experimental Verification

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Abstract:
This paper focus to motivate the practice of multilevel inverter in terms of harmonic content reduction with the least number of overall required components. The complexity of inverter depends on the number of power switches hence reduced drastically as the lesser switches require the lesser number of driver circuits.
In this proposed topology, a new single-phase generalized multilevel inverter is analyzed with equal magnitude of voltage supply. A 9-level/ 11-level/13-level symmetrical inverter with RL-Load is analyzed in MATLAB/Simulink platform and then verified by experimental results using DSPACE-1103. In addition, the experimental results of output voltage and current with the change of modulation index are also included. The analysis of the proposed topology concluded that the required number of overall components are lesser than the classical inverter topologies as well as some new proposed MLI has also been compared in terms of gate driver circuits, power switches, DC sources thereby enhancing the goodness of the proposed topology. In addition, the comparison of this inverter with the other topologies validates its acceptance. The lab module is designed to perform experiments for the „advanced power electronics and drives" course at the undergraduate level. The hardware implementation details of the multilevel inverter are given in detail for reference to the teachers, students and researchers.
On the other hand, it can also be used for students" research projects after class, to stimulate their passion for active learning. In addition, the mathematical deduction, the programming on MATLAB, and the specific experimental verification can provide a platform of extensive study for students with better learning capacity and thus improve students" abilities of scientific thinking and combination of theory and practice.
Keywords: 9-level Single phase Inverter, Generalized Multilevel inverter, Reduced Components, Level Shifted PWM.

PID-52

QUARANTINE APPROACH TO DEFEND AGAINST MALICIOUS CODES IN A TRADITIONAL ANTIVIRUS COMPUTER NETWORK

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ABSTRACT

Here we develop an epidemic model under traditional antivirus defence to counteract the spreading behaviour of malicious codes. Here we also analysed the stability of the epidemic model at the equilibrium points through the basic reproduction number R_0, in which we show, if $R_0 < 1$ then the malicious codes cease to exist, while if $R_0 > 1$, the infection persists. To analyse the spreading behaviour of malicious codes in a computer network, we use MATLAB for solving and simulating the model.
Keywords: Basic reproduction number, e-epidemic model, Stability.

PID-53

Application of a BDDC bidirectional brushless DC drive on a pump hydro energy storage system

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ABSTRACT:

Pump hydro energy storage (PHES) is ideal for solar, wind, etc. Brushless DC (BLDC) machine will boost PHES system efficiency. In this study, a bidirectional DC-DC converter (BDDC) interfaces the DC bus and the bidirectional BLDC (BBLDC) machine. BDDC can supply DC bus power to the BLDC motor to pump water to the upper reservoir. It also supplies electricity from the stored potential energy of water through the BLDC generator to DC bus, which feeds the DC load. A BDDC avoids the inverter's complex control algorithm (VSI). A BDDC and BBLDC drive provide adequate charging and discharging for PHES system. A simple PI controllers maintain the DC bus and rotor speed. A comparison of system performance with and without maximum power point tracking (MPPT) is analysed in this paper. The system performance on steady and dynamic state was analyzed. The proposed system is simulated in MATLAB/SIMULINK.and results are shown.

Keywords: Energy storage system, motoring, generating, pumping

Pid-54

Underground Cable Fault Tracking Using Bacteria Foraging Optimization

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ABSTRACT
An evolutionary optimization approach for the accurate estimation of fault signal parameters such as amplitude, phase, frequency, and damping factor of an underground cable is presented in the paper. Bacteria Foraging Optimization is implemented for tracking the transient signal is highlighted in the paper. A cumulative sum algorithm has been enforced for the fault instant detection. The simulation has been performed in the PSCAD platform and the signals are generated at the sending end side of the underground cable. BFO performs well and tracks the fault signals with minimized error.
Keywords: Fault Analysis; Underground Cable; Bacteria Foraging Optimization; CUSUM Method

PID-55

A review on incipient fault detection, localization and classification in underground cable

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ABSTRACT
Underground cables are replacing overhead systems nowadays. So disturbances like incipient faults in an underground cable are a concern that needs to be detected as rapidly as possible to protect the cable system. Due to the aberrant behavior of incipient faults, the relay can't detect the abnormalities generated in the distributed cable. Hence, sometimes false tripping of the circuit breaker may be initiated. Mainly faulty current, as well as faulty voltage signals, are implemented for localization, detection, and fault classification in a distribution network. This paper discusses several signal processing techniques, Machine learning methods, and Deep Learning techniques for the fault detection, localization, and classification of various faults in underground cable systems. This consolidated and efficacious survey motivates the researchers to understand various state of art techniques as well as traditional techniques of fault analysis.
Keywords: Fault Analysis, Underground Cable, signal processing, machine learning, Deep Learning.

PID-56

FinFET Fractional order Injection Locked Oscillator

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Abstract:

An injection locked oscillator was developed and simulated using 22nm PTM FinFET model. Frequency spectra of the output were used to find he lock-in range. Using a fractional order capacitor showed a marked improvement in lock in range compared to integer order circuits with same Q factor. Compared to reducing Q factor in a linear tank circuit, the described approach provides an avenue to further extend the limited lock in range of injection locked oscillators.

PID – 57

Experimental investigation of a grid-tied high efficiency reversible Pump-turbine energy storage system employing an adjustable BLDC drive

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ABSTRACT:
In this study, analysis of a high-efficiency grid-connected pump hydro energy storage (PHES) system that uses a bidirectional brushless DC (BLDC) machine is presented. The proposed layout is substantially less complicated since it uses an electronic power conditioning system to make all necessary modifications before connecting to the power grid, which removes the need for any mechanical components. This allows for the power plant's reliability to be improved while simultaneously reducing costs. An exhaustive model of the PHES system is created, and a two-tiered synchronous reference control technique for a grid side converter and a simple PI controller for the machine side converter is developed. Hardware data from a compact experimental setup are used to analyse the efficacy of the proposed PHES system.
Keywords: Grid-tied, energy storage system, motoring, generating, BLDC machine

PID-58

Performance Analysis of PV Based Battery Integrated E-rickshaw With Regenerative Braking

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 Abstract-
The article addresses the simple and effective regenerative braking of a solar photovoltaic (PV) battery-powered e-rickshaw. The rickshaw is powered by a brushless DC (BLDC) motor. With the goal of an environmentally friendly transportation model, regenerative braking technology is being used. Regardless of climatic changes such as solar radiation and temperature, both the battery and solar energy ensure that the vehicle never runs out of energy. A 1kW BLDC motor driven by a VSI (voltage source inverter) provides the necessary counter-current generation. The entire system is designed to deliver an energy-efficient e-rickshaw which can be run economically.
Keywords— Solar PV array, Regenerative Braking, PMBLDC Motor, battery storage

PID-59

High Electron Mobility Transistor for Assistive Medical Technology

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Abstract:

In this paper, we emphasize on High Electron Mobility Transistors for assistive medical technology. Our focus is on the application of HEMT-based biosensors for the detection of different biomolecules. In this paper, we have discussed five different types of HEMT based biosensors. The main concept of a biosensor is based on the following three components – detector, transducer, and amplifier. The detector recognizes the suitable analyte, the transducer helps in the conversion of biological signal into a kind of a signal that can be easily measured, and the amplifier amplifies the signal so that it could be visualized in a suitable format. This paper will help researchers to have an idea about HEMT based biosensors at single place which will help them to develop upcoming modern biosensors.
Keywords—Biosensors, 2DEG, GaN-HEMT, HEMTs

PID-60

Analysis of High Frequency AlGaN/GaN Based HEMT for Resistive Load Inverter

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Abstract
Today's demand for millimeter-wave (mmW) band (30-300 GHz) is rapidly increasing due to its shorter wavelength and wide frequency bands, which enable smaller components with better capabilities. Wireless communication systems are intending to use higher frequencies because wireless communication system developers require more bandwidth for numerous new applications. To mitigate this demand, we propose a high electron mobility transistor (HEMT) for wireless communication system operating at higher speed and higher frequency range. The proposed T-shaped gate AlGaN/GaN based HEMT achieves good traits in terms of RF and DC parameters for millimeter-wave applications. Cut off frequency (f_T) is 114 GHz and maximum oscillation frequency (f_{MAX}) is 192 GHz for proposed HEMT. Other device parameters like drain current (I_D), transconductance (g_m) and threshold voltage (V_t) have been also analyzed for proposed HEMT. A resistive load inverter has been implemented using proposed T-gate AlGaN/GaN based HEMT. Voltage transfer characteristics (VTC) curve and transient response of the HEMT based resistive load inverter have been analyzed using mixed mode simulations. All the simulations have been done using Silvaco Atlas simulator.

Keywords—High electron mobility transistor (HEMT); millimeter-wave (mmW); Transient response; Cut off frequency (f_T); maximum oscillation frequency (f_{MAX}); Inverter

PID-62

Reliability Analysis of PV Array or Modules with different Figures of Merit

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ABSTRACT
Physical and/or chemical changes in various module components frequently cause the electrical performance of PV modules to degrade, preventing them from operating at their peak potential. When PV producers choose the technology for their PV modules, reliability estimation of the modules is a key consideration. We never get actual PV power output as per the manufacturer's datasheet. It is simply because of degradation and some climatological parameters. So, reliability estimation is always an important task for PV scientists. In this research paper, the authors have performed a reliability analysis based on some figures of merits such as Fill Factor (FF), Efficiency and regression analysis of different parameters. We usually do not get the actual PV power as per the manufacturer's specification, this happens the change in electrical parameters and external climatological parameters degradation, which is a function of the internal electrical parameters or figures of merit. As a result, reliability estimation becomes a crucial duty for scientists to complete the data that may be provided to users. If this analysis is completed for different PV technologies, it will be simple for users to choose certain climatic conditions and make informed decisions. Since poly si technology for PV modules has been proven to be reliable in the eastern region, a study has been conducted in this work to evaluate the degradation by analysing the values of various electrical parameters.
Keywords: PV Power, PV Array, Degradation, Reliability.

PID-63

Analysis and Design of Single phase Z-source inverter with different PWM techniques for Standalone PV system

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ABSTRACT

This study analyses the two PWM regulating techniques of Single Phase Z-Source Inverter (ZSI) and recommend the better controlling method for applications involving the conversion of renewable energy sources. The effectiveness of the controlling strategies is assessed in relation to the control strategy's simplicity, voltage stress across switches and output voltage peak value. The Maximum boost control(MBC) method is providing higher voltage gain than Simple Boost control(SBC) and these result has been evaluated by simulating the circuit in Matlab simulink .
Keywords: VSI ,CSI, Shoot-Through(ST), ZSI, PWM,SBC , MBC

PID-65

A Novel HK-Type Multi-level Inverter for Reduced Power Electronic Devices

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ABSTRACT
Multilevel converters are acclaimed technology in the field of energy conversion for various applications like AC motor controls, renewable energy systems and various power system applications with reduced harmonics. The basic feature of the multilevel converter is to produce any desired output voltage from several low voltage sources using low power semiconductor switches. The research work carried out in focusing novel multilevel inverter designed for single-phase configuration by means of the lesser component count. The proposed multilevel inverter configuration which is called as HK-Type MLI ensures the AC voltage with maximum possible number of voltage levels at the output. The performance of the low power seven-level inverter that modulated based on the sinusoidal PWM technique is also analysed. The whole PWM and control algorithm are implemented using the dSPACE-1103 based digital controller at a very low sampling time of 20 μ-sec. The power and control circuit along with the necessary PCB is designed at the Power Electronics Laboratory. A 15-level inverter is executed; both the MATLAB/SIMULINK as well as the experimental results has confirmed the accurate voltage-step creation for the proposed MLI for different values of Modulation index. The experimental results of inverter voltages, currents at different modulation index of the inverter is measured and presented in the paper. It is observed that the experimental results are at par with the simulation results.

PID-66

A New Criss-Cross based asymmetrically configured T-Type Multi-level Inverter

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ABSTRACT
High advancements in the arena of power electronic developed a suitable platform to familiarize the different multilevel inverter (MLI) topologies. These MLI topologies comprises of different notable characteristic such as high quality staircase sinusoidal output voltage, lowered number of power switches, no filter requirement etc. In this paper, a novel multilevel inverter is proposed asymmetrical to reduce the number of inverter's components, with admirable creation of voltage-step. The proposed MLI structure provides a high-step staircase type, nearly sinusoidal output voltage waveform without increase of power semiconductor switches. The extension of the proposed circuit can be done in order to increase the levels. Carrier based Sinusoidal Pulse-width Modulation (CB-PWM) technique is employed at a switching frequency of 3 kHz. The operation of proposed MLI has been discussed in detail. A 27-level inverter is executed; both the MATLAB/SIMULINK as well as the experimental results has confirmed the accurate voltage-step creation for the proposed MLI for different values of Modulation index.
Keywords: CB-PWM, Power Electronics, MLI, Power Conversion, Reduced Components.

PID-68

Effects of dust and dirt on the performance of Solar PV panels and array

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ABSTRACT

Environmental factors affect a solar photovoltaic (SPV) system's output power rating because they significantly influence the quantity and amount of solar insolation under outside circumstances. Thus, it is crucial to fully know the characteristics of the daily insolation and how they affect the PV power rating in order to design power plants with proper planning and the assurance of high-quality power. The amount of effective solar irradiance that hits photovoltaic panels in an outdoor setting starts to decrease when the dust begins to build up on the panels' surface. Similar obstructions to solar irradiance landing on photovoltaic panels include other bird droppings, ice, and water droplets. The amount of direct light that strikes solar panels and the amount of this light energy that can be used effectively to generate electricity are the two main aspects that need to be taken into account in order to maximise the efficiency of solar panels. Utilizing solar panels is problematic because of the dust that builds up on them. Dust on the cells of solar panels reduces their efficiency. The authors of this study attempted to examine the validity and dependability of current PV modules. The performance of a photovoltaic (PV) system is examined in the paper's analysis section along with the effects of numerous environmental conditions.
Keywords: Solar Photovoltaic, PV Array, Fill Factor, Performance Ratio.

PID-70

Estimation of State-of-Charge for Lithium-Ion EV Battery Packs using Passive Cell Balancing

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Abstract:

In order to advance the field of sustainable mobility, electric vehicles (EVs) need a battery, which is a key component. Lithium Chemistry is presently regarded as the primary energy storage method for electric vehicles. Due to their high energy per mass compared to other electrical energy storage methods, Lithium-ion batteries are currently employed in the majority of portable consumer gadgets, including cell phones and laptops. Li-ion battery pack is a combination of number of cells connected according to the purpose of application. Since the manufacturing chemistry of each cell is exactly not similar so, their state of charge and depth of discharge capacity differs from each other to some extent. So, a proper Battery Management System is necessary to protect the life of Li-Ion battery and their proper diagnosis during their usable life span to give them. Prior to discussing the most fascinating modelling approaches for predicting battery performance, this study begins by outlining the stringent standards and requirements that apply to integrating battery management circuits and systems. Following that, a generic and flexible framework for implementing BMS is provided, together with the passive method for cell balancing and SOC estimation under MATLAB environment.

Keywords: Battery Management system (BMS), Lithium chemistry, State of Charge (SOC), State of Health(SOH), Depth of Discharge (DOD), State of Function (SOF), C-Rate, Passive Cell balancing

PID-71:

Design of Solar Battery Swapping Station for EV using LSTM assisted Solar Power Forecasting

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ABSTRACT

Electric vehicles (EVs) are gaining fame nowadays as it is the best option for green transportation. But the charging of the electric vehicle is again a challenging task as it takes hours to charge the EV which is not acceptable to the customers, also if we charge the EV using a conventional grid it is again an extra burden on the grid and it produces the centralized pollution instead of distributed one. So, we need to find some solution for these issues and the best solution is using a battery swapping station instead of a battery charging station which will take just 2 minutes to swap the battery instead of charging. And to reduce the burden on the grid we can use solar or other renewable energies to charge the batteries at swapping stations. In this paper, solar power is used to charge the battery packs and if in an emergency case solar power is not sufficiently available to ensure the availability of fully charged battery packs then the power can be taken from the grid or other renewable energy sources. The solar power is forecasted using the long short-term memory (LSTM) model for better power scheduling to the grid or other renewable energies.

Keywords: Battery charging station, Battery swapping station, Electric vehicle, LSTM, Solar forecasting.

PID-72

Design of Solar Battery Swapping Station for EV using LSTM assisted Solar Power Forecasting

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ABSTRACT

This paper presents a fine tree-based classifier for classifying incipient faults from non-incipient faults in underground cables. The incipient faults are very random. So for cable health monitoring, incipient faults should be classified from non-incipient faults. The fine decision tree classifier is implemented for classifying incipient, non-incipient, and healthy systems. Two datasets having uniform and non-uniform data have been tested with the classifier. The accuracy turns out to be greater for the uniform dataset.
Keywords: Underground cable, Fine Decision Tree, Incipient fault, non-Incipient fault

PID-74

Analysis of Permanent magnet fault current limiter for faults occurring at different position of a rectifier circuit load

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ABSTRACT

The fault level is increasing day-by-day due to huge expansion of electrical network. To cope with the increasing fault level Fault Current Limiter is a good solution. Presently the use of DC loads is increasing a lot. Each DC load contains a rectifier circuit with it which helps it to convert the AC power source to DC source. Faults may occur at different position of the network. This paper gives a detailed discussion on the working analysis of a PMFCL for faults occurring at different position in the rectifier circuit.

Keywords: PMFCL, Current Suppression, rectifier circuit, FFT, Fault position, FEM Analysis, ANSYS

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PID-76

Prediction of Driver Inattentiveness for Accident Prevention

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Abstract:
Globally number of accidents are increasing in which driver's lack of attentiveness is one of the major causes. In this paper authors propose a system to detect driver's lack of attention while driving. The system uses vehicle-dataset to predict such behavior. At the same time, it explores how the time periods of lacking-concentration affect driver's behavior and what future reactions might be caused, especially, for commercial vehicles. There are four types of driver inattention – secondary task distraction (phone calls, drinking, chatting with co-passengers), driving-related inattention to the forward roadway (turning back), drowsiness, and non-specific eyeglance away from the forward roadway (texting, operating radio, doing hair and makeup). For better efficiency and generalization of the model, CNN-inception-(3) with data augmentation routine—Mix up is used. This also balances the training data distribution.
 A six-level alert system has been proposed which can alert the system regarding the present and future inattentive behavior as predicted by proposed model, six alert levels are defined. These will be able to keep check and signal the driver of his upcoming unfocused behavior. A major advantage of implementing the alert system will be to help a driver understand and analyze his non-attentive behavior as well as, it will help prevent accidents to some levels.
Keywords—Inception v3, convolutional neural network, deep learning, mixup augmentation.

PID-77

A Robust Super Twisting Sliding Mode Controller for Optimal Grid Synchronization of Photovoltaic System

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ABSTRACT

The grid connected photovoltaic system (GCPVS) faces several difficulties due to their intermittent natures such as solar irradiance variations, grid voltage distortions and unbalanced load distributions. These complications interrupt the functioning of power system to attain maximum probable power output. Therefore, to address these problems, this article proposes a robust super twisting sliding mode-incremental inductance-instantaneous power theory (STSM-IC-IPT) based control mechanism for 3-phase GCPVS. The super twisting sliding mode (STSM) controller is introduced to reduce the difference between actual inverter current and reference inverter current of GCPVS when it is subject to various uncertainties and nonlinearities. The modified incremental conductance (IC) maximizes the solar power output generated from the photovoltaic panels. In addition, the instantaneous power theory (IPT) is applied to enhance the active power and reactive power transmission between grid-connected PV systems. The proposed STSM-IC-IPT method is examined under two different experimental procedures namely simulation setup and experimental setup. The efficiency of the proposed STSM-IC-IPT control mechanism is evaluated by comparing its performance with existing ASMC-IC-IPT control scheme. The experimental results illustrate that the proposed STSM-IC-IPT control mechanism achieves superior performance efficiency under dynamic loading, steady and transient conditions.
Keywords: Super twisting sliding mode controller; Modified incremental inductance; Instantaneous power theory; Grid connected photovoltaic system.

PID-78

A study of the function of soft computing (SC) methods in Microgrid Energy Management Systems

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Abstract- The development of microgrids has made the use of renewable energies more practical and increased the ability to provide for consumers in remote areas, making it an ineluctable subject of research in the field of electrical engineering. The need for Energy Management Approaches was created by the dynamic behaviour of the microgrid caused by the intermittent nature of renewable energy resources and other issues, such as the management of energy storage systems and performance deterioration owing to the lifespan of microgrid components. These strategies are put into practise using a variety of conventional optimising techniques. Although it is obvious that soft computing approaches have evolved and have permeated every academic sector in recent decades. The researchers are successful in utilising these methods for the energy optimization procedure in microgrids. This article offers a thorough examination of soft computing methods and their application to energy management systems for microgrids from all aspects.

Keywords- Microgrids, Energy Management Systems, Soft-Computing techniques, Optimization techniques.

PID-79

Optimal Network Reconfiguration of a Distribution System with Electric Vehicle Charging Stations, Renewable Generation, and Shunt Capacitors Using Fuzzy Systems

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 Abstract. Electric vehicles (EVs) are predicted to supersede conventional vehicles as a preferred means of transportation due to their superior efficiency and lower environmental effect. Electric Vehicle Charging Stations (EVCS) that are linked with the distribution network to charge EVs can hinder their performance if not placed properly. This research offers a RAO-3 based on the fuzzy classification technique for the ideal EVCS, DGs, and SCs sizing and location for 69 radial bus distribution systems with network reconfiguration. Load flow analysis is used to develop EV battery charging loads models using Li-ion battery charging characteristic curves. The proposed fuzzified RAO-3 approach raises substation pf while also including EVCS, DGs, and SCs into the distribution network. The fuzzy multiobjective function is used to position EVCS, DGs, and SCs at the same time, without or with network reconfiguration. According to simulation results, the simultaneous placement technique improves performance by dramatically lowering power loss, improving voltage profile, and utilising the appropriate amount of EVs.

Keywords *Electric vehicles, Electric Vehicle Charging Stations, Substation, Distributed*

Generators.

PID-81

A dual axis sun tracking solar insistent by intelligent controller

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Abstract - Solar energy is fast becoming an essential means of renewable energy resources. In recent decades, the primary sources of energy, such as oil and coal, are expected to end up in the world. This is a severe problem for providing the world with the most affordable and reliable energy source. All the people in the world need renewable energy resources, which are inexhaustible. With sun tracking, generating more energy will be possible since the solar panel can maintain a perpendicular profile to the sun's rays. Even though the initial cost of setting up the tracking system is considerably high, cheaper options have been proposed over time. In this proposed work, a dual-axis sun tracker by which it is possible to conserve full power by the solar panel by receiving the high-intensity sunlight using an Arduino board and Light Dependent Resistors (LDRs) have been used for sunlight detection.

Keywords - Solar PhotoVoltaic (SPV), Dual axis sun tracking system, Arduino Uno, Servomotor, Light Dependent Resistors (LDR)

PID-82

An Intelligent Island Detection to Enhance Grid Resilience

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ABSTRACT

The importance to strengthen grid resilience has grown with the increase in environmental destruction and modern power grid complexity, as a consequence of power outage inflicted by human intrusion and extreme weather event. Micro-grids (MGs) have proven to be a viable alternative in such circumstances. However, these occurrences are highly unpredictable, resulting in unintended islands of MGs with negative consequences. As a response, alerting its distributed generations about unintended island is indeed a crucial issue for enhancing grid resilience with MG. Therefore, it is essential to develop a technique for the efficient and accurate detection of unintended islands. There has been an increase in the use of micro-phasor measurement units (µPMUs) in MG. In perspective of this, using an efficient µPMU, the research provides a method for finding unintended islands in an MG. The µPMU analyses the solar generator bus voltage and analyze it with symmetrical components for island identification. The angular sum between the zero and negative sequence components is calculated and utilized for island detection. The methodology proposed has a signal detection time of 20 milliseconds.
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Keywords: unintended islands, grid resilience, micro phasor measurement units, sequence components.

Pid-83

An island detection methodology with protection against cyber attack

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ABSTRACT

Unplanned islanding of micro-grids is a significant barrier to supplying continuous power to key customers. The identification of the islanding moments must be rapid to enable the distributed generators (DG) to perform control measures in the shortest possible period. Micro phasor measuring units (μ-PMU) are gaining popularity in distribution systems and micro grids as a result of their ability to produce high-quality data at a high speed. These μ-PMUs can be utilized to detect islands. However, the μ-PMU relies heavily on the communication system for transmission of data, which is vulnerable to cyberattacks. In consideration of the previous technique, this research provides a smart island detection application with μ-PMU having lowered cyberattack probabilities. This representation is equipped with a μ-PMU implemented on the relevant DG's bus. The voltage data acquired from these μ-PMUs are processed using the sequence transformation in order to simulate the sequence component angle. The angular sum of the negative and positive sequence components is evaluated and deployed for detection of islanding. Matlab/Simulink tests the proposed approach through an IEEE-34 node distribution network. Multiple simulations demonstrate the robustness of the technique.

Keywords: Island detection, cyber-attack, micro-grid, micro phasor measurement unit.

PID-84

Enhancing the capacity utilization of existing distribution networks using Series Capacitors in remote rural areas

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ABSTRACT

In the backdrop of electricity access to remote and rural destinations, this research has aimed to optimize certain parameters with respect to quality of power distribution. In this work, a model has been developed keeping the existing infrastructure of distribution lines, neglecting the function of boost transformers, thereby eliminating their cost for further load expansion and incorporating Distributed Energy Resources (DERs). The model incorporates the application of series capacitors mainly to find out the maximum distance to which the power can be delivered to the remotest consumer, without compromising on the quality of voltage at the last mile. Further investigation has also revealed the role of series capacitors in reducing system losses which is a malady in the Indian Electricity Distribution Systems. Optimization done using Genetic Algorithm in MATLAB is validated by a real distribution system simulated in PSCAD. Real data from the distribution network in the Kakdwip islands in Sunderbans, West Bengal, India has been considered in this work. The optimized parameters therefore are Renewable Energy Penetration, Maximum Distance over which the customer can be serviced, system losses and optimized switching of series capacitors as a function of load, irradiance with system constraints of quality voltage at the load end and at the point of common coupling (PCC), keeping the network losses within minimalistic limits. The study yield the economic gains from the perspective of the Distribution Network Operator (DNOs) and also DERs Agencies (DRAs), who may sell power.

Keywords: Series Capacitor, Radial distribution network, Genetic Algorithm, MATLAB, PSCAD.

PID-85

ANALYSIS AND INVESTIGATION OF SYNCHRONOUS MACHINE ROTOR WINDING SHORT-CIRCUIT FAULT IN A DISTRIBUTION SYSTEM

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Abstract - With the wide application of permanent magnet synchronous machine (PMSM) in the distribution system, due to the unbalance loading the rotor winding short circuit fault is a major problem which have the huge electromagnetic effect on the rotor winding with the machine external equipment. Therefore, the PMSM rotor winding short circuit current is mostly pay attention for the designing of power system distribution network. For simulation a three phase short-circuit model of synchronous generator is developed here by using MATLAB/SIMULINK software. A technique is implemented to find the quantity of internal winding in a PMSM for short circuit fault and also its position in the distribution network. Hence, to calculate the synchronous inductance and winding resistance through the output current, the PMSM is energized through a small sinusoidal voltage at halt situation. Under zero fault resistance condition it is revealed, that the fluctuation of output current due to internal winding short circuit fault can be utilized to work out the quantity of shorted windings. By utilizing this useful technique, the fault extremity assessment for that particular synchronous machine can be accomplished except any difficulties of machine designing or investigation of internal winding short circuit model including several tappings. This paper mainly focused on fault extremity protection techniques by using harmonic filter and SFCL through before-fault and after-fault activity. To check the discoveries, a MATLAB/SIMULINK based three-phase synchronous machine model with protective scheme is implemented in the distribution network is taken into consideration. Harmonics elimination and instant fault mitigation techniques with load unbalancing are analyzed based on effective outcomes to judge the system stability and feasibility of the short circuit extremity assessment.

PID-22

Synthesis, characterizations and monitoring for power production using potato extract

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Abstract

An aqueous extract of fresh potato was used for the synthesis of silver (Ag)nanoparticles in this research Paper. Silver nanoparticles (Ag NPs) have been synthesized through an environmentally friendly, cost-effective green method using potato extract and the power generation activity of potato bio electrochemical cells was investigated with these Ag NPs. Characterizations of nanoparticles were done using different methods, which include; ultraviolet–visible spectroscopy (UV–Vis), Fourier transforminfrared (FTIR), X-ray diffraction (XRD), Scanning electron microscope (SEM). UV–visible range of the dripping medium containing silver nanoparticles showed absorption peak.Fourier transform infrared spectra showed that biomolecule compounds were responsible for the reduction and capping components of silver nanoparticles. XRD studies showed that the particles crystalline in nature, with a face-centered cubic (fcc) structure. Moreover, NPs has been implemented in potato Bio-electrochemical cells to test the energy production performance of cells. It can be seen that Ag NPs demonstrates a potential role in improving open circuit voltage, short circuit current and power generation potato bio-electrochemical cell. This study demonstrates a simple, cost-effective, and eco-friendly synthesis method of Ag NPs and the excellent performance of Ag NPs in bio-electrochemical cell power generation systems. The effect of Ag NPs on bio-electrochemical cells is a meaningful research task may open a new platform for potential bio-electrochemical cell development.

Keywords: Potato extract, Characterizations, XRD, FTIR,UV-visible, SEM, Power monitoring, Synthesis

PID-86

Innovative Education in Industry Applications

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Abstract: This writing presents some concepts of innovation and invention, discusses old and recent inventions. Discussions are guided towards- how an invention can be converted to industry product and can attract more people to do more businesses in new concepts.

Invention and innovation: Anything new are called inventions. Continuous improvements over invention is known as innovations. It is the advancements over existing process or object. Innovative education teaches the process of delivering the teaching materials aiming that it will grow the thinking pattern of students to innovate the system. Alternatively, it will teach how to grow the desire or appetite of creating of something new.
Different types of innovation: as per OECD's(Organisation for Economic Co-operation and Development) Descriptions), there are four types of innovations as:

(i) *Product Innovation:* it is developing new machine ever seen before. as example wireless machine invention(1895), steam engine(1712) by Thomas Newcomen, aero plane(1903) by Wright brothers etc.
(ii) *Process innovation:* these are managerial manual process, computer process, algorithms etc. As example: Life cycle of any production phases, Six Sigma steps; data sorting algorithms, data security encryption-decryption processes etc.
(iii) *Marketing Innovation:* as per IBM's process analysis, there are three areas of innovations in marketing and these are: * Resource allocation, *Revenue planning and *Campaign optimization. (for more study: 'The Market', Matthew Watson).
(iv) *Organizational Innovation:* it comprises innovation-culture, innovation-capability, continuous improvements, process improvements etc. These are mostly related with business organization's capability growth for innovations. Study and following of standard processes through practical observation can grow capabilities of innovations.

Examples of inventions: Invention is the new creation which should be proved by experiments, logically or theoretically. It is the rule of justification-evolution-verification of invention. In arts and culture, invention can't be proved by experimentally. Some examples of old inventions:
(a) *Example of Science-invention:* In 1895, Jagadish Chandra Bose invented wireless signal and ringed a bell to a far distance of 75 ft. That was the first-time demonstration of wireless communication. Figure of that instrument is shown below:

Fig-1: instruments used for transmission of electro-magnetic signal. Image source: wikimedia

PID-67

Design, Implementation and Validation of an H₂K-Type Multi-level Topology with Fewer Components

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ABSTRACT

Multilevel converters are acclaimed technology in the field of energy conversion for various applications like AC motor controls, renewable energy systems and various power system applications with reduced harmonics. The basic feature of the multilevel converter is to produce any desired output voltage from several low voltage sources using low power semiconductor switches. The research work carried out in focusing novel multilevel inverter designed for single-phase configuration by means of the lesser component count. The proposed multilevel inverter configuration which is called as HK-Type MLI ensures the AC voltage with maximum possible number of voltage levels at the output. The performance of the low power seven-level inverter that modulated based on the sinusoidal PWM technique is also analyzed. The whole PWM and control algorithm are implemented using the dSPACE-1103 based digital controller at a very low sampling time of 20 μ-sec. The power and control circuit along with the necessary PCB is designed at the Power Electronics Laboratory. A 15-level inverter is executed; both the MATLAB/SIMULINK as well as the experimental results has confirmed the accurate voltage-step creation for the proposed MLI for different values of Modulation index. The experimental results of inverter voltages, currents at different modulation index of the inverter is measured and presented in the paper. It is observed that the experimental results are at par with the simulation results.

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