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THE 3rd INTERNATIONAL CONFERENCE ON EMERGING ELECTRICAL ENERGY, ELECTRONICS AND COMPUTING TECHNOLOGIES 2021

PROGRAM BOOK

ICE4CT 2021

VIRTUAL CONFERENCE

16th - 17th DECEMBER 2021

UNIVERSITI MALAYSIA PERLIS

FACULTY OF ELECTRICAL ENGINEERING TECHNOLOGY

JOURNAL OF PHYSICS: CONFERENCE SERIES

IOP Publishing

Third International Conference on Emerging Electrical Energy, Electronics and Computing Technologies 2021 (ICE4CT 2021)

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Welcome Message

On behalf of the Organizing Committee, we would like to extend our gracious welcome to all participants to the 2021 Third International Conference on Emerging Electrical Energy, Electronic and Computing Technologies (ICE4CT2021) held virtually on 16th to 17th December 2021. This is a third edition of ICE4CT, which is a joint collaboration between Faculty of Electrical Engineering Technology, Universiti Malaysia Perlis and Nandha Engineering College, Erode, Tamil Nadu, India. This conference is aimed to gather both industrial and academic professionals from across the world to share their innovation research ideas and cutting-edge technology and practices in the areas of Engineering and Technology including Intelligent Systems, Soft Computing, Optimization, Electrical Energy System, Communication and Informative, Robotic and Automation Design.

ICE4CT2021 is proud of having distinguished keynote speakers: Ir. Ts. Akbal Abu from Custodian Commissioning, Group Project Delivery, Project Delivery & Technology, PETRONAS, Malaysia and Prof. Josep M. Guerrero from Professor, The Faculty of Engineering and Science, Aalborg University, Denmark. We would like to thank them for their presence and contribution to this conference.

ICE4CT2021 will not be a successful conference without the submission of technical papers from researchers who have invested their time and effort writing on a variety of important topics. We would like to thank all the authors for supporting ICE4CT2021 and wish you a fruitful and rewarding discussion. The technical program committee members and external examiners also deserved a standing ovation for a job well done reviewing the submitted papers whilst maintaining a high standard of quality for this conference.

Lastly, ICE4CT2021 would not be possible without the dedicated work and energy of the organizing committee, student committee and support teams who worked tirelessly in making this conference a success. We wish to extend our gratitude for the hard work and commitment throughout this beautiful journey. Thank you.

Syahrul Ashikin Azmi

Conference Chair

ICE4CT 2021

PROGRAM

16TH DECEMBER 2021

9:00 – 10:00	Opening ceremony of ICE4CT2021 Malaysia National Song UniMAP Official Song "Wawasanku" Recitation of Do'a Corporate Video ICE4CT Video Welcoming Speech by Conference Chair NEC Dr. Thangaprakash S Welcoming Speech by Conference Chair UniMAP Dr. Syahrul Ashikin Azmi Officiating Speech by The Vice Chancellor of UniMAP Lt. Kol. Prof. Ts. Dr. Zaliman Bin Sauli
10:00 – 11:30	Keynote Session Ir. Ts. Akbal Abu Custodian Commissioning, PETRONAS Digitalization in Oil & Gas Projects
11.30 – 12:00	Best Paper Award of ICE4CT2021 Virtual Photo session UniMAP Song "Dua Dekad"
12:00 – 14:20	Parallel 1 Session 1-6
14:20 – 15:30	Lunch Break
15:30 – 17:00	Keynote Session Prof Josep M. Guerrero Professor, The Faculty of Engineering and Science, Department of Energy Technology, Aalborg University Microgrids - Energy from The Land, The Sea and to The Moon
17:00	END DAY 1

17TH DECEMBER 2021

9:00 – 12:30	Parallel 2 Session 1-8
12:30	END OF ICE4CT2021

Google Meet link will be provided in the email

PARALLEL SESSION

DATE 16TH DECEMBER 2021
PARALLEL SESSION P1-S1

TIME	ID	
12:00 - 12:20	67	Characteristics of Fast Electric Field Generated by Negative Lightning in Northern Peninsular Malaysia
12:20 - 12:40	11	Double-layer remote configuration with LaOF: Eu^{3+} and Sr_3WO_6:U phosphors: a selection for enhancing the optical efficiency of WLEDs
12:40 - 13:00	12	Optical Efficiency Improvement of Chip-on-Board Design LEDs with TiO_2/Silicone Packaging Coating
13:00 - 13:20	13	The variety of phosphor $Ca_2MgSi_2O_7:Eu^{2+}$ emission color affect white light LEDs
13:20 - 13:40	14	The effect of yellow-green $La_2O_3:Pb^{2+}$ phosphor on color deviation of diodes that emit white color light
13:40 - 14:00	101	Comparative Study of Multiphase 5-Level Cascaded H-Bridge Multilevel Inverter System
14:00 - 14:20	103	The performance of the Optimisation and Regenerative Braking systems by using PI controlling technique for Electric Vehicle (EV)

Google Meet link will be provided in the email

PARALLEL SESSION

DATE 16TH DECEMBER 2021
PARALLEL SESSION P1-S2

TIME	ID	
12:00 - 12:20	9	LPG Mass Monitoring Scale with Automatic Gas Leakage Detector System
12:20 - 12:40	73	DC-DC Buck Converter for Electric Bike with Parameterized DC Motor: Simulation and Experimental Validation
12:40 - 13:00	74	Ruby Stone Light Grade Inspection System Using CCD Linear Sensor – A Review
13:00 - 13:20	78	Smart Lawn with Water Sprinkler for Garden Using Arduino UNO
13:20 - 13:40	79	Vibration analysis of 28 kHz horn transducer for ultrasonic cleaning based on harmonic response analysis
13:40 - 14:00	86	A built-in self-test module for 16-bit parallel photon counting circuit using 180 nm CMOS process
14:00 - 14:20	49	Study of Cu-doped silicene nanoribbons in the electric field

Google Meet link will be provided in the email

PARALLEL SESSION

DATE 16TH DECEMBER 2021
PARALLEL SESSION P1-S3

TIME	ID	
12:00 - 12:20	159	Design of ground-mounted grid-connected photovoltaic system with bifacial modules using PVsyst software
12:20 - 12:40	194	Power Controller for Dual-axis Solar Tracking System using PID
12:40 - 13:00	55	A Comparative Study of Hybrid Energy Storage System using Battery and Supercapacitor for Stand-Alone Solar PV System
13:00 - 13:20	77	Optimum Sizing and Performance of Fuel Cell Stack Integrated by DC-DC Converter for Running DC Load
13:20 - 13:40	231	Mathematical modeling and drying characteristics of thin layer drying of bitter gourd in evacuated tube solar dryer-without heat pipe
13:40 - 14:00	60	Feasibility study of the conversion from a small engine into a single-piston expander operating under different pressure and valve timing for waste heat recovery application
14:00 - 14:20	98	Improvement of Hybrid Energy Storage Wireless Charging System Performance and Efficiency

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PARALLEL SESSION

DATE 16TH DECEMBER 2021
PARALLEL SESSION P1-S4

TIME	ID	
12:00 - 12:20	10	Sine Cosine Algorithm for Tuning Cascaded PI Controllers for PMSM Drive System Speed Control
12:20 - 12:40	42	Boosting Algorithms to Identify Distributed Denial-of-Service Attacks
12:40 - 13:00	57	Development of Electronic Valve Timing Control for Single Piston Expander with Microcontroller
13:00 - 13:20	145	Parameter Estimation of DC Motor using Multiparametric Programming
13:20 - 13:40	168	Development of Vision Based Smart Gripper for Material Handling Using Internet of Things
13:40 - 14:00	48	Design and Implementation of an Automatic Speed Control System of Vehicles for Avoiding Road Accidents in Bangladesh
14:00 - 14:20	82	IoT RFID Lock Door Security System

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PARALLEL SESSION

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TIME	ID	
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12:20 - 12:40	61	Applications of Information Systems in Marketing Management
12:40 - 13:00	112	Active High Transmitter-receiver energy model for heterogeneous energy optimisation in a pipeline network
13:00 - 13:20	75	A Preliminary Analysis on RF Antenna Simulation comparison based on UHF and 5G for Energy Harvest Application
13:20 - 13:40	171	The investigation of dynamic heterogeneity in lead silicate liquid via molecular dynamic simulation
13:40 - 14:00	183	FPGA implementation of programmable Hybrid PUF using Butterfly and Arbiter PUF concepts
14:00 - 14:20	209	Structural properties of silica under the temperature

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PARALLEL SESSION

DATE 16TH DECEMBER 2021
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TIME	ID	
12:00 - 12:20	39	Evaluation of Two-Part rain attenuation model at Ku-band for tropical and equatorial regions
12:20 - 12:40	100	Development of Machine Learning models using WEKA for Atmospheric Data
12:40 - 13:00	69	Scintillation Effects of Ka-band Frequency On Satellite Application
13:00 - 13:20	147	Different Composition Ratio of ZnO/CuO Nanocomposite Thin Film using Sol-gel Spin Coating Technique
13:20 - 13:40	164	Color-based shadow detection method in aerial images
13:40 - 14:00	165	Design and Implementation of IoT based Security System for Children Safety
14:00 - 14:20	66	Real Time Retinal Optic Disc Segmentation via Guided filter and Discrete Wavelet Transform

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9:20 - 9:40	18	Research on the using of ZnO nanostructures to increase the optics efficiency of WLEDs
9:40 - 10:00	27	Power loss mitigation and voltage profile improvement by optimizing distributed generation
10:00 - 10:20	37	Magneto-optical studies of kerosene based ferrofluid
10:20 - 10:40	45	Digital Tools Approach Based On 'Gerun' And Online Partial Discharge Monitoring Project to Resolve Alternator's Failure
10:40 - 11:00	214	Air Plasma Sterilizer Using a Parallel Dielectric Barrier Discharge
11:00 - 11:20	217	Simulation of Molybdenum Disulfide based MOSFET Device using COMSOL Multiphysics software
11:20 - 11:40	53	Analysis of Effectiveness of Different Types Energy Storage for Crane Applications
11:40 - 12:00	163	Switch Mode Power Supply (SMPS) Utilizing Flyback Converter Topology: Simulation and Experiment

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TIME	ID	
9:00 - 9:20	17	Developing the luminous flux by choosing remote phosphor LED packages
9:20 - 9:40	174	Development of Detachable Rogowski Coil Current Sensor using PCB for High Voltage Cable Partial Discharge Measurement
9:40 - 10:00	88	Soil mass movement monitoring for landslide detection using low-cost accelerometer sensor as inclinometer
10:00 - 10:20	91	Analysis of Non-Invasive Fingerprint Thickness Based Authentication Method Utilizing Near Infrared Spectroscopy
10:20 - 10:40	95	Modelling of an Electric Vehicle
10:40 - 11:00	47	AC Power Flow Analysis for Inverters in Microgrid Application
11:00 - 11:20	87	Implementation of Optimized Low Pass Filter for ECG filtering using Verilog
11:20 - 11:40	154	Series Arc Fault Detection Sensor Based on an ABS Rogowski Coil in Medium Voltage
11:40 - 12:00	233	Design and characterization of Screen-Printed Piezoresistive Cantilever for Gas Sensor Application

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PARALLEL SESSION

DATE 17TH DECEMBER 2021
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TIME	ID	
9:00 - 9:20	189	Harmonics Elimination of Nine-level Multilevel Inverter with Reduced Switches Technique using Grey Wolf Optimization
9:20 - 9:40	191	Performance of Restricted Earth Fault And Bias Differential Protection Againts Earth Fault On A Transformer
9:40 - 10:00	197	Arcing fault diagnosis using enhanced cross-correlation technique
10:00 - 10:20	198	Performance of Backfill Material for Grounding System under High Voltage Condition
10:20 - 10:40	205	Performance enhancement of speed control for induction motor using dolphin algorithm
10:40 - 11:00	15	Apply dual-layer remote phosphor structures to improve WLEDs' color uniformity and luminous flux
11:00 - 11:20	16	Color intensity and beams of light of remote-phosphor LEDs improved with red phosphor $CaMgSi_2O_6:Eu^{2+},Mn^{2+}$
11:20 - 11:40	227	Transformer Health Index by Prediction Artificial Neural Networks Diagnostic Techniques
11:40 - 12:00	58	Design and Implementation of General Hardware Binary Multiplier (2^n x 2^n) Bits

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PARALLEL SESSION

DATE 17TH DECEMBER 2021
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TIME	ID	
9:00 - 9:20	36	The prospect of green energy and technology in Bangladesh
9:20 - 9:40	142	Performance Analysis of Different Type PV Module for 3kW Residential Roof Top PV System using PVSyst Simulation tool
9:40 - 10:00	176	Performance of a Single-phase Grid-connected Photovoltaic based DSTATCOM using Modified p-q Theory Control Algorithm
10:00 - 10:20	200	Characterization of Photovoltaic Panel Under Random Partial Shading Condition
10:20 - 10:40	190	Blockchain-Based Smart Contract for P2P Energy Trading in a Microgrid Environment
10:40 - 11:00	94	Application of Automated Machine Learning (AutoML) Method in Wind Turbine Fault Detection
11:00 - 11:20	29	Effect of thin tunnel layers MnO_3 and V_2O_3 on the enhancement of single-layer organic solar cell efficiency
11:20 - 11:40	206	An improved grey wolf optimization based MPPT algorithm for photovoltaic systems under diverse partial shading conditions
11:40 - 12:00	62	Design of Foot Step Power Generation System and Burglar Alarm System

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PARALLEL SESSION

DATE 17TH DECEMBER 2021
PARALLEL SESSION P2-S5

TIME	ID	
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9:20 - 9:40	43	A security aware lighting control system for public open spaces: An IoT powered approach
9:40 - 10:00	80	IoT Based Monitoring System For Stingless Bees Colony in IIUM
10:00 - 10:20	2	Fusion of Thermal and Depth Image to Improve Human Segmentation for a Mobile Robot
10:20 - 10:40	192	Channels Selection for Pattern Recognition of Five Fingers Motor Imagery Electroencephalography Signals
10:40 - 11:00	184	Intelligence system of methadone flexi dispensing (MFlex) program using Mahalanobis-Taguchi system
11:00 - 11:20	222	Single and Multiface Detection and Recognition System
11:20 - 11:40	213	A Conical Beam Antenna Using a Monopole Wire and Rectangular Copper Probe with Four Parasitic Sleeves for UMTS/WLAN Applications
11:40 - 12:00	51	Enhancing Match Detection Process in Generic Code Clone Detection Model using Chi-Square Distance Equation

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PARALLEL SESSION

DATE 17TH DECEMBER 2021
PARALLEL SESSION P2-S6

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9:00 - 9:20	59	VPN–Based WiMAX Network Protection Against Jamming Attacks for VoIP Application
9:20 - 9:40	64	Image reconstruction by shapefree radial basis function neural networks (RBFNs)
9:40 - 10:00	193	Exploration of Pattern Recognition Methods for Motor Imagery EEG Signal with Convolutional Neural Network Approach
10:00 - 10:20	104	Eyeball Segmentation and Measurement in MRI Images of Myopic Children
10:20 - 10:40	215	Design and Simulation of Compact MIMO Antenna for the 5G Communication in C-Band
10:40 - 11:00	102	Enhanced Congestion Control Model Based on Message Prioritization and Scheduling Mechanism in Vehicle-to-Infrastructure (V2I)
11:00 - 11:20	188	A new communication engineering in methadone flexi dispensing (MFlex) program using Mahalanobis-Taguchi system
11:20 - 11:40	169	Conversion of 15-Minutes to 1-Minute Rainfall Distribution Derived from Tropical Rainfall Distribution Measurement
11:40 - 12:00	216	SAR Evaluation of Flexible UWB Antenna for Wearable Applications
12:00 – 12:20	230	Energy Efficient Ant Colony System for Packet Routing in Wireless Sensor Network

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PARALLEL SESSION

DATE 17TH DECEMBER 2021
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TIME	ID	
9:00 - 9:20	93	Improvement of facility layout design using Systematic Layout planning methodology
9:20 - 9:40	97	Computational cooling performance of electronic chips on printed circuit boards
9:40 - 10:00	166	Analysis and Simulation of Temperature Distribution and Stress Development in Wire EDM of Tungsten Carbide
10:00 - 10:20	170	Damage Prediction of Pre-cracked High-Pressure Pipelines
10:20 - 10:40	173	Investigation of water recovery from sewage using solar thermal technology
10:40 - 11:00	220	Numerical Investigation on Heat Sink Material for Temperature Control of Electronics
11:00 - 11:20	223	Homogenization of Green SiO from Rice Husk Burn through Potassium Hydroxide Solid-Liquid Extraction
11:20 - 11:40	229	Effect of Build Parameters on Process Energy Consumption and Material Usage in Fused Deposition Modelling Method
11:40 - 12:00	161	Investigation of The Dynamic Deflection of Conveyor Belts Via Simulation Modelling Methods on Idler Factor

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PARALLEL SESSION

DATE 17TH DECEMBER 2021
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TIME	ID	
9:00 - 9:20	26	Crisis Rescue Vehicle Administration System Utilizing PSO and RFID
9:20 - 9:40	34	Stability analysis of Bangladesh power system and impact of renewable energies and FACTS devices
9:40 - 10:00	52	Real Time Fault Detection and Control in Continuous Stirred Tank Reactor
10:00 - 10:20	63	Ergonomic Assessment in Textile Machinery Manufacturing Industry
10:20 - 10:40	68	Covid-19 Detection Based on Lung CT Scan Using Deep Learning Techniques
10:40 - 11:00	71	Deep Learning Models for detecting Forest Fire and Smoke
11:00 - 11:20	84	Effect of fin geometry on 14 nm FinFET analog performance
11:20 - 11:40	144	Loss of load probability minimization for stand-alone photovoltaic system using elephant herding optimization
11:40 - 12:00	208	The Waste Detection System of Shrimp Feeding with a Waterproof Camera using Yolo Algorithm

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Track 1-Electrical and Electronic
Paper ID: 9

LPG Mass Monitoring Scale with Automatic Gas Leakage Detector System

Abstract. A crucial requirement used in everyday human life is the use of liquefied petroleum gas (LPG) or, more generally, cooking gas. However, problems arise for LPG users when the cooking process is disrupted due to running out of cooking gas without them realized that the volume of gas has reached a critical level. In addition, gas leaks may also occur which can cause the house fire. Therefore, this study aims to develop a product that can monitor the remaining volume of cooking gas content in a gas cylinder using a load sensor. The LPG weight value is through LCD display and LED from three different levels, which is green (full), yellow (medium), and red (critical) where it receives programming instructions from Arduino Uno. The product also performs a function of gas leak detector by using the MQ-2 gas sensor and the user will receive a notification warning about the gas leak via buzzer and SMS sent by ESP32. The development process for monitoring scale and gas leakage detector for liquid petroleum gas (LPG) is based on the adapted from the Engineering Design Process Model (EDP), which consists of five phases, namely identify the problem, gather information, select the best solution, develop model, testing and evaluation. The results show that the developed product able to functioning well. However, in terms of product design there is still room for improvement especially for the size of the product and the gas sensor position to make it more user friendly.

Paper ID: 11

Double-layer Remote Configuration with LaOF: Eu^{3+} and Sr_3WO_6:U Phosphors: A Selection for Enhancing The Optical Efficiency of WLEDs

Khanh Nguyen Hung[1], Phan Xuan Le[2,*], Hsiao-Yi Lee[3]

[1]Faculty of Technology, Dong Nai Technology University, Nguyen Khuyen Street, Quarter 5, Trang Dai Ward, Bien Hoa City, Dong Nai Province, Viet Nam

[2]Faculty of Engineering, Van Lang University, 69/68 Dang Thuy Tram Street, Ward 13, Binh Thanh District, Ho Chi Minh City, Vietnam

[3]Department of Electrical Engineering, National Kaohsiung University of Science and Technology, Kaohsiung 80778, Taiwan

*Corresponding author: le.px@vlu.edu.vn

Abstract. Although the distant phosphor configuration is a good selection for high-luminescence WLEDs, it did not satisfy the high color adequacy standard. With the aim of achieving improved chromatic indices, including the index for color rendering (CRI) and the scale of color quality (CQS), for the distant phosphor structure, a dual-layer design with red or green phosphor addition is suggested in this research report. The color temperature of the WLEDs packets employed in this investigation is 8500 K. The phosphor configuration will be produced by layering green Sr_3WO_6:U or red LaOF:Eu^{3+} phosphor on top of the yellow phosphor YAG:Ce^{3+}. The concentration of additional red phosphor LaOF:Eu^{3+} and green phosphor Sr_3WO_6:U will then be adjusted to observe the changes in color in luminescence performance of the WLED packages. The theory of Mie about scattering combined with Lambert Beer's rule supports the investigation on optical results. The findings demonstrated a rise in CRI and CQS along with the existence of LaOF:Eu^{3+}, indicating that the LaOF:Eu^{3+} presence has a major impact on these two elements. Because of the increased concentration of red light components within WLED packets, CRI and CQS increase with increasing concentration of LaOF:Eu^{3+}. In the meantime, the green phosphor Sr_3WO_6:U improves the beams of light. However, if the concentrations of both the red LaOF:Eu^{3+} and the green Sr_3WO_6:U phosphors are above the corresponding level, the beams of light and color intensity will be reduced. The outcomes of this study are crucial references for producing WLEDs with greater light of white standard.

Keywords: *WLED; YAG:Ce^{3+}; LaOF:Eu^{3+}; Sr_3WO_6:U; color quality*

Paper ID: 12

Optical Efficiency Improvement of Chip-on-Board Design LEDs with TiO_2/Silicone Packaging Coating

Khanh Nguyen Hung[1], Phan Xuan Le[2,*], Hsiao-Yi Lee[3]

[1]Faculty of Technology, Dong Nai Technology University, Nguyen Khuyen Street, Quarter 5, Trang Dai Ward, Bien Hoa City, Dong Nai Province, Viet Nam

[2]Faculty of Engineering, Van Lang University, 69/68 Dang Thuy Tram Street, Ward 13, Binh Thanh District, Ho Chi Minh City, Vietnam

[3]Department of Electrical Engineering, National Kaohsiung University of Science and Technology, Kaohsiung 80778, Taiwan

*Corresponding author: le.px@vlu.edu.vn

Abstract. Since TiO_2 nanoparticles and silicon composites include a strong scatter influence, they are well-known for improving scattered lighting in LED packets. To improve the optic quality of LEDs packaged with chip-on-board (COB), a thin layer made of high-concentration TiO_2 and silicon glue is added to the primary packing layer. COB LEDs' light extraction efficiency (LEE) rises up to 65% when the key encapsulation includes just silicone, according to the findings of experiments. As a coating of TiO_2 and silicone is added, however, the increase in LEE is dependent on the TiO_2 concentration. The LEE can be increased from 6% to 24% as the concentration of nanoparticles drops to 0.035 g/cm^3. Furthermore, at a mean correlated color temperature (CCT) of around 8500 K, the TiO_2/silicone compounds layer will assist in lowering the angular correlated color temperature (CCT) variance between 900 and 470 K within the -90° to 90° observing angle range.

Keywords: *Chip-on-board; YAG:Ce^{3+}; TiO_2 nanoparticles; CCT; color quality*

Paper ID: 13

The variety of phosphor $Ca_2MgSi_2O_7:Eu^{2+}$ emission color affect white light LEDs

Khanh Nguyen Hung[1], Phan Xuan Le[2,*], Hsiao-Yi Lee[3]

[1]Faculty of Technology, Dong Nai Technology University, Nguyen Khuyen Street, Quarter 5, Trang Dai Ward, Bien Hoa City, Dong Nai Province, Viet Nam

[2]Faculty of Engineering, Van Lang University, 69/68 Dang Thuy Tram Street, Ward 13, Binh Thanh District, Ho Chi Minh City, Vietnam

[3]Department of Electrical Engineering, National Kaohsiung University of Science and Technology, Kaohsiung 80778, Taiwan

*Corresponding author: le.px@vlu.edu.vn

Abstract. This research relates to a Solid-state process that creates alkaline earth borophosphate phosphors such as $Ca_2MgSi_2O_7:Eu^{2+}$ mixed with Eu^{2+} ions. The f–d transitions and Eu^{2+} ions mixture take possession of two seperate cation spots in main grids with the help of two emission sashes, one at 465 nm and another at 520 nm. To observe these bands, we replace M^{2+} sites, which were rationalized by two opposing factors: crystal field intensities and bond covalence. The composition-optimized $Ba_3BP_3O_{12}:Eu^{2+}$, $Ca_2MgSi_2O_7:Eu^{2+}$ phosphors, and a near-UV chip of 370nm in size were combined to compose white pc-LEDs with a green and bluish color, respectively. The phosphors could be promising in making green and bluish-white luminous materials for white pc-LEDs with near UV-based.

Keywords: *WLED; $Ca_2MgSi_2O_7:Eu^{2+}$; YAG:Ce; luminous flux; color deviation*

Paper ID: 14

The effect of yellow-green $La_2O_3:Pb^{2+}$ phosphor on color deviation of diodes that emit white color light

Khanh Nguyen Hung[1], Phan Xuan Le[2,*], Hsiao-Yi Lee[3]

[1]Faculty of Technology, Dong Nai Technology University, Nguyen Khuyen Street, Quarter 5, Trang Dai Ward, Bien Hoa City, Dong Nai Province, Viet Nam

[2]Faculty of Engineering, Van Lang University, 69/68 Dang Thuy Tram Street, Ward 13, Binh Thanh District, Ho Chi Minh City, Vietnam

[3]Department of Electrical Engineering, National Kaohsiung University of Science and Technology, Kaohsiung 80778, Taiwan

*Corresponding author: le.px@vlu.edu.vn

Abstract. The WLED packet with adjustable CCT, also called as PC-LEDs packaged, comprises blue and red LEDs with direct emission and phosphor transmutation via creating a merger between two phosphors (green, orange) and blue color from the LED device, was possessed using a nonlinear compass in order to attain the best LER value with both CRI conditions: R9 CRI as well as special CRI conditions to gain potent red beyond 90 with CCT values between 2700 K - 6500 K. Blue and red LED, accompanied by the blue LED dye, as well as green, and orange phosphors have correspondingly ideal peak wavelengths, which have values of 465 nm, 628 nm, 452 nm, 530 nm, as well as 586 nm. At various values of CCTs ranging from 2722 K to 6464 K, a genuine CCT which has adjustable PC/red/blue LED package possessing CRIs and R9s between 90 and 96, CQSs vary from 89 to 94, while LERs ranging from 303 to 358 lm/W, along with LEs running from 105 to appproximately 119 lm/W was accomplished. To obtain a high optical efficiency PC/R/B LED package, the top wavelength deviation is required to be fewer than ± 5 nm in the blue LED, while if the blue LED is ± 2 and ± 1 nm in the red LED.

Keywords: *WLED; white-light LED; color rendering index; color quality scale;* $La_2O_3:Pb^{2+}$

Paper ID: 15

Apply dual-layer remote phosphor structures to improve WLEDs' color uniformity and luminous flux

Khanh Nguyen Hung[1], Phan Xuan Le[2,*], Hsiao-Yi Lee[3]

[1]Faculty of Technology, Dong Nai Technology University, Nguyen Khuyen Street, Quarter 5, Trang Dai Ward, Bien Hoa City, Dong Nai Province, Viet Nam

[2]Faculty of Engineering, Van Lang University, 69/68 Dang Thuy Tram Street, Ward 13, Binh Thanh District, Ho Chi Minh City, Vietnam

[3]Department of Electrical Engineering, National Kaohsiung University of Science and Technology, Kaohsiung 80778, Taiwan

*Corresponding author: le.px@vlu.edu.vn

Abstract. Compared to the conformal and in-cup phosphor structure, the remote phosphor format has the disadvantage of color quality but is contemporaneously more luminous. From this adversity, pieces of research were created with the purpose of enhancing the chromatic performance that belongs to this layout. For our research, it is recommended to utilize the remote phosphor layout with two sheets to ameliorate the CRI along with the CQS in the WLED device. The three structures of the WLED device are equivalent, with various chromatic heat that includes 5600 K, 8500 K that we used. Our concept was to place one sheet of blue phosphor $Zn_2SiO_4:Mn^{2+},As^{5+}$ or red phosphor $La_2O_3:Eu^{3+}$ upon the yellow phosphor $YAG:Ce^{3+}$. Following that was to get the appropriate concentration of $La_2O_3:Eu^{3+}$ to add in to perceive the best chromatic performance. The result suggested that $La_2O_3:Eu^{3+}$ benefited remarkably to increase the level of CRI as well as CQS. Specifically, as the $La_2O_3:Eu^{3+}$ concentration grows, so does the CRI, along with CQS. This is caused by an increase in the red light section of WLED. Meanwhile, the blue phosphor layer brought benefits to the luminous flux. However, if the concentrations of $La_2O_3:Eu^{3+}$ and $Zn_2SiO_4:Mn^{2+},As^{5+}$ excessively increase, it will cause the luminous flux and color quality to decrease correspondingly. This was proved hinged on the theory of Mie-scattering as well as the law of Lambert-Beer. The result will contribute greatly to the constitution of WLEDs with higher white light quality.

Keywords: *WLED; $YAG:Ce^{3+}$; $Zn_2SiO_4:Mn^{2+},As^{5+}$; $La_2O_3:Eu^{3+}$; color quality scale*

Paper ID: 16

Color intensity and beams of light of remote-phosphor LEDs improved with red phosphor $CaMgSi_2O_6:Eu^{2+},Mn^{2+}$

Khanh Nguyen Hung[1], Phan Xuan Le[2,*], Hsiao-Yi Lee[3]

[1]Faculty of Technology, Dong Nai Technology University, Nguyen Khuyen Street, Quarter 5, Trang Dai Ward, Bien Hoa City, Dong Nai Province, Viet Nam

[2]Faculty of Engineering, Van Lang University, 69/68 Dang Thuy Tram Street, Ward 13, Binh Thanh District, Ho Chi Minh City, Vietnam

[3]Department of Electrical Engineering, National Kaohsiung University of Science and Technology, Kaohsiung 80778, Taiwan

*Corresponding author: le.px@vlu.edu.vn

Abstract. Adding red-emitting $CaMgSi_2O_6:Eu^{2+},Mn^{2+}$ phosphor and SiO_2 fleck to yellow-emitting $YAG:Ce^{3+}$ phosphor component is suggested and illustrated as a positive approach to improve illumination efficiency of white LEDs with distant-phosphor structure with mean correlated color temperature (CCT) of 5600K ÷ 8500K. If we increase the concentration of $CaMgSi_2O_6:Eu^{2+},Mn^{2+}$ (2% - 30%) and maintain 5% of the SiO_2 weight, the results showed that CRI, CQS, as well as illuminating beam are all highly dependent on the $CaMgSi_2O_6:Eu^{2+},Mn^{2+}$ concentration. Furthermore, the optic features of $CaMgSi_2O_6:Eu^{2+},Mn^{2+}$ and SiO_2 particles can be improved utilizing Monte Carlo technique as well as the Mie-scattering theory. The findings suggest a promising realistic method to produce remote-phosphor WLED devices (RP-WLEDs) with improved color intensity and lighting performance.

Keywords: *WLED; $CaMgSi_2O_6:Eu^{2+},Mn^{2+}$; SiO_2; Mie-scattering theory; Monte Carlo technique*

Paper ID: 17

Developing the luminous flux by choosing remote phosphor LED packages

Khanh Nguyen Hung[1], Phan Xuan Le[2,*], Hsiao-Yi Lee[3]

[1]Faculty of Technology, Dong Nai Technology University, Nguyen Khuyen Street, Quarter 5, Trang Dai Ward, Bien Hoa City, Dong Nai Province, Viet Nam

[2]Faculty of Engineering, Van Lang University, 69/68 Dang Thuy Tram Street, Ward 13, Binh Thanh District, Ho Chi Minh City, Vietnam

[3]Department of Electrical Engineering, National Kaohsiung University of Science and Technology, Kaohsiung 80778, Taiwan

*Corresponding author: le.px@vlu.edu.vn

Abstract. The main topic highlighted and investigated in this study is how the space between the layers of the dual-layer and triple-layer remote modules affects the color rendering quality and the luminous flux. While doing simulation, it was discovered that by modifying the distance between the layers, we could possibly produce a sufficient gap for forming higher quality WLEDs. Based on the study findings, the most suitable space between two layers of phosphor to attain the greatest ideal effect from the MCW LED's performance is 0.1 mm. The efficiency of the two-layer configurations has been demonstrated via a series of experiments to provide optical qualities that are superior to the three-layer in terms of distance. For the triple-layer configuration, the maximum attainable lumen output is 0.6 mm while for the dual-layer structure is 0.1 mm. In the meantime, the distance rises make the color rendering index insignificantly vary. Because of the cost and low conversion efficiency, it is impractical to apply the triple-layer design for high-power white LEDs. The best WLED configuration for enhancing luminous productivity and color rendering index is a dual-layer remote phosphor module with a phosphorus gap at 0.1 mm.

Keywords: *WLED; YAG:Ce^{3+}; luminous flux; YAG:Ce^{3+}; color quality*

Paper ID: 18

Research on the using of ZnO nanostructures to increase the optics efficiency of WLEDs

Khanh Nguyen Hung[1], Phan Xuan Le[2,*], Hsiao-Yi Lee[3]

[1]Faculty of Technology, Dong Nai Technology University, Nguyen Khuyen Street, Quarter 5, Trang Dai Ward, Bien Hoa City, Dong Nai Province, Viet Nam
[2]Faculty of Engineering, Van Lang University, 69/68 Dang Thuy Tram Street, Ward 13, Binh Thanh District, Ho Chi Minh City, Vietnam
[3]Department of Electrical Engineering, National Kaohsiung University of Science and Technology, Kaohsiung 80778, Taiwan

*Corresponding author: le.px@vlu.edu.vn

Abstract. Though the widely used technique for manufacturing WLEDs is to create the merger between blue LED chips and a yellow phosphor, the resulting angular CCT homogeneity remains low. As a result, this study suggests that ZnO nanostructures be added to WLED packs to improve color homogeneity. The results indicate that the ZnO nano-granules' form at various concentrations substantially influnece the scattered energy and CCT deviations in WLED packs. The addition of node-like (N-ZnO), sheet-like (S-ZnO), and rod-like (R-ZnO) domains reduces CCT respectively varies (3455.49 K - 96.30 K, 40.03 K, 60.09 K). WLED equipments , on the other hand, will obtain higher CCT uniformity and poorer lighting flux decrease with 0.25 % N-ZnO, 0.75 % S-ZnO, and 0.25 % R-ZnO. The outcomes of this paper could be helpful to the producer as a guide in developing WLEDs.

Keywords: *White light-emitting diodes; YAG:Ce^{3+}; ZnO nanostructures; Mie-scattering theory; color quality*

Paper ID: 26

Crisis Rescue Vehicle Administration System Utilizing PSO and RFID

Shanoorbaba Yargatti
PG VLSI and Embedded Systems
Dept. of Electronics and Communication
K.L.E Dr. M.S. Sheshgiri College of Engineering and Technology,
Belagavi, India
shanooryargatti007@gmail.com

Udaykumar L. Naik (SM IEEE)
Dept. of Electronics and Communication
K.L.E Dr. M.S. Sheshgiri College of Engineering and Technology,
Belagavi, India
naikudayl@gmail.com
naikudayl@klescet.ac.in

ABSTRACT - The critical patient movement to the hospital requires a reduction in ambulance travel time to provide quality health care to the patient. To achieve this goal, our work uses two advanced technologies: Particle Swarm Optimization (PSO) and Radio Frequency IDentification (RFID). Particle swarm optimization algorithm helps in route optimization to locate the nearest ambulance for emergency patient calls. The RFID innovation is utilized to execute shrewd traffic light control. RFID introduced at traffic light tracks RFID labeled rescue vehicles and sends the information to the cloud. Thus, the implementation of this work is to have optimized method for the ambulance selection and ease of ambulance movement at the road intersection. This developed prototype system model with RFID and PSO technologies works as supporting traffic management aid in critical patient movement.

Keywords: ESP8266, Particle Swarm Optimization, PYTHON, PySwarms, RFID, Raspberry pi.

Paper ID: 27

Power loss mitigation and voltage profile improvement by optimizing distributed generation

S N Syed Nasir[1], **A F Othman**[2], **R Ayop**[1] **and J J Jamian**[1]
[1]School of Electrical Engineering, Faculty of Engineering, Universiti Teknologi Malaysia, 81310, Skudai, Johor, Malaysia.
[2]Tenaga Nasional Berhad, 59200 Kuala Lumpur, Malaysia.
E-mail: syednorazizul@utm.my

Abstract. In a developing country, electricity has become the necessity of the growth industries; thus, the distribution system power quality and reliability are crucial. With low carbon initiatives, renewable energy or distributed generation (DG) is a promising source of electricity and leads the complex distribution system. Vital rises in DGs in power grids will significantly impact the system reliability and security, especially in power losses and voltage profiles parameters. This research focuses on an optimization placement and size of DGs in distribution systems to minimize power loss and improve voltage profile using the Modified Lightning Search Algorithm (MLSA). This research has modelled the practical 69-bus radial distribution system. Then MLSA with a weight summation approach is used to identify the suitable location and size for the DGs in the design proposal stage. The optimization objectives are to reduce power losses and improve the voltage profile, especially at the connection point of DGs. Besides that, load profile, DGs constant load and the solar load in distribution system modelled using MATLAB software. The results of the simulation using MLSA indicated that the optimization allocation and sizes of solar DGs applied with current load and load changes can minimize the power losses and improve voltage profile. These results verify the proposed approach's effectiveness and success in determining the optimal location and sizing of solar DGs to reduce power losses as well as improve voltage profiles.

Paper ID: 37

Magneto-optical studies of kerosene based ferrofluid

O K Nimisha[a], Kannan Pradeesh[a] and A P Reena Mary[a]

[a]Department of Physics, Govt. Victoria College, Palakkad, University of Calicut, Kerala, India

email: nimmykrishnangvc@gmail.com

Magnetic fluids are technologically important due to their tunable magnetic, electrical and optical properties. The magneto optical properties of ferrofluids have a major role for the development of optoelectronic devices. This paper represents the detailed analysis of kerosene based ferrofluid, their structure and magneto optical properties will be investigated. Iron oxide nanofluids are synthesised by a Co-precipitation method. The X-ray diffraction technique is used for structural characterization . The magneto optical property of the iron oxide nanofluids have been investigated by linear dichroism measurements. Intrinsic optical anisotropy or the shape anisotropy of individual magnetic particles are the causes of linear dichroism. The magnetic susceptibility of ferrofluid with different volume fractions is measured using Quincke's method.

Keywords: Ferrofluid, Magneto optical measurement, Magnetic susceptibility

Paper ID: 45

Digital Tools Approach Based On ‘Gerun’ And Online Partial Discharge Monitoring Project To Resolve Alternator’s Failure

Azwanizam b Che Abdul Rahman, Engineering Department, PETRONAS Gas Berhad, Malaysia

Mohd Rahmat Tahir, Engineering Department, IRSO East Coast, Malaysia

M Hamdan Kamarul Bahraini, Engineering Department, PETRONAS Gas Berhad, Malaysia

Mohd Helmi Halim, Heliz & Rasraaf Sdn Bhd and MHH Condition Monitoring Sdn Bhd

Muzamir Isa, Faculty of Electrical Engineering Technology, Universiti Malaysia Perlis (UniMAP)

Abstract. There is no online monitoring system and digital tools to monitor generator gas turbine healthiness led to generator failure caused un-planned outages resulted power import and penalty chargers. Maintenance program for generator is based on time-based method. Since 2016 to 2020, Asset Team spent millions of ringgit Malaysia for generator rectification and incurred power import cost due to the failure. To overcome the tripping issues, Generator Health Monitoring System was initiated as a research/pilot project as tools to monitor healthiness of Gas Turbine Generator. This project was categorized as digital transformation initiative (Revolution 4.0) as to enable online monitoring & performing diagnostic & prescriptive. The initiative consisted of 2 main pillars which are Generator Rotor Unhealthiness Notification (GERUN) and Online Partial Discharge Monitoring System (PD ONLINE). The aim of this paper is to share the experience in monitoring, economical way, diagnosis, condition evaluation, and possibility of predicting the performance of the generator. The methodology of the Generator Healthiness is to monitor the real time performance of the generator during running condition through rotor thermal losses, ratio of excitation current over the real output power and stator partial discharge pattern. This real time monitoring can improve the maintenance strategy and planning. As a result, plant's OEE can be increased, reduce the MTBF and more importantly the repair cost. The parameters have been introduced to prevent the generator sudden failure event and bridge the gap condition monitoring especially on the generator part. Arriving to the objective, this project was categorized as digital transformation initiative (Revolution 4.0) as to enable online monitoring & performing diagnostic & prescriptive. The initiative consisted of 2 main pillars which are Generator Rotor Unhealthiness Notification (GERUN) and Online Partial Discharge monitoring system (PD ONLINE) project. Diagnose & prescriptive and provide asset owners with insights on alternator’s health, subsequently prevent unforeseen failure in real time and prescribe operational mitigations to prolong alternator’s life. Recommends targeted test and maintenance (3rd level maintenance predictive) addressing the exact health issue of the alternator value creation & cost saving by eliminating tripping, scope reduction for major inspection, non-dependable on FSR, internal troubleshooting and etc. The system has been implemented across gas

processing and utilities Petronas Gas Berhad for 14 units of gas turbine generator. In view of the success implementation, this digital tool will be duplicate to others Petronas Operating Unit.

Paper ID: 47

AC Power Flow Analysis for Inverters in Microgrid Application

M A Roslan1, S A Azmi1 and K H Ahmed2

1School of Electrical Systems Engineering, Universiti Malaysia Perlis, Malaysia

2Power Electronics, Drives and Energy Conversion (PEDEC) Group, Strathclyde University, Glasgow, UK

Email: mazrik@unimap.edu.my, ashikin@unimap.edu.my, khaled.ahmed@strath.ac.uk

Abstract. In a microgrid system, proper current distribution and load sharing strategies are essential to achieve reliable parallel operation. Line impedance is an important factor when implementing a control technique for an inverter for microgrid operation, whether it is operating in grid connected or island mode. It is sometime difficult to visualize the impact of different line impedance to the power flow in AC microgrid. In this paper, AC power flow of an inverter-based system connected to a common ac bus through purely resistive, inductive or complex line impedances is investigated. For each line impedance case, the effect of an inverter's output voltage power angle and amplitude on the active and reactive power flow are studied. Several active and reactive powers plots are generated in 3D surf plots to visualize the impact of line impedance on the power flow in an AC system.

Paper ID: 49

Study of Cu-doped silicene nanoribbons in the electric field

Hoang Van Ngoc

Institute of Applied Technology, Thu Dau Mot University, No 6, Tran Van On Street, Thu Dau Mot city, Vietnam

Email: ngochv@tdmu.edu.vn

Abstract. This work studies copper doping in silicene nanoribbons. The electric field acting on the system has a constant magnitude of 0.4V/Å. The unit lattice studied here consists of twelve silicon atoms and four hydrogen atoms in one unit cell, hydrogen atoms to modify two edges. There are two doped structures studied, the top stucture and the valley structure, each with one substitution doped Cu atom per unit cell. The theory used to study computation here is density functional theory (DFT). The formation energies, state bands and energy regions of the doped system are calculated and plotted. Thanks to the copper doping process and the influence of the electric magnetic field, the system after doping becomes semi-metallic. The top doped structure shows more optimization and stability. In the quest to find new materials with features that match the requirements of practice, this is a promising study. This study lays the groundwork for future applications in electronic technology.

Keywords: Silicene nanoribbons; Cu doping; top structure; valley structure.

Paper ID: 53

Analysis of Effectiveness of Different Types Energy Storage for Crane Applications

N.B Ahamad1, K.Z. Gang1, S. M. Suboh1, M. Othman1, E. Che Mid1,NM Isa2

1. Electric Vehicle Energy Storage System (eVess) Research Group, Center of Excellence Renewable Energy (CERE), Universiti Malaysia Perlis, Kampus Tetap Pauh Putra, 02600 Arau, Perlis, Malaysia.

2. Jabatan Kejuruteraan Petrokimia,Politeknik Tun Syed Nasir Syed Nasir,Hab pendidikan tinggi PagohPagoh, Johor

baizura@unimap.edu.my, zhigang0903@gmail.com, surina@unimap.edu.my, muzaidi@unimap.edu.my, ernie@unimap.edu.my,

Abstract. The energy storage system (ESS) is the subject of this research project. It comprises of many sources of energy that are widely utilised in electric cranes. In this project, a simulation model is created to examine the behaviour of a supercapacitor, batteries, and flywheel under varied power demands with charging and discharging circumstances. Lead acid batteries and supercapacitors are the most crucial components to be used as the combination for HESS. In electric cranes, the performance is improved where the supercapacitor is used due to the battery's power density issue, quick discharging and charging conditions. With the help of a supercapacitor, the battery is relieved from peak stress and the efficiency can be optimized. However, the challenge is the optimization of HESS in order to take the advantage of their strengths which combine battery and supercapacitor respectively. Other than that, discharging characteristics are determined by investigating the combination of HESS. Thus, case studies of power demands are studied to understand the behaviour of a supercapacitor when it is under power demands. Hence, the behaviour of all energy storage systems is investigated and validated with the simulation results of MATLAB Simulink. The simulation results are presented to verify the analysis of performance. The results have shown under various power demands, a proposed strategy to study state of charge characteristics is effective.

Keywords— Energy storage, supercapacitor, Flywheel, Battery, Crane

Paper ID: 58

Design and Implementation of General Hardware Binary Multiplier (2^n x 2^n) Bits

Alaa Ghazi Abdulbaqia[1], Yasir Hashim[2, *]

[1]Department of Information Technology, Tishk International University, Kurdstan Region, Erbil, Iraq

[2]Department of Computer Engineering, Tishk International University, Kurdstan Region, Erbil, Iraq

*yasir.hashim@ieee.org

Abstract. In this paper, a new general 2^n x 2^n bits hardware multiplier based on combinatorial has been designed, implemented and analysed. First, a new design for circuit to multiply two binary numbers with 2^n bits length, this new design starts with basic 2x2 bits circuit multiplier, n here equal to 1. Then based on this circuit, the 4x4 bits circuit multiplier has been designed. And based on 4x4, the 8x8 bits multiplier has been designed and continually the 16x16 bits multiplier. The final design for general 2^nx2^n bits multiplier has been presented. All these circuits have been mathematically proved and tested to get the final results.

Paper ID: 67

Characteristics of Fast Electric Field Generated by Negative Lightning in Northern Peninsular Malaysia.

Yong-Jia Hwang[1], Chin-Leong Wooi[1], Syahrun Nizam bin Md Arshad@Hashim[1], Mohd Riduan Bin Ahmad[2], Hadi Nabipour-Afrouzi[1]

[1]Centre of Excellence for Renewable Energy (CERE), School of Electrical System Engineering, Pauh Putra Main Campus, Universiti Malaysia Perlis, 02600 Arau, Perlis, Malaysia.

[2]Atmospheric and Lightning Research Laboratory (ThorLab), Centre for Telecommunication and Innovation (CeTRI), Fakulti Kejuruteraan Elektronik dan Kejuruteraan Komputer (FKEKK), Universiti Teknikal Malaysia Melaka (UTeM), 76100 Durian Tunggal, Melaka

Abstract. The development and advancement of lightning locating system (LLS) reaches until 2021 and the characteristics of lightning can be studied by observing the electric field produced by lightning. There are several studies proven that preliminary breakdown pulses (PBPs) are always preceded the return stroke, the duration of the PBPs and the time for the PBPs preceded the return stroke tend to be different depends on the types of lightning, regions, and location. This paper observed and recorded the fast electric field changes of negative cloud to ground lightning (CG). Total of ten sample data was captured on 13 May 2021 and selected to be analyzed in detail. Information such as rise time to peak, duration of preliminary breakdown pulses has been recorded. The captured result is compared with the results from other papers. The results show that the PBPs duration are very similar when compared with local results which shows an average of 2.347 ms. While the average time for PBPs to precede the first return stroke is around 9.44 ms and the rise time from 10% to 90% peak of first return stroke shows an average time of 4.86 μs**.**

Keywords: Lightning, Fast electric field, preliminary breakdown pulse, return stroke.

Paper ID: 73

DC-DC Buck Converter for Electric Bike with Parameterized DC Motor: Simulation and Experimental Validation

M N Abdullah[1], M K Mat Desa[1], E A Bakar[2] and M N Akhtar[2]

[1] School of Electrical and Electronic Engineering, USM, Penang, Malaysia
[2] School of Aerospace Engineering, USM, Penang, Malaysia

Email: eemnazir@usm.my

Abstract. This paper presents a single stage DC-DC Buck power converter for an electric bike system which is used as a DC motor driver. The DC motor is firstly parameterized to identify and estimate the dynamic of electrical and mechanical parameters. In this paper, the simulation and the experimental validation of the system are presented. A model of a DC-DC Buck converter fed with DC motor is developed. The simulation was carried out using Matlab-Simulink software and the experimental setup is based on a built prototype of Atmega 328 microcontroller board. The similarities of voltage and current input/output waveforms between simulation and experimental results proved that the single stage DC-DC Buck converter with parameterized DC motor suitable to prototype a low power electric bike model.

Paper ID: 74

Ruby Stone Light Grade Inspection System Using CCD Linear Sensor – A Review

F M Rahalim, J Jamaludin, S N Raisin and F A Asuhaimi

Electrical and Electronic Engineering Department, Faculty of Engineering and Built Environment, Universiti Sains Islam Malaysia, Bandar Baru Nilai, Negeri Sembilan, Malaysia. juliza@usim.edu.my/0000-0003-4693-2236

Abstract. Many countries import ruby stones for use in their precious stone industries, manufacturing industries, as well as in medical and dentistry applications. Several gemmology tools, such as loupes, microscopes, and dichroscopes, have already been used to facilitate in the grading of ruby stones. These tools, however, are highly reliant on human visual assessment and require years of experience to use correctly. Currently, there is no systematic and standardized technique for evaluating ruby stone grading other than those that rely on human factors which can lead to inaccuracies. Gemmologists, stakeholders in the precious stone and manufacturing industries, as well as dentistry applications, would benefit from a standardized quantitative grading valuation of ruby stones. Extensive study is required to analyse the light properties of rubies for inspection purposes. As a result, this paper provides an overview of the ruby stone light grade inspection system that employs a Charge-Coupled Device (CCD) linear sensor. The relevant light characteristics of ruby stones for grading purpose is discussed in further detail in this paper. This paper discusses various types of gemmological tools used for grading and valuing rubies, as well as their applications. Due to the limitations of current techniques and the persistent high demand for excellent quality in the precious stone industry, a new standardized method for quantitative grading valuation of ruby stones using Charge-Coupled Device (CCD) linear sensor is proposed.

Keywords: Ruby, light characteristics, Charge-Coupled Device (CCD), gemmology.

Paper ID: 78

Smart Lawn with Water Sprinkler for Garden Using Arduino UNO

K H Yusof[1]*, A S Ahmad[1], M S S M Basir[2], N. I. A. Katim[3] and M M M Zaki[1]

[1]*Faculty of Information Sciences & Engineering, Management and Science University, 40100 Shah Alam, Selangor, Malaysia.*
[2]*Department of Electrical Engineering, Politeknik Mukah, 96400 Mukah, Sarawak, Malaysia.*
[3] *Faculty of Engineering and Built Environment, MAHSA University, 42610 Jenjarom, Selangor, Malaysia.*

E-Mail: khairul_huda@msu.edu.my

Abstract. This paper presents a system of smart lawn and garden water sprinkler using Arduino UNO, whose water tank can be monitored through smartphone. The main purpose of this system is to minimize the issue of water loss and water delivery system by using Internet of Things (IoT) as a platform to monitor the water tank level/status within range of 20 meters from the WIFI module. In this system, interface YFS201 Hall Effect Water Flow Sensor is used to measure the flow rate and volume of water, while ultrasonic sensor is used to detect water level inside the tank. Two systems (integrated) had been tested. Firstly is the proposed system, where the flow rate and volume of water are displayed on the LCD and the reading of the water tank is displayed on smartphone. The second system is watering clock system, which uses Real Time Clock (RTC) for timer setting purpose. The watering clock system shows the timer of watering session on LCD to ensure the user know their lawn and garden have been watered. The proposed system using the Arduino UNO, IoT Platform and Wi-Fi modules is able to immediately notify consumer to control water losses.

Paper ID: 79

Vibration analysis of 28 kHz horn transducer for ultrasonic cleaning based on harmonic response analysis

Suchada Phopayu, and Jatuporn Thongsri*

Computer simulation in Engineering Research Group, College of Advanced Manufacturing Innovation, King Mongkut's Institute of Technology Ladkrabang, Bangkok 10520, Thailand

Email: suchada.phopa@gmail.com, jatuporn.th@kmitl.ac.th

Abstract. The Horn Transducer (HT) is one of the key components in ultrasonic applications, consisting of a front mass, piezoelectric, and back mass parts. Previously, most of the research focused on vibration study of the front mass part based on modal analysis, but the other parts were ignored; therefore, the research results have limitations to actual usage. This research presents the vibration analysis of HT included all parts, based on harmonic response analysis (HRA). First, a conventional HT of 28 kHz, 50 W, 220 V, front mass-radius (*R*) of 29 mm, and height (*H*) of 5 mm was investigated for the vibration. Next, proposed designs were also investigated by varying the *R* as 27 mm - 32 mm, and *H* as 4 mm - 8 mm. All results were analyzed to find a suitable shape and investigated the designs that affected the vibration. The simulation results revealed that the longitudinal amplitude depends on both *R* and *H*. In addition, the simulation results were consistent with an experiment and previous work. Finally, the suitable design with *R* of 29 mm and *H* of 7 mm provided the optimum vibration at 27,250 Hz. The outcomes of this research were applied to develop a high-performance ultrasonic cleaner.

Keywords. Finite element analysis; harmonic response analysis; ultrasonic cleaning; ultrasonic horn; vibration analysis

Paper ID: 84

Effect of fin geometry on 14 nm FinFET analog performance

W B Siong[1], **N E Alias**[1], **S Isaak**[1] **and Y Yusof**[1,*]
[1]School of Electrical Engineering, Faculty of Engineering, Universiti Teknologi Malaysia, 81310 Skudai, Johor, Malaysia
[*]corresponding author: yusmeeraz@utm.my

Abstract. Short channel effect downgrades the system performance and reliability as the MOSFET is scaled down further. The FinFETs successfully replaced MOSFET and became the mainstream device structure transistors at sub-22 nm CMOS technology node, because of their superior short channel control at a smaller footprint. Since analog circuits are part of any modern VLSI chip, understanding the analog parameter characterization of FinFET is necessary. In this paper, Synopsys Sentaurus TCAD is used to perform a numerical simulation to investigate a 14 nm bulk FinFET device with hafnium oxide as the dielectric material. The device electrical characteristics have been studied at different fin dimensions to understand the impact of fin width and fin height on the device analog performance. The result shows that narrower and shorter fin will reduce the current drivability, thus degrades the transconductance (g_m), but at the same time decreases the short-channel effects, and thus increase the output resistance (R_o) greatly. The variation on the geometrical dimensions, such as fin width and fin height bring similar trends on the FinFET performance.

Paper ID: 86

A built-in self-test module for 16-bit parallel photon counting circuit using 180 nm CMOS process

S. Isaak[1], **H.C. Yeo**[1, 2], **C.K. Chang**[1,3] **and Y. Yusuf**[1]

[1]School of Electrical Engineering, Faculty of Engineering, Universiti Teknologi Malaysia, 81300, Johor Bahru, Johor, Malaysia

*Corresponding author: stalinyeo97@gmail.com

Abstract. This study investigated the use of a built-in-self-test (BIST) module detecting catastrophic errors in photon-counter accumulator for liquid contamination level measurement. Efficient algorithms are exceptionally demanded for a high-count rate and low voltage system photon counting circuit on-chip. The photon counter sensors are also required high sensitivity digital counter that encodes the arrival of photon in precise timing to prevent any count erroring the absence of light. The proposed BIST is integrated on the data acquisition system, where the accumulator is located. The design circuit, functionality and topology tests of BIST and circuit under test are realized with 180 nm Silterra CMOS Process. The same Verilog codes are verified using field programmable gate array (FPGA) to predict the hardware functionality prior fabrication. The measurement was able to detect at least 90 % fault coverage within 16-bit data acquisition system at minimum operating frequency of 166.7 MHz.

***Keywords*:** photon counting, data acquisition, BIST, FPGA, ASIC.

Paper ID: 87

Implementation of Optimized Low Pass Filter for ECG filtering using Verilog

Nooraisyah N Samsudin*, Dr Suhaila Isaak and Dr Norlina Paraman

School of Electrical Engineering, Faculty of Engineering, Universiti Teknologi Malaysia, 81310 Skudai, Johor, Malaysia.

* *Corresponding author: nnabilah38@graduate.utm.my*

Abstract. Electrocardiogram is a standard method used for the diagnosis of heart related disease. QRS complex plays an important role in Electrocardiogram signal processing since it is the prominent feature of Electrocardiogram signal. One of the important modules in the QRS detection algorithm is filtering. Electrocardiogram signal is processed to filter out unwanted signal through digital filtering. The main objective of this paper is to compare the resource utilization of hardware realization consumed between Direct Form I structure and Direct Form II structure. In this work, Infinite Impulse Response low pass filter to remove high frequency noise is designed with a passband frequency and stopband frequency of 5 and 25 Hz respectively. The designed filter is verified using Matlab Filter Design Analysis tool and realized in hardware using Verilog. Both the results show that the unwanted signals in the raw ECG signal are attenuated through the designed filter. The resource utilization result shows improvement with optimized Direct Form II implementation. The amount of look up tables, flip flop and digital signal processing used with Direct Form II structure shows a reduction to 0.26%, 0.12% and 2.50% respectively compared to 1.17%, 0.20%, 2.92% of utilization with Direct Form I structure.

***Keywords*:** Electrocardiogram, Digital filter, Infinite Impulse Response filter.

Paper ID: 88

Soil mass movement monitoring for landslide detection using low-cost accelerometer sensor as inclinometer

S. Kaharuddin[1], M.F. Ain[1], M.N. Mamat[1], M.N. Abdullah[1], Mohamad Firdaus Bin Mahamad Yusob[1]

[1]School of Electrical and Electronic Engineering, 14300 Nibong Tebal, Penang

Email: suardi@usm.my

Abstract. This paper presents soil mass movement monitoring for landslides detection using low-cost MEMS accelerometer as inclinometer. Commercial inclinometers for geotechnical ground observations are quite expensive. This research aims to study and develop low-cost inclinometer as an alternative using accelerometer. The output of the low-cost accelerometer is noisy and fluctuated make it not suitable for accurate measurement device. We solved this problem in this paper using moving average filter. The digital filter algorithm was tested and showed promising results.

Paper ID: 91

Analysis of Non-Invasive Fingerprint Thickness Based Authentication Method Utilizing Near Infrared Spectroscopy

Q A Tajul Ariffin1, N Sulaiman1

[1]Faculty of Engineering, IIUM, 53100 Gombak, Selangor, Malaysia.

qamarulaiman@gmail.com, nadzril@iium.edu.my

Abstract. Fingerprints are a popular method of biometric based authentication. However, methods currently in use are susceptible to being bypass through the use of forgeries of the fingerprint pattern. Measuring the epidermal thickness of the fingerprint is a solution to the issue, as there are no current ways for a third-party to precisely replicate the thickness measurements. Near-Infrared Diffused Reflectance (NIR-DR) spectroscopy is the proposed method of measuring fingerprint thickness. Reflectance reading is taken at 5 specific wavelength points to generate a simplified plot for comparison. Thickness measurement is gauged by calculationg change in reflectance percentage between the 800-900nm range. Data gathered showed variation in the reflectance spectra that was unique to each subject. Application for a fingerprint thickness-based authentication method is plausible but require additional research with a larger population sample and looking into the effects of age and skin colour for their effect on epidermal thickness.

Paper ID: 95

Modelling of an Electric Vehicle

[1] N Madhav Sai, [2] Lekshmi S, [3] Manitha P V

[123]Department of Electrical and Electronics Engineering, Amrita School of Engineering, Bengaluru, Amrita Vishwa Vidyapeetham, India.
E-mails: bl.en.u4eee19013@bl.students.amrita.edu, [2]s_lekshmi@blr.amrita.edu, [3]pv_manitha@blr.amrita.edu

Corresponding Authors: Lekshmi S, Manitha P.V., Department of Electrical and Electronics Engineering, Amrita School of Engineering, Bengaluru, Amrita Vishwa Vidyapeetham, India, s_lekshmi@blr.amrita.edu,pv_manitha@blr.amrita.edu

Abstract. Electric Vehicles (EVs) are considered to be as an essential aspect in the immediate term to reduce global emissions and to improve local air quality. The automobile industry will have a substantial transformation in the upcoming five to ten years than it has in the last few decades. The development of technologies promoted a better eco-friendly version of EVs. Electric cars in short are the thought of batteries on wheels and are the future of motoring. Growing concerns over the limited supply of fossil fuels led to the invention of electric cars which truly rely upon the use of an electric drive system rather upon the Internal Combustion Engines. In addition, electric cars diminished the pressure of massive carbon emissions, urban pollution, greenhouse gases, and city noises. This paper proposes an investigative study on electric vehicle modelling, simulation, and step-by-step control design for an effective environment. For the purpose of modelling and simulation of an electric vehicle MATLAB/SIMULINK software is used.

Paper ID: 101

Comparative Study of Multiphase 5-Level Cascaded H-Bridge Multilevel Inverter System

Murni Nabila Zawawi[1], Zainuddin Mat Isa[1], Mohd Hafiz Arshad[1], Baharuddin Ismail[1], Ernie Che Mid[1], Mohd Hairul Nizam Talib[2], Siti Khodijah Mazelan[1]

[1] Faculty of Electrical Engineering Technology, Universiti Malaysia Perlis, Malaysia
[2] Faculty of Electrical Engineering, Universtiti Teknikal Malaysia Melaka, Malaysia

Abstract. In terms of cost and structural design, the cascaded H-bridge multilevel inverter (CHBMLI) has a significant advantage over diode clamped and capacitor clamped multilevel inverters. The total harmonic distortion (THD) of a 5-level CHBMLI system for three different phases (single-phase, three-phase, and six-phase system) is studied and compared in this work. As switching angles play a role in lowering THD, the switching angles for a 5-level CHBMLI are evaluated using four specific switching angle methods in the initial section of this paper. In the simulation of single-phase system, these angles are being utilized. The angles with the lowest THD value are chosen for three-phase and six-phase system simulation. Based on the findings, the higher phase of 5-level CHBMLI is more efficient in decreasing harmonics.

Keyword: Cascaded H-Bridge Multilevel Inverter, Single-Phase 5-Level CHBMLI system, Three-Phase 5-Level CHBMLI system, Six-Phase 5-level CHBMLI system

Paper ID: 103

The performance of the Optimisation and Regenerative Braking systems by using PI controlling technique for Electric Vehicle (EV)

A Rahmat1, M I Fahmi2,3, LH Fang2,3, AA Mustafa1, HMT Noh4, MZ Aihsan2,3, M Saifizi2,3

1 Institut Kemahiran MARA Beseri, KM 14, Jalan Kaki Bukit, 02400 Beseri, Perlis.

2 Faculty of Electrical Engineering Technology, University Malaysia Perlis (UniMAP), Malaysia.

3 Electric Vehicle Energy Storage System (eVess) Research Group, Centre of Excellence Renewable Energy (CERE), Universiti Malaysia Perlis, Kampus Tetap Pauh Putra, 02600 Arau, Perlis, Malaysia.

4 Institut Kemahiran MARA Sungai Petani, Jalan Badlishah, 08000 Sg. Petani, Kedah.

Email: izfahmi@gmail.com.

Abstract. Electric automobiles have lower fuel costs because electric motors are more efficient than internal combustion engines. These automobiles can only drive a certain distance because to insufficient batteries and the lack of charging stations. EVs, on the other hand, lack a short driving distance and require frequent charging and discharging of power batteries. EVs will benefit from the development of energy-saving technologies that will expand their reach and prevent battery damage caused by frequent charging and discharging. The goal is to improve the energy efficiency of braking system and its motor efficiency to generate current, as well as to improve regenerative braking (RB) efficiency in EV's. Using a Brushless DC (BLDC) motor by adding an LC filter is the method that will be applied. A significant addition of current and less ripple and spike in the torque and a quick dynamic interference is the desired result. The performance of the system optimisation and RB circuit systems by using PI controlling technique. The output from torque produced by a 2200 Rpm is 3 Nm and demonstrates that the BLDC motor is efficient when driven by an LC filter circuit. Finally, using the Matlab/Simulink tool, this research presents a thorough simulation of a BLDC motor's operation as a motor and a generator with RB to create more current in EVs.

Paper ID: 154

Series Arc Fault Detection Sensor Based on an ABS Rogowski Coil in Medium Voltage

A.N. Nanyan[1,a], M. Isa[1,b], M.N.K.H. Rohani[1,c], H.A. Hamid[1,d], Z.H. Bohari[2,e], S Akhmal[1,f], AZ Abdullah[1,g]

[1]Faculty of Electrical Engineering Technology, Universiti Malaysia Perlis, Pauh Putra Main Campus 02600 Arau Perlis Malaysia.
[2]Faculty of Engineering Technology Universiti Teknikal Malaysia Melaka Hang Tuah Jaya, 76100 Durian Tunggal Malacca, Malaysia.

[a]ayobnazmy@unimap.edu.my,[b]muzamir@unimap.edu.my,
[c]khairulhafizi@unimap.edu.my, [d]haziah@unimap.edu.my, [e]zulhasrizal@utem.edu.my,
[f]syedakhmal@unimap.edu.my, [g]zaidiabdullah@unimap.edu.my

Abstract. Three types of Rogowski coils were designed and constructed by utilising 3D printing technology: RC1, RC2, and RC3, with the sensors having the same geometrical dimensions but varying number of turns: 20, 50, and 100 respectively. To verify the feasibility and effectiveness of the proposed sensors, a series arc fault generator was set up and high voltage of up to 3-kV was injected. The analysis of the Fast Fourier Transform (FFT) was done by using MATLAB to determine frequency and voltage amplitude. From the analysis, it was determined that the higher the number of turns, the greater the sensitivity. The resonance frequency (MHz) dropped significantly as the number of turns increased. Furthermore, sensor features such as frequency bandwidth and sensitivity are affected by the number of turns, which was thoroughly investigated in this study. The Rogowski coil was created to detect the high frequency component of the series arc fault signal. All the designed sensors reliably detect the series arc fault signal, according to the experimental results.

Keywords— series arc fault; Rogowski coil; medium voltage ac; acrylonitrile butadiene styrene (ABS); Fast Fourier Transform (FFT)

Paper ID: 163

Switch Mode Power Supply (SMPS) Utilizing Flyback Converter Topology: Simulation and Experiment

F Fauzi[1,3], M E Zaidi[1], U Udom[1] and N A A Manaf[2]

[1] Fakulti Kejuruteraan Teknologi Elektrik, Universiti Malaysia Perlis (UniMAP), Pauh Putra Campus, Arau, 02600, Perlis, Malaysia.
[2] Pusat Asasi Pertahanan, Universiti Pertahanan Nasional Malaysia (UPNM), Kem Sungai Besi, 57000 Kuala Lumpur, Malaysia
[3] Author to whom any correspondence should be addressed.

Abstract. This paper presents simulation and experimental works of a single, 5 volt DC output switch mode power supply (SMPS). The main objective of this work is to design, build and evaluate the SMPS using flyback converter topology. In this work, a 555 timer was chosen as the pulse width modulator. The 555 timer was chosen because it is easily available, cheap and has the capability to produce stable pulse width modulation. The complete circuit of the SMPS consist of full bridge rectifier, smoothing capacitor, pulse width modulator, high frequency transformer and flyback converter. The complete SMPS circuit was firstly designed and simulated using Proteus software. After obtaining acceptable results from the simulation process, the hardware part of the project, soon follows. Next, the SMPS circuit was constructed on a breadbroad. Testing and measurements of important parameters such as the input and output voltages and duty cycle were carried out using digital oscilloscope and multi meter. Both simulation and experimental results have shown that the designed circuit can convert single 24 Vrms 50 Hz AC voltage input into a stable single 5±0.15 V DC outputs. This work also has shown that pulsed DC voltage with peak value of 3.8 V and frequency lower than 4 kHz is adequate in controlling the switching frequency of a MOSFET transistor, thus regulating the output voltage within the desired range. Further analysis also shows close correlation between the simulation and experimental results.

Paper ID: 172

Electronic Ballast using Half Bridge Converter

Y Sukhi[1]*, Y Jeyashree[2],A Jenifer[1], S Anita[1], A Fayaz Ahamed[1]

[1]EEE Department, R.M.K. Engineering College, Kavaraipettai, Tamilnadu, India
[2]EEE Department, SRM Institute of Science & Tecnology, Kattankulathur, Tamilnadu, India

[1]ysi.eee@rmkec.ac.in, [2]jeyashry@srmist.edu.in

Abstract. This paper presents a front-end ac-dc high power factor single stage topology. The proposed topology has good efficiency, better power factor and small size structure. The electronic ballast is designed with buck boost converter. The electronic ballast supplies power to fluorescent lamp. The lamp power regulation for the variations in the input voltage is assured. The steady state operation of the electronic ballast is done. The design of the converter in carried out from the basic principle. The equations for the electronic ballast circuit is derived from the basic principle and the analysis of the converter is done based on the equations. The elements used in the converter circuit is designed using the derived equations. The proposed converter circuit is developed for testing using 40W lamp and to determine the performance of the converter. The input pf measured has become more than 0.99. The electronic ballast efficiency with PFC circuit and buck boost converter is 94.46%

Paper ID: 174

Development of Detachable Rogowski Coil Current Sensor using PCB for High Voltage Cable Partial Discharge Measurement

S Akhmal1, a, Muzamir Isa1, b, A Z Abdullah1, c, A N Nanyan1,d and Z H Bohari2

1Faculty of Electrical Engineering Technology, Universiti Malaysia Perlis
2Faculty of Electric and Electronic Engineering, Universiti Teknikal Malaysia Melaka

Email: asyedakhmal@unimap.edu.my, bmuzamir@unimap.edu.my, czaidiabdullah@unimap.edu.my, dayobnazmy@unimap.edu.my, 2zulhasrizal@utem.edu.my

Abstract. Insulation failure in High Voltage (HV) cables is evaluated using a variety of monitoring techniques. Previous silicon technologies were outperformed by wide-bandgap semiconductor power devices with faster switching speeds. Their precise current management or current protection measures must be upgraded. As a result, their precise current control or protection measures have become more sophisticated. The traditional Rogowski Coil (RC) with the magnetic core, on the other hand, has low measurement accuracy, a short measuring range, and is difficult to fabricate. This paper presents and discusses the development of a Rogowski Coil using a detachable Printed Circuit Board (PCB) as a current sensor for Partial Discharge (PD) measurement. Furthermore, the development of this innovative current sensor concentrated on the detachable PCB Rogowski Coil's capability to measure as a high-voltage (HV) current sensor and its sensitivity in fault diagnosis, over-voltage current sensing, and high-impulse current sensing on HV cables. The experimental design, techniques, and measurement parameters used in models were discussed. Finally, a brief analysis of the detachable PCB RC current sensor such as sensitivity, maximum voltage and current detection is presented. This paper can also be used as a guideline for other researchers to develop an advanced RC current sensor using PCB as a HV current sensor in the future. The measurement results of the detachable PCB RC current sensor such as the sensitivity and current detection signal can also be used as a guideline by another researcher. As a result, the goal of this project is to measure PD on HV cables using an RC current sensor by utilising PCB technology.

Keywords : Rogowski Coil, Printed Circuit Board, Partial Discharge, High Voltage

Paper ID: 189

Harmonics Elimination of Nine-level Multilevel Inverter with Reduced Switches Technique using Grey Wolf Optimization

Muhammad Zaid Aihsan1, Norjasmi Abdul Rahman1,2, Baharuddin Ismail1,2, Mohd Hafiz Arshad1, Muhammad Izuan Fahmi1,2 and Nor Ashbahani Mohamad Kajaan1,3

1 Faculty of Electrical Engineering Technology, Universiti Malaysia Perlis (UniMAP), Malaysia.
2 Centre of Excellence for Renewable Energy (CERE), Universiti Malaysia Perlis (UniMAP), Malaysia.
3 Centre of Electrical Energy System, School of Electrical Engineering, Faculty of Engineering, Universiti Teknologi Malaysia, Johor Bahru, Malaysia.
Email: zaid@unimap.edu.my

Abstract – Multilevel inverters (MLIs) are the alternative power electronic circuits to replace the conventional two-level inverters and the operation of MLIs is flexible control of dv/dt and di/dt ratios while providing an increased number of output levels in voltage and current in staircase waveforms. However, the architecture of conventional multilevel inverter requires more power switches and has a limitation when it comes to a wide range of applications. The direction of this paper mainly focused on the single-phase nine-level with reduced switches technique with the targeted low order harmonics such 3rd, 5th, and 7th to be eliminated. The switching angles were calculated using the non-linear equations derived from the Fourier series of the output voltage and current waveform using the Grey Wolf Optimization (GWO) algorithm. The proposed circuit was tested under two modulation indexes and simulated using PSIM software and evaluated thru experimental assessment. The value of THD for modulation index 0.68 is approximately 7.92% for simulation and experimental yields 7.80% while for modulation index 0.80 yields 4.13% for simulation result and the experimental result is 4.3%.

Paper ID: 191

Performance Of Restricted Earth Fault And Bias Differential Protection Againts Earth Fault On A Transformer

Nor Haidar Hashim1, Nasrul Helmi Halim1, Syahrun Nizam Md Arshad1, Muhammad Hatta Hussein1, Siti Rafidah Abdul Rahim1, Abubakar Abdullkareem Suleiman2

1Faculty of Electrical Engineering Technology, Universiti Malaysia Perlis, Arau, Perlis, Malaysia.
2Federal Ministry of Humanitarian Affairs, Disaster Management and Social Development, Abuja
Nigeria

Abstract
In this paper, the effectiveness of restricted earth fault and bias differential protection against earth fault on of transformer winding is presented. Earth fault is one of the failure that occurs on a power transformer winding. Its magnitude depends on how the neutral is connected and the location of fault. For a transformer which is connected to Neutral Earth Resistance (NER), as the fault moves towards its neutral, the magnitude of fault current decreases and the detection of fault diminishes, thus limiting percentage of winding that can be protected. To overcome this problem, restricted earth fault is employed. This paper will show that based on its principles, restricted earth fault protection is more sensitive and provide better coverage for the star winding against earth fault especially resistance earthed.

Paper ID: 197

Arcing fault diagnosis using enhanced cross-correlation technique

Melaty Amirruddin[1], Mohd Rafi Adzman[1], Nur Adyani Mohd Affendi[1], Muhd Hafizi Idris[1], Muzamir Isa[1], Sahirah Abd Halim[2]

1Faculty of Electrical Engineering Technology, Universiti Malaysia Perlis (UniMAP), Pauh Putra Campus, 02600 Arau, Malaysia.
2Department of Electrical, Electronic & Systems Engineering, Faculty of Engineering & Built Environment, Universiti Kebangsaan Malaysia, 43600 UKM Bangi, Selangor, Malaysia.
E-mail: melaty@unimap.edu.my

Abstract. This study explored the potential use of cross-correlation as a technique for detecting arcing faults in a power system distribution network. The cross-correlation technique was employed to investigate the effect of each antenna placement as a detection device, time difference of arrival (TDOA), time delay, and correlation magnitude of arcing signals detected during on-line arcing fault measurement. The arcing fault was detected using four antennas that had been set up around the arc source point in a high voltage (HV) laboratory. The measurements were taken using a digital oscilloscope. For precise results, the Discrete Wavelet Transform (DWT) denoising technique combined with cross-correlation (CC) technique were applied using MATLAB software to identify the arcing signals detected in order to diagnose the differentiation between noisy and real arcing fault signals. Further assessment was carried out by performing a cross-correlation technique on the real arcing signals obtained to find the similarities and arrival time's delay between single arcing signals' placement. The outcome shows that all measurements including the time difference of arrival (TDOA), correlation magnitude, time delay, and antennas' placement towards the arcing source point are valuable in determining the arcing signals detected precisely.

Paper ID: 198

Performance of Backfill Material for Grounding System under High Voltage Condition

N H Halim1, S N M Arshad1, N H Hashim1, Z Adzis2, M Isa1, O A Bakar1

1Centre of Excellence for Renewable Energy (CERE), Faculty of Electrical Engineering Technology, Pauh Putra Main Campus, Universiti Malaysia Perlis, 02600 Arau, Perlis, Malaysia
2Institute of High Voltage and High Current (IVAT), School of Electrical Engineering, Faculty of Engineering, Universiti Teknologi Malaysia, 81310, Johor Bharu, Johor, Malaysia

Abstract. Grounding play the main role to in order to protect electrical equipment, building and life from lightning, switching and earth fault occurrences. A good grounding system must be able to dissipated this unwanted charge in very fast time and this can be achieved by reducing the grounding resistance. Introduction to backfill material is widely practice to lowering the resistance of grounding system. This paper investigates the performance of backfill materials under high alternating and impulse voltage condition. The findings reveal that performance of grounding system may significantly change from the expected outcomes at design stages.

Paper ID: 205

Performance enhancement of speed control for induction motor using dolphin algorithm

FIRAS SAADULDEEN AHMED[1], AHMED A. ALLU[2], MAAN A. JIRJEES[3]

[1,2,3]Department of Electrical Power, Technical Institute of Mosul, Northern Technical University, Iraq

firas_saad@ntu.edu.iq, aaallu7@ntu.edu.iq, Maan.a_jirjees@ntu.edu.iq

Abstract: Induction motor is renowned as one of the most motors commonly used in an industry where rapid response and high control precision are need for a wide range of speeds. In this paper, a field oriented control method (FOCM) has been used to obtain a higher control efficiency by dividing the stator current into torque and field control components, including the space vector pulse width modulation (SV-PWM) technology. FOCM also reduces the harmonics of the inverter output signal and allows the best use of DC voltage. This paper aims to enhance the speed response during a sudden change in load torque or reference speed. The Dolphin Algorithm (DA) is used to find the best parameters of the control circuit in both the current and voltage controllers of the FOCM to improve the motor speed response using two objective functions which are Mean Average Error (MAE) and Mean Error (ME). Simulation results for dolphin-PI controllers show the trial superiority by noting PI controllers error and decrease the delay time during the state change.

Paper ID: 214

Air Plasma Sterilizer Using a Parallel Dielectric Barrier Discharge

Dionysius J D H Santjojo[1*], Masruroh[1], Setyawan P Sakti[1]
[1]Department of Physics, Faculty of Mathematics and Natural Sciences, Brawijaya University, 65145, Malang, Jawa Timur, Indonesia

*Corresponding author: dsantjojo@ub.ac.id

Abstract. Air sterilizer is one of the essential components in combating the Covid-19. A wind tunnel model of the air sterilizer using a dielectric barrier discharge plasma is proposed to destroy the virus by direct contact with the plasma. Dangerous ozone production in the plasma reactor should be controlled to a safe level. Two parameters affecting the ozone concentration, i.e., electrical power and airflow, were investigated. The DBD reactor was a cell constructed from an array of alternate electrodes. The plasma was generated by an AC high voltage generator with a range of 2kV -3kV. The power and the high voltage were varied by controlling the DC input voltage of the generator. The airflow was varied by controlling the speed of an exhaust fan from 0.5 m/s to 3.0 m/s. The state was characterized using optical emission spectroscopy in the range of 200 nm – 1000 nm. The results showed that both parameters played a significant role in ozone concentration. The trend of the ozone is strongly correlated with the OH species, which reacts with oxygen. The highest ozone concentration of 4.51 ppm was observed at the DC voltage around 19 volts or the power of 34.2 watts. However, a decrease of the ozone concentration at a voltage higher than 19 volts related to 2.9 kV was observed. In general, the data showed that faster airflow decreases ozone concentration. A drastic decrease of the nitrogen species sustaining the plasma occurred at the airflow higher than 2 m/s.

Paper ID: 217

Simulation of Molybdenum Disulfide based MOSFET Device using COMSOL Multiphysics software

Sudharsanam Subramaniyam , Sasikala Muthusamy and Dr. Sudhakar K Bharatan

Department of Electrical and Electronics Engineering, Sri Venkateswara College of Engineering, Chennai - 602117,India

E-mail: sudhakar@svce.ac.in

Abstract. In this work, 2D physical modeling and simulation of Molybdenum disulfide based MOSFET device using COMSOL multiphysics software is carried out. The impact of dielectric materials such as SiO2 and Al2O3 on the performance of FET are investigated. Threshold voltage (VT), sub-threshold swing and on/off ratio are some of the electrical parameters studied in this work. The values of channel doping concentration, choice of metal work function and dielectric material, and the corresponding thickness of the gate material, are systematically varied to arrive at the device threshold voltage. FET device with 50nm thick Al2O3 gate insulator exhibits a threshold voltage of 1V and an on/off ratio of 107, whereas the device with SiO2 as the gate material with the same thickness exhibited higher threshold voltage of 2.8V and lower on/off ratio of 106. The polynomial first order technique in the MATLAB curve fitting tool is utilized to determine the relation between VT and gate oxide thickness

Paper ID: 227

Transformer Health Index by Prediction Artificial Neural Networks Diagnostic Techniques

A.M. Abdullah[1,2], R. Ali[1], S.B. Yaacob[1], T.M.N.T. Mansur[1], N.H. Baharudin[1], K. Ananda-Rao[1], N.A. Uloom[1]

[1] Faculty of Electrical Engineering Technology, Universiti Malaysia Perlis (UniMAP), Perlis, Malaysia.
Email: rosnazri@unimap.edu.my

[2]Public Works Department Malaysia (JKR), Kuala Lumpur, Malaysia.
Email: abdmuiez@gmail.com

Abstract. This paper presents the artificial neural network diagnostic techniques for predicting the health index in transformer. Collection data is measured and tested from insulation resistance in between phase-ground, phase to phase and also the winding resistance transformer. The data was collected from 10 units of transformers from Company Transformer Manufacturing and Servicing (CTMS) in Malaysia. The data was used to calculate condition transformer index or health index transformer. Condition transformer index can identify whether transformer in good condition or not good condition. The purpose of knowing transformer health index or condition transformer index is to prevent failures functional transformer and ensure transformer in stable condition. Prediction health index or condition transformer index can be determined by artificial neural network. Therefore, it can monitor and observe very closely conditions of the transformer. Data health index transformer is very important because it know the condition transformer and can solve the major problem in transformer or do the maintenance in early stage before the transformer is totally malfunction.

Paper ID: 233

Design and characterization of Screen-Printed Piezoresistive Cantilever for Gas Sensor Application

1st DR. Nursabirah Binti Jamel *School of Electrical Engineering University Malaysia Perlis* Perlis , Malaysia nursabirah@unimap.edu.my
2nd DR. Illani Mohd Nawi *Faculty of Electrical Engnieering University of Technology Petronas.* Perak, Malaysia illani.nawi@utp.edu.my
3rd Naouras Saleh *School of Electrical Engineering University Malaysia Perlis* Perlis , Malaysia naouras@studentmail.unimap.edu.my

***Abstract*—** In this paper, the design, and the characterization of screen-printed cantilever-based humidity sensor are described. The paper represents the design, analysis, and simulation of screen-printed sensor-based cantilever of various geometry to analyze their sensitivity. The main aim of this paper is to compare the screen-printed technology with other existing technologies like micro-electro-mechanical system (MEMS), and low temperature cofired circuit (LTCC). The sensor has been simulated under different level of relative humidity with two different temperature value: 35 degC, and 45 degC. This paper also represents an analytical and mathematical modeling approach for frequency shift and thick film resistance change of the selected sensor. The analytical results are compared with the simulated results.

Keywords—Humidity, Piezoresistive, Cantilever, Screen printed, Frequency, COMSOL.

Track 2-Renewable Energy
Paper ID: 29

Effect of thin tunnel layers MnO_3 and V_2O_3 on the enhancement of single-layer organic solar cell efficiency

Naim Shuvo[1], Md Abu Hasan Al Askary[2], Tasmia Binte Hai[3], Sanney Ul Islam[4] Saraban salsabila[5]

[1]Department of Electrical and Electronics Engineering,
[2,3]Department of Mechanical Engineering,
Chittagong University of Engineering and Technology (CUET), Chittagong, Bangladesh
[4]Dpartmental of Mechanical Engineering, Khulna University of Engineering and Technology, Khulna 9203, Bangladesh
[5]Department of Mechanical and Productive Engineering, Islamic University of Technology

as.hasan45@gmail.com

Abstract. Layer thickness optimization has proven to be effective in the case of increasing Performance Conversion Efficiencies (PCE) of organic solar cells. In this research, optimization of the solar cell is performed and found an efficiency of 9.74%. After that, a solar cell with the insertion of some oxide layers is proposed. Two of them are the thick insulating oxide layers which have helped the efficiency to reach up to 15.23%. Under 1sun and at 1.5AM, the energy spectrum received from the sun has been calculated as 2.43eV for a 510nm light wavelength (has been considered as the peak among the visible light wavelengths), which is much more than the energy band gap of the active material. This incident is supposed to be one of the causes of the high electron tunnelling between the donor and acceptor of the LUMO (Lowest Unoccupied Molecular Orbital). Apart from its inorganic counterpart, as low charge carrier is the main concern for the organic solar cell, this can help a little by ensuring a high charge carrier and pushing the organic solar cell a step further with respect to its competitor, the inorganic solar cell.

Paper ID: 34

Stability analysis of Bangladesh power system and impact of renewable energies and FACTS devices

Pollen Barua[1] , M.G Rabbani[2] , Muhammad Quamruzzaman[3]

1,3Chittagong University of Engineering and Technology, Dept. of E.E.E, Chittagong
2Eastern University, Dept. of E.E.E , Dhaka
1pollen.eee@gmail.com

Abstract. Renewable energy (RE) sources have been very demanding in every country's power system. The rise of Renewable Energy (RE) will lead significant changes in power sectors all over the world. Though they have very good aspect from environmental sides, they may have some drawbacks also. As renewable source of energy has limitations in reactive power generations and they replace or will replace synchronous generators, overall power system stability needs to be studied. The country like Bangladesh from its inchoate stage has been suffering from shortage of power. To increase the system capacity, there is a plan to have a 52 MW wind turbine generating (WTG) plant based on doubly fed induction generator (DFIG) which will be increased further up to 83 MW along with a 100 MW solar photovoltaic generator (SPVG). As the stability is of great concern, the overall stability in transmission level will be checked in the region of RE penetration. Steady state stability will be obtained by Saddle node bifurcation (SNB) point and dynamic state stability will be determined by Hopf bifurcation (HB) point while transient stability will be checked by time domain analysis against faults. To find out the critical modes of oscillation Eigenvalue analysis technique will be used. To increase the obtained stability level further, a controller tuned static synchronous compensator (STATCOM) will be placed in a suitable location.

Paper ID: 36

The prospect of green energy and technology in Bangladesh

Md A H A Askary[1], T B Hai[1], S S K Showmik[1], Md A. Kader[2], and Md Tauhidur Rahman[3]
[1]Department of Mechanical Engineering,
[2]Department of Urban and Regional Planning,
[3]Department of Petroleum and Mining Engineering,
Chittagong University of Engineering and Technology (CUET), Chittagong-4349, Bangladesh

as.hasan45@gmail.com

Abstract. Green Energy comes from environmental natural resources which are renewable. Green technology alludes that is earth unneighbourly, created, and utilized in a way with the goal that it does not irritate our condition and conserves natural resources. Its uses are getting a solution for widespread global warming fears and the increasing scarcity of many natural resources. Green energy and technology are interrelated to achieve a stable environment and sustainable development. This paper reviews the studies which are related to green energy and technology and shows the existing scenario, potentialities of using it in Bangladesh. Data identifying strategies are gathered from research papers, government documents, relevant green energy and technology policies, interviews with experts. There are some problems with the growing green energy and technology in the country. Therefore, based on problems, some strategic ideas are recommended in this paper.

Keywords: Green energy and technology, renewables, sustainability, Bangladesh

Paper ID: 55

A Comparative Study of Hybrid Energy Storage System using Battery and Supercapacitor for Stand-Alone Solar PV System

N A Uloom[1], T M N T Mansur[1,2], R Ali[1,2], N H Baharudin[1,2], A M Abdullah[3],

[1]Faculty of Electrical Engineering Technology, Universiti Malaysia Perlis (UniMAP), Perlis, Malaysia.
[2]Centre of Excellence for Renewable Energy (CERE), Universiti Malaysia Perlis (UniMAP), Perlis, Malaysia.
[3]Public Works Department Malaysia (JKR), Kuala Lumpur, Malaysia.
tunkunizar@unimap.edu.my

Abstract. The standalone solar power system has long been used to meet the electrical needs of basic building structures. To counter the natural supply–demand imbalance caused by solar energy, standalone solar PV system often include energy storage devices, primarily lead–acid batteries. Due to lead-acid battery limitations, solar systems often have higher operational costs compared to traditional power systems. It has been discovered that a supercapacitor-battery hybrid energy storage device can be used to prolong the cycle life of a battery system by reducing the charge–discharge stress caused by variable power exchange. This research examines the influence of a supercapacitor on a photovoltaic system that makes use of a hybrid energy storage system that includes both batteries and supercapacitors in order to lessen the stress placed on the batteries. The methodology involves data collection for load profile and meteorological information, designing solar PV system, and simulation using Matlab SIMULINK to study the effect of supercapacitor on battery current of the evaluated system. Three different energy storage system topologies in building applications were simulated, and their ability in managing battery stress was investigated and evaluated. From the result, it is clear that by applying passive HES system, 53% of battery current can be reduced compared to battery-only system and 92% of reduction can be achieved by using semi-active HES system.

Paper ID: 60

Feasibility study of the conversion from a small engine into a single-piston expander operating under different pressure and valve timing for waste heat recovery application

M N A Mohamad[1], W S I W Salim[1], and W N A W Muhammad[1]

[1] Faculty of Mechanical and Manufacturing Engineering, Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Batu Pahat, Johor, Malaysia

E-mail: anuarm@uthm.edu.my

Abstract. There are limited studies on improving the piston expander performance for a wider operating range by adopting the variable valve timing method. This study uses a simple conversion technique to develop a single-piston expander (SPE) from a small two-stroke engine. The SPE is being tested at different operating conditions to study the feasibility of the SPE operating under different intake pressure and valve timing conditions. By fixing the exhaust valve timing, the SPE was tested at four intake pressure; 3, 4, 5, and 6 bar, while the intake valve closing varied from 30° to 110°. From the study, the highest power produced by the SPE is only 64 Watt when was tested at 8 bar, with the intake valve opening at TDC and closed at 70°.The results show that the converted SPE is feasible in terms of functionality, but it is not performance-wise because much power has been lost through the recompression process. The study also observed that the intake valve timing could significantly affect the SPE power output, besides the intake pressure alone.

Paper ID: 62

Design of Foot Step Power Generation System and Burglar Alarm System

R Jayachitra #1**, K Punitharani**#2**, M S Anirudh**#3 **, S Divyanand**#4 **, S Ganesh**#5 **, K Prabadevi** #6
#1,2Associate professors, #3,4,5,6UG students,
#1,2,3,4,5,6Department of Mechanical Engineering, PSG College of Technology, Coimbatore
jayachitrapsg@gmail.com(corresponding author), punithapsgtech@gmail.com

Abstract: The energy crisis is one of the major problems faced by the world over the past few decades. To overcome the demand rate, energy harvesting from alternative sources of energy is gaining much importance. Piezoelectric power generation is one among them. By using Piezoelectric materials, the power can be generated from foot step. This energy source can be used in public places or shops or malls and so on. Nowadays security system is necessary for safeguarding the properties in stores/shops. The store/shop protection and product safety from robberies is the primary purpose of a security system. This paper focuses on a piezoelectric power source coupled with a security system which will detect the foot step of person while walking on tiles attached with piezoelectric.

Paper ID: 77

Optimum Sizing and Performance of Fuel Cell Stack Integrated by Boosted DC-DC converter for Running DC Load

M Irwanto[1,2], N Hussin[1], Suhelmi[3], Iswandi[4], B Ismail[1], N H Baharudin[1], A Azis[5], Rimbawati[5], W Z Leow[1], Jufrizal[6]

[1]Fellow of Centre of Excellence for Renewable Energy, Faculty of Electrical Engineering Technology, Universiti Malaysia Perlis (UniMAP), Perlis, Malaysia
[2]Department of Electrical Engineering, Universitas Prima Indonesia (UNPRI), Medan, Indonesia
[3]Department of Electrical Engineering, Sekolah Tinggi Teknologi Immanuel (STTI), Medan, Indonesia
[4]Department of Mechanical Engineering, Universitas Medan Area (UMA), Medan, Indonesia
[5]Department of Electrical Engineering, North Sumatera Muhammadiyah University (UMSU), Indonesia
[6] Mechanical Engineering, Universitas Sumatera Utara (USU), Medan, Indonesia

Abstract. A fuel cell stack (FCS) converts the chemical energy to be the electrical energy through an electrochemical process. One type of FCS is proton exchange membrane (PEM) with hydrogen and oxygen as the main chemical energy source. The PEMFCS has been applied widely for operating direct current (DC) loads. However, the optimum sizing of FCS, DC load and the other supported devices are not considered well, thus the system performance does not have function optimum fully. This paper present the FCS integrated by boosted DC-DC converter for running DC load. The optimum sizing of FCS and boosted DC-DC converter are explained to obtain the required number of FCS and boosted DC-DC converter. A simulation of the FCS integrated boosted DC-DC converter is conducted using SIMULINK MATLAB. The simulation results show that the FCS and boosted DC-DC converter have good performance in the operation of DC load.

Key word: Fuel cell, boosted DC-DC converter, Optimum sizing, DC load.

Paper ID: 94

Application of Automated Machine Learning (AutoML) Method in Wind Turbine Fault Detection

N F Fadzail[1], S Mat Zali[1], E C Mid[1] and R Jailani[2]

[1] Faculty of Electrical Engineering Technology, Universiti Malaysia Perlis, Pauh Putra Campus, 02600 Arau, Perlis, Malaysia
[2] Integrative Pharmacogenomics Institute, Universiti Teknologi MARA, 42300 Puncak Alam, Selangor, Malaysia

Abstract. Fault detection has drew much attention nowadays, as it can save time and operational maintenance costs, especially in the wind turbine (WT) that is becoming familiar with renewable energy. Machine learning became widespread use in fault detection methods. However, most available machine learning needs more data and much time to train. Therefore, there is a need to detect faults using a few data during the training process. This paper aims to apply Automated Machine Learning (AutoML) method for fault detection in WT systems. The fault detection in the WT system focuses on the internal stator fault in the generator as it is the main part of the WT. The AutoML model was developed using a neural network (NN) algorithm in python based on the Auto-Keras model. The model was developed using four inputs, i.e. stator and rotor currents in the *d-q* axis (I_{qs}, I_{ds}, I_{qr} and I_{dr}) while the outputs are impedance values, i.e. stator resistance, R_s, and stator inductance, L_s. The WT system used in this research is the doubly-fed induction generator (DFIG) in MATLAB/Simulink. In the Auto-Keras model, the impedance values (R_s and L_s) indicated the condition of the DFIG, either normal or fault conditions. Two fault types were applied to the WT system, i.e. inter-turn short circuit and open circuit fault. The Auto-Keras model was trained and tested with the various values of data. The accuracy and the root means square error (RMSE) value of the model were calculated. The result shows that the accuracy is high as it is more than 93% in most conditions, and the RMSE value is low, close to the zero value. Applying the AutoML method in fault detection of the WT system shows its capability to identify faults accurately.

Paper ID: 98

Improvement of Hybrid Energy Storage Wireless Charging System Performance and Efficiency

H F Liew [1], K H Chong [1], M I Fahmi [1], A A M Ezanuddin[2], A M J Junaidah [1] and K Norhanisa[1]

[1] Faculty of Electrical Engineering Technology, University Malaysia Perlis, Sungai Chuchuh, 02100 Padang Besar (U), Perlis, Malaysia.
2. Department of Renewable Energy Management, Spectrum International College of Technology (SICT), Subang Jaya, Selangor, Malaysia.

Abstract. To reduce pollution due to the use of conventional fossil fuel, many transportations are going to be electrified, environmental-friendly and zero-emission energy. Among countries with the most electric vehicle user are United State, Norway, and China. About 100,000 of charging outlet for electric vehicle (EV) in United States had been installed to increase the market demand of electric vehicle. As an essential step, the introduction battery is used as the main energy storage for EV, but it weighs heavily and expensive in price as caused by the increased energy storage capacity and improved EV performance. Lifespan of the battery will reduce as it needs to provide high demand of current in acceleration. There is a possibility for the contact charging to cause short circuit during raining as some of the charging port is exposed at open area. The aim of this research is to design a hybrid energy storage system (HESS) of wireless charging system with charge monitor in EV application. The energy storage types chosen were three series 3.7 V, 2000 mAh at 18650 lithium-ion batteries and five series 2.7 V with 50 F ultracapacitors arranged in passive configuration. The system was designed and simulated with Simulink from MATLAB and Proteus 8 to analyse the HESS and the performance of the wireless charging system. The charging time and discharging time of HESS was estimated. The wireless charging system was designed with the output voltage range of 5 V to 13 V and the output current range of 0.5 A to 2.0 A.

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Paper ID: 142

Performance Analysis of Different Type PV Module for 3kW Residential Roof Top PV System using PVSyst Simulation tool

Abdullah A Z[1,2], Isa M[1,2], Amlus M H[1,2], Azizan N[1,2], Sali I M[3], Rahim M H [4]

[1]Faculty of Electrical Engineering and Technology, UniMAP, Arau, Perlis, Malaysia
[2]Center of Excellent or Renewable Energy, UniMAP,Arau, Perlis, Malaysia
[3]Leader Cable Industry Berhad, Tikam Batu, Sg Petani, Kedah, Malaysia
[4]Jabatan Elektrik, Kolej Komuniti Bandar Darul Aman, Jitra , Kedah, Malaysia

Email: zaidiabdullah@unimap.edu.my

Abstract. The purpose of this article is to discuss a performance comparison of solar panel between mono crystalline, poly crystalline and HIT photovoltaic for roof top solar photovoltaic (PV) system. Residential PV power generation is a growing fast nowadays due to technology transfer success to everyone while also serving as a renewable energy source. Correct selection of PV modules possible to get a fast return of investment while wrong selection is vice versa. Three type of PV panel was applying in 3.12kW rooftop PV design in Selangor, Malaysia residential this work for comparison analysis. To make a fair comparison, the PV module analyse with same location, weather, orientation and losses. Simulation was performed fully under PVSyst software and looking at performance ratio system, a yearly balanced, effective output energy, daily output generation, system output generation, and yearly system losses. In this article the performance of three different types of PV panels is demonstrated. The HIT PV module shows the highest yearly performance ratio up to 81 % compare to mono and poly type. The normalized production with standardized variable to evaluate the PV output including collection losses, device losses and energy generated show the HIT type produces lowest losses while highest output. The performance of HIT PV module was good compared to PV module mono and poly type; this is due to the lower losses and high output produce significantly. The PV system's payback period can be shortened, and the PV system can perform better, if the PV panels are more efficient.

Keyword: Performance Analysis, PV Module, Residential, Roof Top, PV System

Paper ID: 144

Loss of load probability minimization for stand-alone photovoltaic system using elephant herding optimization

Sulaiman S I[1], **Ab Majid H**[1] **and Othman Z**[1]

1 School of Electrical Engineering, College of Engineering, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia

Abstract. Stand-alone photovoltaic systems have been widely deployed for rural electrification. Notwithstanding this, non-optimal sizing has been a constant issue in implementing such systems as non-optimal system sizing reduces the reliability of the system in meeting the load demand. Hence, this paper presents Elephant Herding Optimization (EHO) for optimal sizing of a stand-alone photovoltaic system. The EHO was used to determine the optimal PV module, battery, charge controller and inverter of the system such that the loss of power supply probability was minimized. Prior to the development of EHO-based sizing algorithm, an iterative-based sizing algorithm was first developed to present the optimal sizing using non-computational intelligence approach. The optimal sizing solution from this iterative approach was then used for the validation of optimal sizing solution obtained from EHO-based sizing algorithm. The results showed that EHO was able to yield similar loss of load probability as presented by the iterative approach but with approximately 2.86 times lower in computation time. In addition, EHO was also discovered to be superior than evolutionary programming by producing lower loss of load probability with slightly faster computation.

Paper ID: 159

Design of ground-mounted grid-connected photovoltaic system with bifacial modules using PVsyst software

NSS Mohamed[1,2], SI Sulaiman[1], SRA Rahim[2]

[1] Faculty of Electrical Engineering Technology, Universiti Malaysia Perlis, Perlis.
[2] School of Electrical Engineering, College of Engineering, Universiti Teknologi MARA, 40450 Shah Alam,Selangor Darul Ehsan
Email: norsyafiqah@unimap.edu.my

Abstract. Bifacial photovoltaic module has gained significant traction in recent years due to its higher irradiation capture capabilities with cost-effective technology. This paper presents the design, simulation, and techno-economic evaluation of a 45MW fixed-tilt ground-mounted grid-connected photovoltaic system with bifacial photovoltaic modules. The site is located in Sungai Petani, Kedah, Malaysia. The PVsyst 7.2 software was used to design the system by selecting the rating of PV module, inverter and tilt angle of PV modules. In addition, shading and loss calculation, as well as performance evaluation, were also conducted using the software. The simulation of the optimal geometrical parameters had shown an optimal tilt angle of 5º, the pitch of 5.5m and PV array installation height of 1.5m with an albedo value of 0.25. Besides, the performance of system with bifacial and monofacial modules were compared in terms of techno-economic performance indicators. The results showed that the bifacial PV system produces higher energy output with a lower levelized cost of electricity when compared to the system with monofacial PV modules.

Paper ID: 176

Performance of a Single-phase Grid-connected Photovoltaic based DSTATCOM using Modified p-q Theory Control Algorithm.

Ridzwan M A H[1], N H Baharudin[1,2], T M N T Mansur[1,2], R Ali[1,2], Ananda-Rao K[1], E Che Mid[1], S M Suboh[1], A M Abdullah[1,3]

[1]Faculty of Electrical Engineering Technology, Universiti Malaysia Perlis, Pauh Putra Campus, 02600 Arau, Perlis, Malaysia
[2]Centre of Excellence for Renewable Energy (CERE), Faculty of Electrical Engineering Technology, Universiti Malaysia Perlis, Pauh Putra Campus, 02600 Arau, Perlis, Malaysia
[3]Public Works Department Malaysia (JKR), Kuala Lumpur, Malaysia

Abstract. This paper investigates the performance of a single-phase grid-connected photovoltaic based DSTATCOM by using modified p-q theory control algorithm. Previously, p-q theory controller has been applied for a three-phase DSTATCOM system. Thus, this paper proposes a modified p-q theory control algorithm for an application on a single-phase grid-connected solar PV (GCPV) based DSTATCOM. Thus, the GCPV system has improved with DSTATCOM capabilities such as harmonic reduction for a single-phase distribution system under varying solar irradiances. The simulation results have been obtained by using MATLAB/SIMULINK software in accordance with IEEE Standard 519:2014, which stated that the THD of the line current at the Point of Common Coupling (PCC) should be less than 8%. The performance of the single-phase GCPV based DSTATCOM have been analysed for dynamic and steady state conditions under varying solar irradiances.

Paper ID: 190

Blockchain-Based Smart Contract for P2P Energy Trading in a Microgrid Environment

Nor Ashbahani Mohamad Kajaan[1], Nurul Hanisa Nor Amidi[2], Zainal Salam[2] and Raja Zahilah Raja Mohd Radzi[3]

[1]Faculty of Electrical Engineering Technology, Universiti Malaysia Perlis, Arau, Perlis, Malaysia
[2]Centre of Electrical Energy System, Faculty of Electrical Engineering, Faculty of Engineering, Universiti Teknologi Malaysia, Skudai, Johor, Malaysia
[3]School of Computing, Faculty of Electrical Engineering, Faculty of Engineering, Universiti Teknologi Malaysia, Skudai, Johor, Malaysia
ashbahani@unimap.edu.my

Abstract. The purpose of this study is to propose a method of peer-to-peer (P2P) energy trading that allow prosumers with energy deficiency to buy energy from prosumers with excess energy in a microgrid system. The proposed method solves the problems associated with lack of trust in P2P energy trading and utilized the blockchain technology that made it impossible to tamper with data. The data is referred as transaction generated by using blockchain. A blockchain based smart contract execute the trading and payment rules without the intermediaries. Thus, the security and fairness of energy trading are significantly enhanced compared to conventional database technology.

Paper ID: 194

Power Controller for Multi-axis Solar Tracking System using PID

Lim Che Er1**, S M Suboh**1**, N H Baharudin**1,2**, N B Ahamad**1**, E Che Mid**1

1 Faculty of Electrical Engineering Technology, Universiti Malaysia Perlis, 02600 Arau, Perlis, Malaysia
2 Centre of Excellence for Renewable Energy (CERE), Faculty of Electrical Engineering Technology, Universiti Malaysia Perlis, 02600 Arau, Perlis, Malaysia
s171092686@studentmail.unimap.edu.my

Abstract. Solar energy is one of the rich and unlimited energy sources in Malaysia which can generate power instead of the burning of fossil fuels which can cause air pollution. In this study, a solar tracking system is proposed to improve the harvested power. To encourage the maximum output power is produced, PID controller is used. Its function is try to achieve the reference power where the angle of the horizontal and vertical axes are considered. The solar radiation is studied from 7am (0700) to 5pm (1700) according to the habit of solar altitude angle and the azimuth angle in Perlis, Malaysia. There is two PID controllers are developed for the orientation and inclination axis of the solar tracker. The output power between the multi-axis and single-axis of solar tracking system are compared through the simulation in MATLAB Simulink. In conclusion, the multi-axis solar tracker has a better performance than the single-axis solar tracker due to the higher degree of freedom to follow the motion of sun. This maximum power can keep going to the reference power of the photovoltaic module during the greatest radiation of sun depending on the solar altitude and azimuth angle.

Paper ID: 200

Characterization of Photovoltaic Module Under Random Partial Shading Conditions

Norjasmi Abdul Rahman1,2, Muhammad Faridun Naim Tajuddin1,2, Nurhakimah Muhd Mukhtar1,2, Muhammad Zaid Aihsan1,3

1 Faculty of Electrical Engineering Technology, University Malaysia Perlis (UniMAP), Malaysia.
2 Centre of Excellence for Renewable Energy (CERE), University Malaysia Perlis (UniMAP), Malaysia.
3 Faculty of Electrical Engineering, University Teknikal Malaysia Melaka (UTeM), Malaysia.
Email: norjasmi@unimap.edu.my

Abstract – Photovoltaic (PV) systems have been gaining pace in the energy market for the past decade. Reducing capital costs and government incentives are among other factors that drive the PV forward. PV massively depends on the sunlight that falls onto its surface to generate electricity. However, partial shading events are a common nemesis to the PV systems. It happened when some part of the PV panel's surface did not receive the maximum light energy. It can be caused by passing clouds, nearby trees or poles, leaves, bird dropping, etc. The harvested power drops during this event, hence the overall system's efficiency is also affected. This paper investigates the characteristic of the single panel system during various partial shading conditions. The identification of the maximum power point (MPP) location and the intensity of the event to occur at the region on the P-V plane is given priority in this study. All in all, this study aims to provide useful information for considerations in the process of designing the converters.

Paper ID: 206

An Improved Grey Wolf Optimization Based MPPT Algorithm for Photovoltaic Systems Under Diverse Partial Shading Conditions

D J Krishna Kishore[1], M R Mohamed [1*], K Sudhakar[1], K Peddakapu[1].

College of Engineering., Universiti Malaysia Pahang, Pekan, Malaysia

[1]Corresponding author: Email: rusllim@ump.edu.my

Abstract. The photovoltaic (PV) systems are performing a substantial role in electric power systems for generating electrical power in various uncertain circumstances. Nonetheless, the PV systems face numerous challenges for power production in the event of partial conditions. Moreover, different types of multiple peak power points (MPPP) are generated in the characteristics of the PV system under diverse partial patterns. The MPPP's having only one global maximum peak power (GMPP) and the remaining are local peak PowerPoints (LPPP), in which LPPP are interrupted to grab maximum power. Hence, improved grey wolf optimization (I-GWO) approach is developed in this work for enriching the required power generation at partial conditions. The proposed system has been designed in the MATLAB/Simulink environment. As per the simulation findings, the suggested I-GWO demonstrates great performance with regards to tracking time, accuracy, and efficiency as compared with other studied algorithms.

Keywords PV system, Partial Conditions, Power System, MPPP, GMPP, I-GWO.

Paper ID: 231

Mathematical modeling and drying characteristics of thin layer drying of bitter gourd in evacuated tube solar dryer-without heat pipe

Dhiraj Kumar Yadav[1], Priyanka Dhurve[1], and Vinkel Kumar Arora[1]

[1]*Department of Food Engineering, National Institute of Food Technology Entrepreneurship and Management, Sonipat Haryana, India.*

Corresponding author: vinkelarora17@gmail.com

Abstract

Evacuated tube solar dryer-without heat pipe (ETSD-WHP), also called direct flow evacuated tube solar dryer was used for preservation and quality analysis of bitter gourd (*Momordica charantia*). Mathematical modeling with eight semi-empirical models and drying characteristics of bitter gourd were carried out in the current study. Bitter gourd was dried in 12 hours from an initial moisture level of 91.85 % to a final moisture level of 6.77 %. The maximum rate of mass removal (drying rate), was found to be 15.15 g moisture/g dry matter/hr at 1 PM when solar radiation was high i.e 735 W/m^2. Among all models, the Midilli and Kucuk model was found best fitted for bitter gourd with R^2, $\chi^{2,}$ and RSME values of 0.9982, $2.43\times10^{-4,}$ and 0.0129, respectively. From the quality analysis, it was observed that the color and water activity of bitter gourd decreased after drying significantly.

Keywords: *Evacuated tube solar dryer, bitter gourd, drying kinetics, color analysis, water activity.*

Track 3-Control, Intelligent System, Robotics

Paper ID:2

Fusion of Thermal and Depth Image to Improve Human Segmentation for a Mobile Robot

H S Hadi[1,2], M Rosbi[3], and U U Sheikh[3]

[1]Department of Electrical Engineering, Politeknik Ibrahim Sultan, Johor Bahru, Johor, Malaysia
[2]Member of Malaysia Board of Technologies, Professional Technologies
[3]School of Electrical Engineering Universiti Teknologi Malaysia, Skudai, Johor, Malaysia

saipolhadi@pis.edu.my

Abstract. In machine vision, surveillance systems are a kind of security that concentrates on the safety of the human and property. One of the main tasks of a surveillance system is the detection of humans. This paper presents a system of human detection and the development of a technique of human segmentation using a combination of information thermal and depth in a real indoor setting from a mobile robot. A novel fusion of thermal-depth information (FTDI) is introduced to enhance the efficiency of the segmentation process and expedite processing. In experimental studies, evaluation of the performance for the proposed system is carried out using Ground Truth (GT), in which the proposed system yield is compared to GT. The proposed system performs well with an approximate accuracy of over 90% for all data sets as illustrated in the quantitative results and even outperformed state-of-the-art algorithms. This paper presents the novelty of the work, in which the detection method can improve the classification of persons and their occlusion. The advantages, such as being computationally inexpensive and performs well even under severe occlusion and poor illumination, show that this proposed system is robust.

Paper ID: 10

Sine Cosine Algorithm for Tuning Cascaded PI Controllers for PMSM Drive System Speed Control

Doaa Salih Naser[1], and Issa Ahmed Abed[2*] , Diyah AL-Thammer[3]
[1,2,3] Southern Technical University, Engineering Technical College, Basrah, Iraq
Corresponding author: issaahmedabed@stu.edu.iq

Abstract. This paper presents the new metaheuristic which termed as the Sine-Cosine Algorithm (SCA) to tune the parameters of three Proportional Integrals that are optimum (PI) controllers to track the speed desired of Permanent Magnet Synchronous Motor (PMSM). The Integral Time Square Error (ITSE) is utilized as an objective function. The suggested PI controllers tuned by the SCA algorithm are used to obtain the best PI values. Finally, the simulation findings reveal that the suggested objective fitness with SCA is more successful than the classical approach for tuning PI values in terms of high speed tracking and less ripple.

Paper ID:32

White Blood Cells Detection Using Saturation Level

Nur Liyana Ezaty Mohd Fairuz and Nurhanis Izzati Che Marzuki

University of Cyberjaya (UoC), Persiaran Bestari, Cyber 11, 63000 Cyberjaya, Selangor.

liyanaezatyy@gmail.com

Abstract. Blood is made up of three main components; erythrocytes, leukocytes and thrombocytes. Each of these blood components all have their own roles in the human body. Leukocytes, which can be divided into five types; Basophil, Neutrophil, Eosinophil, Lymphocytes and Monocytes are all part of the body's defence mechanism to fight against pathogens that could harm the body. Identifying the presence of these blood cells is one of the fundamental ways to diagnose a disease. Hence, blood tests are always being run by physicians in clinical practice. Manually identifying leukocytes is a tedious and time-consuming process, and does not guarantee standardised results as it depends fully on the operator's skills. Therefore, many works have been done to develop an automated method of leukocyte identification, which aims to reduce the processing time, cost-effective and is efficient in producing standardised results. The proposed method uses the technique of segmenting the nucleus and cytoplasm of leukocytes by extracting it from the Saturation level of the image.

Paper ID: 42

Boosting Algorithms to Identify Distributed Denial-of-Service Attacks

V Kumar[1], A Kumar[1], S Garg[1] and S R Payyavula[2]

Birla Institute of Technology, Mesra, Ranchi[1], Samsung Research India, Bangalore[2]

Abstract. In the current pandemic situation, much work became automated using Internet of Things (IoT) devices. The security of IoT devices is a major issue because they can easily be hacked by third parties. Attackers cause interruptions in vital ongoing operations through these hacked devices. Thus, the demand for an efficient attack identification system has increased in the last few years. The present research aims to identify modern distributed denial-of-service (DDoS) attacks. To provide a solution to the problem of DDoS attacks, an openly available dataset (CICDDoS 2019) has recently been introduced and implemented. The attacks currently occurring in the dataset were identified using two machine learning methods, i.e. the light gradient boosting method (LGBM) and extreme gradient boosting (XGBoost). These methods have been selected because of their superior prediction ability in high volumes of data in less time than other methods require. The accuracy achieved by LGBM and XGBoost were 94.88% and 94.89% in 30 and 229 seconds(s), respectively.

Paper ID:43

A security aware lighting control system for public open spaces: An IoT powered approach

Mohamed Fazil Mohamed Firdhous[1,3] and Janaka Wijesundara[2,3]

[1]Dept. of Information Technology, University of Moratuwa, Moratuwa, Sri Lanka.
[2]Dept. of Architecture, University of Moratuwa, Moratuwa, Sri Lanka.
[3]UoM Urban Lab - Center for Cities, University of Moratuwa, Moratuwa, Sri Lanka.

Corresponding author: Mohamed Fazil Mohamed Firdhous (firdhous@uom.lk)

Abstract. Cities world over are becoming more congested as people moving into them for better living conditions. Such fast migration towards cities puts heavy demands on city resources. One of the resources that suffers an impact almost immediately is the open spaces in cities. Open spaces are the public spaces that are accessed by people freely for different purposes. Open spaces help citizens maintain a healthy life by relieving stresses. The open spaces visited by people at night must have adequate lighting for them to engage in their activities. It is seen that many open spaces waste energy as the lights have been on throughout the nights irrespective of usage of the space. In this paper, the authors propose a security aware lighting control system that helps minimize the energy waste without compromising on security. A prototype implementation was tested and the results show that the energy saving potential of the system is more than 50 percent promising for real field implementations.

Paper ID:48.

Design and Implementation of an Automatic Speed Control System of Vehicles for Avoiding Road Accidents in Bangladesh

Umme Hafsa1, Farhadur Arifin1
1Department of Electrical and Electronic Engineering, American International University Bangladesh, Dhaka, Bangladesh
Email: umme.hafsa40@gmail.com

Abstract. Road accident has been a major problem in Bangladesh in recent years. An automatic speed control system is proposed in this paper to reduce road accidents by controlling the speed of the vehicle automatically. The main idea of the proposed system is to design a speed control system where the vehicle can adjust the speed depending upon the speed limit of the road. The designed system includes a sensor unit, a microcontroller unit and a functional unit. In the sensor unit, different sensors are used to perceive information to control the speed of vehicles. In the functional unit, a throttle automation system and brake automation system are introduced. This functional unit is mainly based on an electrical throttle control mechanism. Finally, the microcontroller is applied for taking decisions regarding the speed control of vehicles. This system shows a good prospect for speed control of the vehicles. Thus, it can able to reduce road accidents in Bangladesh.

Paper ID:51

Enhancing Match Detection Process in Generic Code Clone Detection Model using Chi-Square Distance Equation

Noormaizzattul Akmaliza Abdullah, Mohd Azwan Mohamad Hamza and Al-Fahim Mubarak-Ali

Faculty of Computing, College of Computing and Applied Science, Universiti Malaysia Pahang, 26600 Pekan, Pahang, Malaysia.

E-mail: maizzattul45@gmail.com, azwan@ump.edu.my, fahim@ump.edu.my

Abstract. The code that is being copied repetitively is called the code clone. The code clone is divided into four different types, which are code clone Type-1, clone Type-2, clone Type-3, and clone Type-4. These code clone types have been detected by multiple code clone detection tools and approaches. However, the deficiency of these approaches and detection tools are not able to detect all code clone types as there is no generic model. Therefore, code clone detection models were developed to confront the deficiency generic model. Generic Code Clone Detection (GCCD) model consists of five structural processes to detect all types of code clones. Hence, an enhancement towards one of the processes is proposed. The process is the Match Detection process. This process is the final and crucial process as it produces the code clone detection result. The goal of this work is to improve this process and produce a better output of code clone detection results. An experiment using four distance measures is done. The result of analysis from this experiment shows a significant increase in detecting the code clone Type-3 and clone Type-4 by using Chi-Square distance.

Paper ID:52

Real time fault detection and control in continuous stirred tank reactor

S Vijayachitra, K Prabhu, P Dharani and C Kavya

Department of Electronics and Instrumentation Engineering

Kongu Engineering College, Perundurai-638060, Erode, Tamil Nadu, INDIA

Email: dr.svijayachitra@gmail.com

Abstract. Continuous Stirred Tank Reactor (CSTR) plays a major role in many of the industrial applications like chemical processing, pharmaceutical processing and tertiary water treatment processing and etc., CSTR is a nonlinear process and operates at steady state. Accuracy of the output can be reduced due to the variation in process parameters in terms of flow, level and temperature. Hence it is necessary to do real time fault diagnosis in the CSTR Skid to get a desired output. By varying the inlet and outlet flow rate of CSTR in terms of 25%, 50%, 75% and 100%, the performance was analysed and their appropriate faults were diagnosed

Paper ID:57.

Development of Electronic Valve Timing Control Unit for Single Piston Expander with Microcontroller

A. Z. A. Ali [1], M. F. Zakaria[1], M. N. A. Mohamad[2], W. N. A. W. Muhammad[2] and W. S. I. W. Salim[2]

[1] Faculty of Electrical and Electronic Engineering, Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Batu Pahat, Johor, Malaysia
[2] Faculty of Mechanical and Manufacturing Engineering, Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Batu Pahat, Johor, Malaysia

E-mail: anuarm@uthm.edu.my

Abstract. An electronic valve timing control unit has been developed mainly for the internal combustion engine operation. This study aims to implement a similar technology into a single-piston expander (SPE) with readily available and low-cost microcontrollers. The study used an Arduino Mega 2560 and ESP32-WROOM microcontrollers to control the valve timing with the rotational input signal obtained from an absolute encoder. The SPE has been expected to run at the rotational speed of up to 2000 rpm. This setup was prepared to simulate the actual SPE operation using a direct current motor to drive the spindle connected to the encoder shaft to create a similar hardware testing and controlled environment. The study aims to identify the efficiency of the microcontroller's performance with a variation of the valve's opening and closing time. Results have shown that the clock rate of the microcontroller affects the performance of valve timing response. By increasing the clock rate, the microcontroller can control the valve at a higher speed.

Paper ID: 80

IOT BASED MONITORING SYSTEM FOR STINGLESS BEES COLONY IN IIUM

H A Rosli, N Abdul Malik and Y A Ahmad

Department of Electrical and Computer Engineering, International Islamic University Malaysia (IIUM), 53100 Kuala Lumpur, Malaysia
norehaa@iium.edu.my, yasser@iium.edu.my

Abstract. Currently, the beekeeping method in IIUM is based on manual monitoring by human inspection to see the condition of the stingless bees. However, frequent manual monitoring by opening the lid can stress the colonies causing colony collapsed disorder (CCD). Therefore, this project offers a smart apiary system prototype to add value in preserving the species and the environment because bees are good pollinators. It can benefit the users in tracking the health status of stingless bees by proposing an IoT-based monitoring system. One way is to develop a real-time autonomous beekeeping system that offers several insights to the apiarists in terms of weight, temperature, humidity and pressure caused by intrusions. These parameters can be monitored with a wireless mobile application. The hardware consists of a microcontroller board (Arduino Uno) based on the ATmega328P, a DHT11 temperature and humidity sensor, an HX711 load cell sensor and an FSR402 force sensor connected to ESP8266 wifi module for internet access. The user interface was developed with the Blynk platform to display all information and provide alarms for unwanted incidents or emergencies that need to be catered, such as sudden pressure surges exerted on the beehive log and temperature beyond 40 °C.

Paper ID:145

Parameter Estimation of DC Motor using Multiparametric Programming

A N Ali[1], E Che Mid[1*], S M Suboh[1], N B Ahamad[1], E Ruslan[2], D A Hadi[2]

[1]Faculty of Electrical Engineering Technology, Universiti Malaysia Perlis (UniMAP), Perlis, Malaysia.
[2]Faculty of Electrical and Electronic Engineering Technology, Technology Campus, Universiti Teknikal Malaysia Melaka, Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, Malaysia.

Email: *ernie@unimap.edu.my

Abstract. Parameter estimation is important in aspects for applied in many process models in control system design, chemistry, and other engineering application for expectation models of statistical observation. The focus of this work is on a nonlinear ordinary differential equation (ODEs) system which is a direct current (DC) motor model to estimate the model parameters using multiparametric programming. In this work, the ODE model is discretized by implementing Euler's method to obtain the algebraic equation. Then, the model parameters of the DC motor will be derived as an explicit function of measurements to estimate the parameter values. The applicability of the proposed method and accuracy of parameter estimation is demonstrated.

Paper ID:168

Development of Vision Based Smart Gripper for Material Handling Using Internet of Things

H Ali[1], M I Zainur[1], AH Mohd Aman[2]

[1]Faculty of Electrical Engineering Technology, UniMAP, 02600 Arau, Perlis, MALAYSIA
[2]Faculty of Information Science and Technology, UKM, 43600 Bangi, Selangor, MALAYSIA

hasimahali@unimap.edu.my

Abstract. Robotic grippers have becoming an emerging trend due to their boundless applications in industrial automation. Nowadays, the deployment of vision based smart gripper for material handling in industrial applications remains challenging and ongoing research. As the Internet of Things (IoT) becomes more commercialized, the various concept of IoT have been integrated with the gripper due to efficient usage. Therefore, this project proposes the development of vision-based sensor of smart gripper for material handling in industrial applications that integrates with the IoT. The rationale of integrating IoT to vision based smart gripper is that it allows authenticated users to log in from any device, anywhere, and view video or images from vision based smart gripper in real-time for critical material handling. This system incorporates a vision sensor camera that acts as an "eye" to automatically detect and recognize the object with different weights and shapes and send the information to the robot for the next task. This smart gripper adopts a force sensor mounted into the fingertip to control the force applied when working with a wide range of objects with different weights. As for the electronic system, power module, communication and control module, sensor and actuator as well as user interface module have been adopted and integrated into the system. In the software development system, user interface configuration was developed through mobile application in which it communicates with Raspberry Pi B+ camera to serve as IoT platform. A series of experiments shows that the vision based gripper using IoT able to detect and recognize the objects and then send the information/command directly to the robot to execute grasping and lifting phase of the object to the desired location that has been assigned.

Paper ID:184

Intelligence system of methadone flexi dispensing (MFlex) program using Mahalanobis-Taguchi system

S K M Saad[1*], M Y Abu[1], F Ramlie[2], N Harudin[3], W Z A W Muhamad[4], and R Dolah[5]

[1] Faculty of Manufacturing and Mechatronic Engineering Technology, Universiti Malaysia Pahang, 26600 Pekan Pahang, Malaysia.
[2] Fakulti Teknologi & Informatik Razak, Universiti Teknologi Malaysia, 54100 Kuala Lumpur Malaysia.
[3] Department of Mechanical Engineering, Universiti Tenaga Nasional, 43000 Kajang, Malaysia.
[4] Institute of Engineering Mathematics, Universiti Malaysia Perlis, 02600 Arau Malaysia.
[5] Fakulti Teknologi & Informatik Razak, Universiti Teknologi Malaysia, 54100 Kuala Lumpur Malaysia.

[*]Email: sitikhadijah9797@gmail.com

Abstract. Patients under methadone flexi dispensing (MFlex) program are required to do blood tests for lipid profile. To confirm the patient has lipid disorder, a doctor assesses 3 parameters like cholesterol, HDL cholesterol, and LDL cholesterol. As a result, the present system lacks a stable ecosystem for classification and optimization due to imprecise measurement techniques and a lack of justifications for major elements that impact diagnosis accuracy. The aim is to include the Mahalanobis-Taguchi system (MTS) into the MFlex program. The data is obtained at the Bandar Pekan clinic and includes 34 parameters. For classifications and optimization, two types of MTS methods are used like RT-Method and T-Method. The Mahalanobis distance (MD) average for healthy is 1.0000 and for unhealthy is 79.5876. The positive degree of contribution is parameter 1, 3, 4, 6, 7, 8, 9, 11, 12, 17, 18, 23, 26, 27, 28, 30, 31, 33, and 34. To reach a lower MD, 15 unknown samples were diagnosed with different degrees of positive and negative contribution. The best proposed solution is modification type 5 of 6. Finally, a pharmacist from the Bandar Pekan clinic confirmed that MTS can address an issue of classification and optimization in MFlex program.

Paper ID:192

Channels Selection for Pattern Recognition of Five Fingers Motor Imagery Electroencephalography Signals

R N Azizah1, H Zakaria1, and B R Hermanto1

1Department of Biomedical Engineering, Bandung Institute of Technology, Bandung, Indonesia

Abstract. Research about pattern recognition on electroencephalography (EEG) signal of finger motor imagery (MI) plays a critical role in Brain-Computer Interfaces (BCI) based hand prosthetics development. However, the previous research still used irrelevant channels to finger MI. This work proposed optimal EEG channels combination for five-finger MI. It is achieved by subject-dependence channel selection using One versus Rest Common Spatial Pattern (CSP-OVR) combined with sequential searching algorithms due to specific neural activation areas of MI. Optimal channels combinations are of great importance to reduce channels number. It supports the development of practical BCI-based hand prosthetics that can help hand handicapped to do daily activities easier. Experimental results show 4 out of 19 channels are relevant to five-finger MI with 0,6% accuracy degradation compared with EEG-MI pattern recognition using 19 channels. This result is better than the Principal Component Analysis (PCA) channel selection method that only selects 11 out of 19 channels with 1 % accuracy degradation.

Paper ID:208

The Waste Detection System of Shrimp Feeding with a Waterproof Camera using Yolo Algorithm

Zaryanti Zainuddin[1], Julian[2], Andani[3], Intan Sari Areni[4], and Zulkifli Tahir[5]

[1,2,3,4,]Department of Electrical Engineering, Hasanuddin University, Makassar, Indonesia
[5]Department of Informatics, Hasanuddin University, Makassar, Indonesia

Abstract. This study aims to build a waste detection system of shrimp feeding using the Yolo algorithm. Shrimp are not efficient in utilizing their feed, which is only 70-80%. The remaining shrimp feed will become waste that causes decay and decreased water quality due to the accumulation of high organic matter and toxic compounds, namely nitrite (NO2) and ammonia (NH3). Therefore, a feed waste detection system was developed in this study using You Look Only Once (YOLO). The initial stage is to collect images in the water as training data with a waterproof camera. Furthermore, the image is marked with a Yolo mark. Then training is carried out where it is extracted with the Convolutional neural network layer, which is used as input into the Fully Connected Layer. The output is a weight file that will be used to detect shrimp feed. From the tests carried out, the system produces 96-97% mean average precision (mAP) values at max batches of 4000-10000. Another result shows that the best mAP was obtained at a distance of 25 cm with mAP value of 82.31%.

Paper ID:222

Single and Multiface Detection and Recognition System

F N M Ariff1**, H Jaafar**2**, S N H Jusoh**2 **and N A F Haris**2

1Faculty of Electrical Engineering Technology, University Malaysia Perlis, Pauh Putra Campus, 02600 Arau, Perlis, Malaysia

2Faculty Electrical Engineering Technology, University Malaysia Perlis, Uniciti Alam Campus, 02100 Padang Besar, Perlis, Malaysia

Abstract. Face detection has drawn the interest of numerous research groups because to its vast application in various domains such as surveillance and security systems, as human-computer interaction, and many more. Face identification is the important phase involving several factors such as lighting, facial expression, and ageing effects. It's more tough as detection takes a lot of time to detect and distinguish a single face at a time. Moreover, most of the existing technology cannot accurately detect many faces simultaneously. This study therefore presents a system that can recognize and identify multiple face image simultaneously with various expressions. Face-recognition procedure consists of data gathering, face detection, extraction, and classification feature. The face dataset is obtained from 10 participants with varied backgrounds and expressions. Subsequently, the viola-jones technique together with threshold technique is utilized in face detection to detect face presents while removing the unnecessary background to reduce face recognition time processing further. The Principal Component Analysis (PCA) is then employed to extract features while maintaining as much information as possible from enormous image data set. After formulating each face's representation, the classification process is considered to recognize the identities of users' faces. Here, a non-parametric classifier i.e. Support Vector Machine (SVM) is applied in this process. Conclusively, the system is able to detect around 90 percent multi-face user in different conditions.

Track 4-Computer Science, Electronics and Communications Engineering

Paper ID: 33

Application of the Monte Carlo method for evaluating the patch cord length distribution of the central data center crosses using spine-leaf architecture

A B Semenov[1], N A Shishova[2], D A Klimov[2] and S S Shavrin[2]

[1] Department of Automation and Power Supply. Moscow State University of Civil Engineering (MGSU) National Research University, 26, Yaroslavskoye Shosse, Moscow, Russia
[2] Department of Multichannel Telecommunications Systems. Moscow Technical University of Communications and Informatics (MTUCI), 8a, Aviamotornaya str, Moscow, Russia

Abstract. An approach to determining the patch cord length of the central data center crosses with spine-leaf architecture, which is based on the Monte Carlo method is proposed. The possibility of its implementation in Excel spreadsheets is shown. The results of calculating the length distribution when installing the cross in cabinets with a height of 42 and 47U are given. It is established that for the majority of cords the length of 1–1.5 m is sufficient. The need to use 800 mm wide cabinets for the central cross and the possibility of placing it in one cabinet for 126 leaf level switches when building a data center according to the top-of-rack scheme is substantiated.

Paper ID: 39

Evaluation of Two-Part rain attenuation model at Ku-band for tropical and equatorial regions

Yagasena
Faculty of Computing & Engineering, Quest International University, Malaysia.

yagasenaappannah@gmail.com

Abstract. The current ITU rain attenuation model that is used in the design of satellite-earth communication link was derived using data collected predominantly from temperate regions and has limitations when applied to tropical and equatorial regions that are characterized by heavy rainfall. Elevation and frequency scaling was applied to the rain attenuation data obtained from tropical and equatorial regions to validate the linear relationship for rain rates above 90 mm/h in the TPRA model. Analysis of the data from these regions also confirms the linear relationship between the rain attenuation and rain rates above 90 mm/h. The TPRA model can be considered as an alternative model for a reliable satellite-earth link for use in the tropical and equatorial regions.

Keywords: rain attenuation, Ku-band, two-part model, frequency scaling, tropical, equatorial

Paper ID: 59

VPN–Based WiMAX Network Protection Against Jamming Attacks for VoIP Application

Shayma W Nourildean[1] , Siddeeq Y Ameen[2] , Yousra A Mohammed[1]

[1]Communication Engineering department., University of Technology, Baghdad, Iraq
[2] Duhok Polytechnic University, Duhok Iraq

Abstract. WiMAX technology with up to 30 miles of coverage compared to other technologies is more vulnerable to jamming attacks, and therefore, the security issue was a major concern. The jamming attack affected the network by reducing throughput and increasing delay in different applications, several solutions and protocols were introduced for this issue. One of these solutions is a VPN that uses encryption algorithms for securing data transmission. Moreover, the network is integrated with the firewall to protect the server from any unauthorized access. Thus, the paper investigates the impact of VPN with the firewall for securing WiMAX using OPNET Modeler (v14.5) which was chosen as a suitable tool for simulating WiMAX networks. A VoIP application was applied with other applications in terms of sent/received traffic, delay and throughput. After running the OPNET simulation, the collected results showed that the existence of VPN with firewall increased throughput and decreased the delay which was caused by the jamming attack. The inclusion of the firewall will prevent any access to a specific application from the server but the VPN would allow access from a specific source (Base Station1) to access the server. The benefit of integrating VPN in the system is that the unauthorized client cannot access the server from any base station. This will provide more security for the system.

Paper ID: 61

Applications of Information Systems in Marketing Management

Arshi Naim[1], Anandhavalli Muniasamy[2], Syeda Meraj Bilfaqih[2], Ruheena Mahveen[2], Reshma Mahjabeen[2]
College of Computer Science, King Khalid University, Abha,KSA
arshi@kku.edu.sa , anandhavalli@kku.edu.sa , bilfagih@kku.edu.sa , ruheena.mahveen@gmail.com , rjabeen@kku.edu.sa

Abstract
This paper is an extended paper showing the role of applications of Information Systems (IS) in Marketing Management. There are many applications of IS and for the purpose of the study we have applied, Decision Support Systems (DSS) in other fields of Marketing Management (M.Mgnt). DSS facilitates in decision making process in many M.Mgnt concepts. Customer Relationship Management (CRM) is one of them and it depends on the firm's tasks for developing and retaining customers while achieving their satisfaction and enhancing the sense of belongingness for their products and services. Profit maximization, the process of customer value, and building strategic values for the firm are the three empirical benefits of CRM that are achieved through analytical, operational, and direction (AOD) capabilities respectively. This research focuses on the application of DSS models of what-if analysis (WIA) for CRM at (AOD) and also shows the dependence on the Information Success model (ISM). Hypothetical data are analyzed for (AOD) by three types of (WIA) to attain CRM and profit maximization and this analytical method can be used by any customer-oriented firm as a general model.

Keywords
CRM, DSS, Analytical, Operational, Directional, What if Analysis

Paper ID: 64

Image reconstruction by shapefree radial basis function neural networks (RBFNs)

P Paewpolsong[1], **N Sriapai**[1], **S Tavaen**[1] **and S Kaennakham**[1]

[1]School of Mathematics, Institute of Science, Suranaree University of Technology, Nakhon Ratchasima, 30000, Thailand

E-mail: sayan_kk@g.sut.ac.th

Abstract. With the growth of artificial intelligence technologies, the research on artificial neural networks (ANNs) has been paid much more attention. Radial basis function neural networks (RBFNs) are a type of ANNs that are referred to as models that replicate the role of biological neural networks. While their applications are growing in a wide range of areas, conventional forms of RBFs contain a highly problem-dependent shape parameter, making it not as convenient as one would expect. This work investigates the numerical effectiveness of RBFs containing no shapes, so they are referred to as 'shapefree', under the application of image reconstruction. Nine forms of shapefree RBFs have been gathered and implemented in conjunction with the RBFNs. Two popular images (known as Lena and Plane) are damaged in Salt-and-Pepper manner before being repaired by the networks using these shapefree RBFs. The overall performances are monitored based on error norm, CPU-time and storage, and condition number. This aims to provide useful information regarding choices of RBFs for future uses, to overcome the pain one faces from choosing a suitable value of shape parameter.

Paper ID: 66

Real Time Retinal Optic Disc Segmentation via Guided filter and Discrete Wavelet Transform

Sonali Dash[1], P. Satish Rama Chowdary[1], V.V.S.S.S. Chakravarthy[1], C.V.Gopala Raju [2], Gupteswar Sahu[3], KJN Siva Charan[4], Y. Umamaheshwar[2]

[1]Department of Electronics & Communication Engineering, Raghu Institute of Technology (A), Visakhapatnam-531162, Andhra Pradesh, India
[2]Visakha Eye Hospital, NBE Post-graduate Training Center, Visakhapatnam, AP, India
[3]Department of Electronics and Communication Engineering, Raghu Engineering College (A), Visakhapatnam-531162, Andhra Pradesh, India.
[4]Dept of Ophthalmology, Maharajahs Institute of Medical Sciences, Nellimarla, AP, India
sonali.isan@gmail.com, satishchowdary@ieee.org, managingdirector.veh@gmail.com, gupteswar.sahu@gmail.com, jwalasivacharan97@gmail.com, myeedocy@gmail.com

Abstract: In the world, glaucoma is the one of the main causes for loosing vision. Optical Coherence Tomography or fundus camera is utilized to capture the optic disc and optic cup images. For the detection of glaucoma and afterwards monitoring the patients, investigation of the head of optic nerve or cup-to-disc ratio (CDR) is an important factor. For computing the CDR value, segmentation of optic disc and optic cup are utilized for the isolation of the relevant parts of the fundus image. Even though ophthalmologists are computing the CDR value physically, however, it limits the identification of glaucoma at the early stage. The accurate value of CDR is hard to find out if the optic cup and optic disc are not well defined properly. Thus, this paper has suggested a combined model of Guided filter and Discrete Wave Transform (DWT) for the enhancement and OD segmentation. Hysteresis thresholding is utilized for the optic cup segmentation. A set of 50 images of 25 patients are obtained from Visakha Eye Hospital, Visakhapatnam, India, is used to verify the performance of the suggested model. The recommended approach is also verified on the glaucoma subset of High-Resolution Fundus (HRF) database. The experimental results of both the databases demonstrate that the CDR value is computed accurately with low computational time.

Paper ID: 68

Covid-19 detection based on Lung CT scan using Deep Learning techniques

S V Kogilavani1, R Sandhiya2 and S Malliga3
1 Associate professor, Department of computer science and Engineering, Kongu engineering college, Perundurai, Erode.
2 PG scholar, Department of computer science and Engineering, Kongu engineering college, Perundurai, Erode.
3 Associate professor, Department of computer science and Engineering, Kongu engineering college, Perundurai, Erode.

Abstract. Coronavirus, a new virus, has emerged as a pandemic in recent years. Humans are becoming infected with the virus. In the year 2019, the city of Wuhan reported the first ever incidence of Coronavirus. Coronavirus infected people have symptoms that are related to pneumonia and the virus affects the body's respiratory organs, making breathing difficult. A Real time Reverse Transcriptase Polymerase Chain Reaction (RT-PCR) kit is used for diagnosis of disease. Due to a shortage of kits, suspected patients are unable to be treated in a timely manner, which results in spreading of disease. To come up with an alternative, radiologists looked at the changes in radiological imaging like CT scans. The suspected patient's Computed Tomography (CT) scan is used to distinguish between a healthy individual and a Coronavirus patient using deep learning algorithms. For Covid 19, a lot of Deep Learning methods have been proposed. The proposed work utilizes CNN architectures like VGG16, DeseNet121, MobileNet, NASNet, Xception and EfficientNet. Dataset contains 3873 total CT scan images with the class labels as covid and non-covid. The dataset is divided into train, test and validation. Accuracies obtained for VGG16 is 97.68 %, DenseNet121 is 97.53 %, MobileNet is 96.38 %, NASNet is 89.51 %, Xception is 92.47 % and EfficientNet is 48.33 % respectively. From the obtained analysis the results shows that the VGG16 architecture gives better accuracy compared to other architectures.

Paper ID: 69

Scintillation Effects of Ka-band Frequency on Satellite Application

Abstract The satellite communication system is currently congested because of the high demand for data transmission. The Ka-band is a greater range band that can help to solve the issue. However, Ka-band is severely impacted by scintillation at its high frequency. One of the transmitting impairments is scintillation, a sudden fluctuation in the amplitude of the signal and electromagnetic waves, that generates signal attenuation and degradation. In the presence of rain and even under clear skies, scintillation affects the output of Ka-Band. The scintillation prediction model has mostly been evaluated and applied in countries with four-season climates. The objective of this study was to evaluate the Ka-band scintillation data and compare the findings with other existing scintillation models to validate the outcome. For data of one year (2016) at the Ka-Band frequency of 20.2 GHz, this research focused on analysing the tropospheric scintillation from the satellite data. The experimental data from MEASAT 5 were analysed to see the effect of tropospheric scintillation under clear-sky conditions using a dish antenna with a diameter of 7.3 metres and an elevation angle of 68.8°. The satellite signal measurement samples were gathered and filtered using MATLAB to provide clear-sky scintillation. Next, the obtained raw data was converted into readable data. The data was then plotted, and the experimental data was compared to the other models of scintillation. It was essential to evaluate the outcome of the comparison and address which model was most appropriate for tropical climates. Moreover, this project's cutoff frequency was 0.023Hz, which was computed from the average cut-off frequencies of 12 months in 2016.

Paper ID: 71

Deep Learning Models for detecting Forest Fire and Smoke

Malliga Subramanian[1], P S Nandhini[2], Obuli Sai Naren[3], K Premkumar[3], K Rankish[3]

[1] Professor, Department of Computer Science and Engineering,
Kongu Engineering College, Erode, Tamil Nadu, India
[2] Assistant Professor, Department of Computer Science and Engineering,
Kongu Engineering College, Erode, Tamil Nadu, India
[3] Students, Department of Computer Science and Engineering,
Kongu Engineering College, Erode, Tamil Nadu, India

Abstract. Forest fires are a major environmental hazard, causing economic, ecological, and human harm. Forest fires are natural flames that occur in forests, shrubs, and grasslands. Wildfires are usually caused by lightning or human error and occur during dry hot summers. Predicting such an environmental issue is crucial to reducing the threat. WSN is one of the innovative technologies and approaches developed to anticipate and detect forest fires. The accuracy of such fire detection technologies ranges from 80% to 91%. In this work, deep learning identification systems based on Convolutional Neural Networks (CNN) namely VGG16, Mobile Net and Mobile Net via Teachable Machine are presented to automatically detect fire in its early phases. Fire, No Fire, Smoke, and Smoke Fire are the four classes of images of forest fires are identified in this work. On the Fire Image dataset, Mobile Net via Teachable machine achieves 98.5% accuracy and presents good accuracy in estimating the fire when compared with other approaches in the literature.

Keywords: Forest Fire, Convolutional Neural Network (CNN), Fire Images Dataset, VGG16, Mobile Net, Teachable Machine, Accuracy.

Paper ID: 75

A Preliminary Analysis on RF Antenna Simulation comparison based on UHF and 5G for Energy Harvest Application

N. A. M. Affendi1, N.N. Nasir2, S.S. Ismail3
1Faculty of Electrical Technology Engineering, UniMAP, Arau, Perlis, Malaysia.

2Bakar Arang Industrial Estate, Sungai Petani, Kedah Malaysia.
3School of Marine Technology Engineering, Institut Kemahiran MARA, Perlis, Malaysia.

Abstract. The purpose of this study is to present an examination of RF antenna performance in the UHF and 5G ranges for energy harvesting applications. The process of capturing and storing external sources in a wireless autonomous device is known as energy harvesting. This simulation is primarily focused on two design parameters for a meander dipole antenna that can be used for energy harvesting applications in the UHF and 5G bands. For the initial simulation, FR4 material with a dielectric constant of 4.4 and thicknesses of 3.5 mm and 1.15 mm is chosen for antenna design. As a result, the CST Studio Suite Software was used to model the meander dipole type. S11 passes below -25.795 dB for UHF and -25.7 dB for 5G ranges are commonly used to evaluate performance. At these frequencies, the antenna bandwidths are 44.5 MHz and 450 MHz, respectively Finally, the developed Meander dipole antenna can be employed in RF energy harvesting applications, such as wireless sensor networks, by combining rectifier and matching circuits.

Paper ID: 82

IoT RFID Lock Door Security System

M S Z M Zabidi[1], K H Yusof[1*], A S Ahmad[1], N H Shahadan[2] , K A Yusof, K Amri Yusof, and S N M Subari

[1] Faculty of Information, Science, and Engineering, University Drive, Off Persiaran Olahraga, 40100 Shah Alam, Selangor, Malaysia

[2] Department of Electrical Engineering, Politeknik Ibrahim Sultan, KM 10 Jalan Kong Kong, 81700, Pasir Gudang, Johor, Malaysia

E-mail: khairul_huda@msu.edu.my

Abstract. Wireless security system is widely used and favored by many industries, leading to mass growth of this technology. Prior to that, many advancement has been made throughout the decades. One of the popular wireless security systems is the Radio Frequency Identification System or RFID. RFID is favored over other systems due to myriads of its application in current systems like ATM cards, national ID card, toll system, parking lot system, and even mobile phones. This paper proposes an improved design of an RFID security system utilizing a Wi-Fi capable microcontroller (ESP-8266/ESP-12E). Combining the RFID system with an IoT system shall provide user with maximum control and monitor over the system. In this system, a RFID module (MCRF522) and an ESP-12E are used to identify a RFID card UID, in which a relay will turn on if the card is authorized, and the otherwise if not. The information will then be transmitted over the internet to a database, in which the information will be accessible via an app created specifically for the system for flexible configuration by the host user.

Paper ID: 100

Development of Machine Learning models using WEKA for Atmospheric Data

P Venkata Ramana Moorthy[1], B Sarojamma[2], and S Venkatramana Reddy[3*]

[1&3]Department of Physics, Sri Venkateswara University, Tirupati 517502, A.P., India.
[2]Department of Statistics, Sri Venkateswara University, Tirupati-517502, A.P., India.
* Author for Correspondence e-mail: drsvreddy123@gmail.com

Abstract. There are number of Atmospheric variables such as rainfall, temperature, wind speed, humidity, visibility, Wind gust, Precipitation, etc. For learning covariance of machines by principles, practical and probabilistic approaches are made using Gaussian process. In this paper by taking visibility, time with date, temperature as independent or responding variables and wind speed as dependent or response variable, we fit Gaussian process model. K star is an instance based classifier that classifies the data. RBF network is used for data and is similar structure of Gaussian process but it uses clustering method with weight parameters. Additive regression classifies the variables by using Decision Stump. Decision Tree Regression improves the model by removing the decisions of the tree that are not important in classification. We fit different Waikato Environment for Knowledge Analysis (WEKA) models for atmospheric data and which model is the best based on RMSE values.

Keywords: Wind speed, Gaussian process, RBF network, K star, Additive regression, Decision tree regression, RMSE

Paper ID: 102

Enhanced Congestion Control Model Based on Message Prioritization and Scheduling Mechanism in Vehicle-to-Infrastructure (V2I)

Noraini Ismail[1,3] , **Mohammad Asif Hossain**[1], **Rafidah Md.Noor**[1,2], **Ainuddin Wahid Abdul Wahab**[1,2]

[1]Department of Computer System and Technology, Faculty of Computer Science and Information Technology, Universiti Malaya, 50603 Kuala Lumpur, Malaysia.

[2]Center for Mobile Cloud Computing Research (C4MCCR), Faculty of Computer Science and Information Technology, Universiti Malaya,50603 Kuala Lumpur,Malaysia.

[3]Faculty of Ocean Engineering Technology and Informatics, Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu Darul Iman, Malaysia.

E-mail: aini_284@yahoo.com; asif.ewu@gmail.com;
fidah@um.edu.my;ainuddin@um.edu.my

Abstract. Vehicular Ad Hoc Networks (VANETs) is an origination of Mobile Ad-Hoc Network (MANET), where road vehicles will distribute messages and provide safety alerts to notice hazardous circumstances to the drivers. One of its greatest challenges is ensuring Quality of Service (QoS) owing to channel sharing, high traffic and topology changes in VANETs. These challenges cause of degradation of network performance. Congestion control should be properly considered to improve the network performance and transmission message over VANETs. However, there seem significant limitations to most of the other current congestion control mechanisms. In this paper, an enhanced congestion control model based on prioritization and scheduling-based strategy is proposed. This strategy assigns priorities of the safety messages and non-safety messages based of the message type and network condition. Further, safety message can be classified into event-driven messages and beacon messages. At that point, all messages transmit into the appropriate queue based on their priority and schedule all messages in each queue. However, when new message enqueue, reschedule in each queue may cause additional unwanted delay to be processed cause of inefficient scheduling technique. Thus, an improved dynamic scheduling algorithm also proposed to schedule the messages in this circumstance.

Paper ID: 104

Eyeball Segmentation and Measurement in MRI Images of Myopic Children

J E Rayan2, S S Mokri1*, Y C Low3, B Mohd-Ali3, A B Huddin2, M Mohamad-Shahimin3, N Arif3, H Abdul-Hamid4 and N Mohidin5

1Lecturer, Department of Electrical, Electronics and System, Faculty of Engineering and Built Environment, Universiti Kebangsaan Malaysia, Selangor, Malaysia.
2Department of Electrical, Electronics and System, Faculty of Engineering and Built Environment, Universiti Kebangsaan Malaysia, Selangor, Malaysia.
3Optometry and Vision Science Program & Research Centre for Community Health (Reach), Faculty of Health Sciences, Universiti Kebangsaan Malaysia Kuala Lumpur, Malaysia.
4Department of Radiology, Faculty of Medicine, Universiti Kebangsaan Malaysia, Selangor, Malaysia.
5Optometry Centre, Faculty of Health Science, Universiti Teknologi MARA, Selangor, Malaysia.
*Corresponding author E-mail : siti1950@ukm.edu.my

Abstract. Myopia occurs when the beam of light stops before entering the retinal layer resulting in long-distance vision becomes blurred. Myopia in children is very common nowadays requiring for prompt intervention and effective treatment. Thus, research on myopia among the children is aggressively conducted to propose better treatment technology. One of the aspects of myopia research is to analyze the shape of the eyeball and its association with this abnormality. Eyeball imaging is commonly conducted via magnetic resonance imaging (MRI). Thus, this paper presents eyeball segmentation in MRI images of myopic children based on Chan-Vese Level Set method. MRI eye images of 35 myopic children were used. The measurement of pertinent lines was also done. The accuracy of the lines' measurement was compared with the manual measurement. An average difference of 0.2825 mm (std 0.2386mm) for left eye and an average difference of 0.2677 mm (std 0.2526 mm) for the right eye were obtained. Also, statistical t-test evaluation showed that both measurements were statistically similar that confirms the agreement between the two. In conclusion, the process of segmentation and measurement of eyeball are important to furnish the need for myopia treatment research as well as to study on any treatment efficacy.

Keywords: *Magnetic Resonance Images (MRI), Myopic, Eyeballs, Segmentation, Level Set*

Paper ID: 112

Active High Transmitter-receiver energy model for heterogeneous energy optimisation in a pipeline network

S K Subramaniam[1], F S Feroz[2], A F T Ibrahim[3], I Y Panessai[4] and R Sujatha[5]

[1]Advance Sensors & Embedded Controls System (ASECS), [2]Pervasive Computing and Educational Technology (PET), [3]Broadband & Network (BBNET), [1,2,3]Fakulti Kejuruteraan Elektronik dan Kejuruteraan Komputer, Universiti Teknikal Malaysia Melaka, Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, MALAYSIA.
[4]Faculty of Art, Computing and Creative Industry, Universiti Pendidikan Sultan Idris, 35900 Tanjong Malim, Perak, MALAYSIA.
[5]Department of Embedded Technology (IoT and sensors specialization) School of Electronics and Communication Engineering, Vellore Institute of Technology, Vellore-632014, INDIA.
siva@utem.edu.my[1], shahnaz@utem.edu.my[2] ,fayeez@utem.edu.my[3] , ismailyusuf@fskik.upsi.edu.my[4] and sujatha.r@vit.ac.in[5]

Abstract. A network energy management and optimisation are frequently associated to the network lifetime (maximum operation of nodes in a network) that is contributed by heterogeneous energy consumption pattern among nodes arranged in a pipeline layout. This scenario becomes even critical in a remote monitoring application of an oil and gas pipeline network where a series of sensing points (commonly battery powered wireless nodes) are needed to communicate the measurements to a centralised monitoring station. This paper introduces the Active High Transmitter-receiver energy model (AHiT) which was designed as an adaptive sleep/wake for sensor nodes to optimise energy consumption in the long run. Implementing AHiT energy model on sensor nodes improves the energy consumption based on data transfer activity in a multi-hop pipeline layout wireless sensor network (WSN). In this research, the proposed AHiT energy model optimises node energy by the demand that is unlike to the conventional sleep and wake energy model that is operated on a predefined scheduling scheme that accommodates the data traffic pattern in a network. Generally, in a pipeline network where sensor nodes connectivity is considered critical among neighbouring nodes to support data transfer from one end to the other end of a network. Simulations results in NS2 has indicated node energy consumption is approximately 60% with extended network lifetime around 30% subjected to the data traffic pattern as compared to the conventional energy model.

Key-Words: - Energy model, network lifetime, WSN, multi-hop linear topology, static routing

Paper ID: 147

Different Composition Ratio of ZnO/CuO Nanocomposite Thin Film using Sol-gel Spin Coating Technique

Shafinaz Sobihana Shariffudin[1*], Nor Fadzleen Qistina Mohd Fahmi Visuvanathan[2], Najwa Ezira Ahmed Azahar[3], Puteri Sarah Mohamad Saad[4], Hashimah Hashim[5] and Mohamad Hafiz Mamat[6]

[1, 2,3,4,6] NANO-ElecTronic Centre, School of Electrical Engineering, College of Engineering, Universiti Teknologi MARA, Shah Alam, MALAYSIA
[5]School of Electrical Engineering, College of Engineering, Universiti Teknologi MARA, Shah Alam, MALAYSIA
sobihana@uitm.edu.my

Abstract. ZnO/CuO nanocomposite thin films were deposited at different ratio, 50:50, 60:40, 70:30, 80:20 and 90:10 using sol – gel spin coating technique on glass substrates. The thin films were annealed at 500$_{o}$C for 1 hour at room ambient after the deposition process. The structural, optical and electrical properties of the thin films were characterized by Field Emission Scanning Electron Microscopy (FESEM), UV-Vis spectrophotometer, and 2-point probe I-V measurement system. The FESEM results showed the formation of ZnO/CuO nanoparticles shape, with the average particle size for each sample decreased with increased of ZnO ratio. The average transmittance of the thin films increased with increase of ZnO ratio, with the highest transmittance showed by 90:10 thin film with a value of 82.95%. Bandgap of the thin films were calculated and obtained using Tauc's plot and were found between 3.29 to 3.90 eV. I-V characteristic showed that the highest current reading is at 50:50 ratio. The highest conductivity was achieved by 70:30 thin film with a value of 0.396 x 10^{-3} S/cm.

Paper ID: 164

Color-based shadow detection method in aerial images

S. M-Desa*, S.A Zali#, W. Mohd-Isa, Z. Che-Embi

Faculty of Computing and Informatics, Multimedia University, Persiaran Multimedia, 63100 Cyberjaya, Selangor, Malaysia.

*shahbe@mmu.edu.my, #sitiaisyahzali25@gmail.com

Abstract. This study evaluates the performance of shadow detection using different image color models. The pixel-level supervised classification procedure employed in this study includes filtering images, creating a trained shadow model, obtaining shadow masks and post-processing of the output masks. Considering the advent of drones usage, we discuss the results of shadow detection on aerial images. Based on the results, the method using YCbCr color features yielded 92.71% average accuracy. The low performance of shadow detection on images with small shadowed regions and images under various weather conditions indicated that additional investigation is necessary to create detection schemes for challenging input images with high spatial resolution.

Paper ID: 165

Design and Implementation of IoT based Security System for Children Safety

Xin S S[1], W.Z. Leow[2], Y.M. Irwan[1], I. Safwati[3], M. Irwanto[2], X.J. Tan[3], and Z. Atika[1]

[1] Electronics Engineering Technology, Faculty of Electronic Engineering Technology (FTKEN). Universiti Malaysia Perlis (UniMAP), Kampus UniCITI Alam, Sungai Chuchuh, Padang Besar 02100 Perlis, Malaysia.
[2] Faculty of Electrical Engineering Technology, University Malaysia Perlis, 02600 Arau, Perlis, Malaysia.
[3] Institute of Engineering Mathematics, Faculty of Applied & Human Sciences, Universiti Malaysia Perlis
[4] Centre for Multimodal Signal Processing, Department of Electrical and Electronic Engineering, Faculty of Engineering and Technology, Tunku Abdul Rahman University College (TARUC), Jalan Genting Kelang, Setapak, 53300 Kuala Lumpur, Malaysia

E-mail: sehxinsaw.gmail.com

Abstract. This proposed project is dedicated to reduce criminal and the public health problem among children from corona virus pandemic with the implementation of IoT technologies. This innovation is driven for the children safety especially when attending school or for those who are living far from their family with the risk of being kidnaped and diagnosed with COVID-19 disease recently. It provides the features of detecting the important health care parameters and the location of the being. The health care parameters include temperature and pulse rate. It also aims to provide a monitoring system for parents to observe their children through IoT platform. This project implements the integration of ESP32 processor with temperature sensor, GPS module, IoT platform, ThingSpeak and customized application through MIT App Inventor. When children are missing or are detected with some possible COVID-19 symptoms, the device will prompt the email notifications to parent smartphones while message will be displayed on the OLED of the device. It indeed provides a convenient way to track them. Therefore, it can reduce the potential exposure risk to the children.

Paper ID: 169

Conversion of 15-Minutes to 1-Minute Rainfall Distribution Derived from Tropical Rainfall Distribution Measurement

Alya Syakirah Bohari , Abdullah Irfan Abdullah, Ahmad Fadzil Ismail,
Khairayu Badron
Dept. of Electrical and Computer Eng., International Islamic University Malaysia
alysykrh@gmail.com, irfan.abdullah@mod.gov.my, af_ismail@iium.edu.my,
khairayu@iium.edu.my

Abstract. The radiocommunication sector of the International Telecommunication Union (ITUR) necessitates a 1-minute integration time of rainfall rate to predict attenuation at terrestrial links and earth-space links. Since time series of rainfall that satisfies this requirement is not common, the conversion into corresponding 1-minute distribution is suggested as an alternative of time series with longer integration time T (e.g.,10-,30-,60-minutes). This research reviews existing methods for the conversion of cumulative distributions of rainfall and compares the said conversion methods. Several approaches are utilized to convert the 15-minutes rainfall rate to a 1-minute rainfall rate in the tropical area of Kampung Paya Jaras. It found that Segal's method performs the best conversion procedure overall.

Paper ID: 171

The investigation of dynamic heterogeneity in lead silicate liquid via molecular dynamic simulation

Tran Thanh Dung[1*], Mai Van Dung[1*], Truong Đuc Quynh[2*], Nguyen Van Yen[3,42], Le The Vinh[5]

[1]Thu Dau Mot University, No.6, Tran Van On street, Phu Hoa ward, Thu Dau Mot city, Binh Duong province, Viet Nam.
[2]Ho Chi Minh city University of Transport, No.2, Vo Oanh street., Ward 25, Binh Thanh district, HoChiMinh City, VietNam.
[3] Institute of theoretical and applied research, Duy Tan University, Hanoi, 100000, Vietnam;
[4]Faculty of Natural Sciences, Duy Tan University, Da Nang, 550000, Vietnam
[5] School of Automobile Technology and Aviation Engineering, Miendong University of Technology, DongNai Province, Viet Nam.

Abstract. The structure and dynamics of liquid lead silicate with a wide range of PbO content are done by molecular dynamics methods. The simulated result shows that the pair radial distribution functions (PRDFs) are in good agreement with previous experimental and simulated results. Our simulation indicates that the system exists regions of fast and slow atoms determined via the mean square displacement (MSD) in the same interval. The exhibition of dynamical heterogeneity (DH) is also found in this paper.

Keywords: *Lead silicate material, molecular dynamics (MD), Dynamical heterogeneity*

Paper ID: 183

FPGA implementation of programmable Hybrid PUF using Butterfly and Arbiter PUF concepts

Devika K N[1] and Ramesh Bhakthavatchalu[2]

Department of Electronics and Communication Engineering, Amrita Vishwa Vidyapeetham, Amritapuri, India

E-mail: devikanandalal@gmail.com[1], rameshb@am.amrita.edu[2]

Abstract. Physical Unclonable Functions (PUF) are physical entities that generates output as a function of process variation for a given input. It is an emerging hardware security solution to safeguard Intellectual Property, authentication of devices and to ensure data integrity through fingerprint generation. Delay based PUFs forms one of the popular category among different kinds of PUFs wherein the interconnect and gates delays due to uncontrollable manufacturing deviations are exploited to generate secret keys. However some of the designs such as arbiter and butterfly PUFs are seldom implemented in FPGA due to higher component of routing delay in comparison to random delay. This research work focus on the design of Hybrid PUF using the concepts of Butterfly and Arbiter PUF to reduce the skew delay factor in these PUFs. The proposed structure combines the benefits of both PUFs to increase the randomness and accuracy of the arbiter PUF. The architecture is designed to be programmable to work for any N-bit challenge as input. The PUF structures was simulated using Modelsim and Xilinx Vivado software version 19.2 were the tool used for implementing the design in spartan-7 FPGA.

Paper ID: 188

A new communication engineering in methadone flexi dispensing (MFlex) program using Mahalanobis-Taguchi system

S K M Saad[1*], M Y Abu[1], F Ramlie[2], N Harudin[3], W Z A W Muhamad[4], and R Dolah[5]

[1] Faculty of Manufacturing and Mechatronic Engineering Technology, Universiti Malaysia Pahang, 26600 Pekan Pahang, Malaysia.
[2] Fakulti Teknologi & Informatik Razak, Universiti Teknologi Malaysia, 54100 Kuala Lumpur Malaysia.
[3] Department of Mechanical Engineering, Universiti Tenaga Nasional, 43000 Kajang, Malaysia.
[4] Institute of Engineering Mathematics, Universiti Malaysia Perlis, 02600 Arau Malaysia.
[5] Fakulti Teknologi & Informatik Razak, Universiti Teknologi Malaysia, 54100 Kuala Lumpur Malaysia.

[*]Email: sitikhadijah9797@gmail.com

Abstract. Patients under methadone flexi dispensing (MFlex) program are required to do methadone dosage trends for up-down case since no parameters were employed to identify the patient with a possible rate of recovery. As a result, the present system lacks a stable ecosystem for classification and optimization due to imprecise measurement techniques and a lack of justifications for major elements that impact diagnosis accuracy. The aim is to include the Mahalanobis-Taguchi system (MTS) into the MFlex program. The data is obtained at the Bandar Pekan clinic and includes 16 parameters. For classifications and optimization, two types of MTS methods are used like RT-Method and T-Method. The Mahalanobis distance (MD) average for healthy is 1.0000 and for unhealthy is 6116.0247. The positive degree of contribution is parameter 1, 2, 6, 8, 12, 13, 14, 15, and 16. To reach a lower MD, 6 unknown samples were diagnosed with different degrees of positive and negative contribution. The best proposed solution is modification type 1 of 6. Finally, a pharmacist from the Bandar Pekan clinic confirmed that MTS can address an issue of classification and optimization in MFlex program.

Paper ID: 193

Exploration of Pattern Recognition Methods for Motor Imagery EEG Signal with Convolutional Neural Network Approach

Hasballah Zakaria, Beni R Hermanto and Hanina N Zahra

School of Electrical Engineering and Informatics, Bandung Institute of Technology, Bandung, West Java 40132, Indonesia

fahala@gmail.com, benirio@gmail.com, haninanz@gmail.com

Abstract. As an application of EEG, Motor Imagery based Brain-Computer Interface (MI BCI) plays a significant role in assisting patients with disability to communicate with their environment. MI BCI could now be realized through various methods such as machine learning. Many attempts using different machine learning approaches as MI BCI applications have been done with every one of them yielding various results. While some attempts managed to achieve agreeable results, some still failed. This failure may be caused by the separation of the feature extraction and classification steps, as this may lead to the loss of information which in turn causes lower classification accuracy. This problem can be solved by integrating feature extraction and classification by harnessing a classification algorithm that processed the input data as a whole until it produces the prediction, hence the use of convolutional neural network (CNN) approach which is known for its versatility in processing and classifying data all in one go. In this study, the CNN exploration involved a task to classify 5 different classes of fingers' imaginary movement (thumb, index, middle, ring, and pinky) based on the processed raw signal provided. The CNN performance was observed for both non-augmented and augmented data with the data augmentation techniques used include sliding window, noise addition, and the combination of those two methods. From these experiments, the results show that the CNN model managed to achieve an averaged accuracy of 47%, meanwhile with the help of augmentation techniques of sliding window, noise addition, and the combined methods, the model achieved even higher averaged accuracy of 57,1%, 47,2%, and 57,5% respectively.

Paper ID: 209

Structural properties of silica under the temperature

Mai Van Dung[*]

[*]Thu Dau Mot University, No. 6, Tran Van on Street, Phu Hoa Ward, Thu Dau Mot City, Binh Duong Province, Vietnam.

Corresponding Author: Email: dungmv@tdmu.edu.vn

Abstract. The structure of the SiO_2 system consisting of 12800 atoms is performed via molecular dynamics simulation with the Tersoff potential. Our simulation shows that the onset of the melting temperature is at 3450 K. This value is much higher than the previous result of Ringdalen and co-workers [26]. The structural evolution of the system is analyzed through the pair radial distribution function, the distribution of the bond length and the distribution of the bond angle. Structural parameters are compared with the previous experimental and simulated results. The mean square displacement is also discussed in this paper.

Keywords: *molecular, dynamics, structure, silica, properties.*

Paper ID: 213

A Conical Beam Antenna Using a Monopole Wire and Rectangular Copper Probe with Four Parasitic Sleeves for UMTS/WLAN Applications

K Nuangwongsa[1], P Wongsiritorn[2], R Sukkamat[3], C Phongcharoenpanich[3] and T Pumpoung[4*]

[1]Faculty of Engineering, Rajamangala University of Technology Isan, KhonKaen campus, 150 Srichan Road, Muang, KhonKaen, 40000, Thailand.
[2]Faculty of Engineering, Rajamangala University of Technology Rattanakosin, 96 Mu 3 Phutthamonthon Sai 5 Road, Salaya, Phutthamonthon, Nakhon Pathom, 73170, Thailand
[3]Faculty of Engineering, King Mongkut's Institute of Technology Ladkrabang, Bangkok, 10520, Thailand
[4] Faculty of Engineering and Architecture, Rajamangala University of Technology Isan, 744 Suranarai Road, Nai Mueang, Mueang, Nakhon Ratchasima, 30000, Thailand.
*****Corresponding author**:** T Pumpoung
E**.**mail**:** tajchai**.**pu@rmuti**.**ac**.**th
E**.**mail**:** oonny11@gmail**.**com

Abstract. This paper aimed to present a wideband monopole antenna for base station applications of indoor reception for UMTS (B1) and WLAN (IEEE 802.11b) systems. The operating frequency was ranged from 1.92 GHz to 2.5 GHz. The proposed antenna was made up of a probe and four connecting parasitic sleeves from the upper copper circular patch to the ground. The rectangular probe structure technique was used to extend the frequency band and effectively improve the matching conditions. The results from simulation and measurement showed that the presented antenna had a proper matching impedance of $|S_{11}|$ (dB) lower than -10 dB in the frequency band from 1.71 GHz to 3.72 GHz and also from 1.58 GHz to 2.98 GHz, respectively. The percentage of bandwidth was74.03% and 61.40%, respectively. The antenna had a conical radiation pattern. The simulated and measured gains were 2.93 dBi to 3.6 dBi and 2.58 dBi to 3.54 dBi, respectively.

Keywords: Conical beam, Indoor application, Wideband monopole antenna

Paper ID: 215

Design and Simulation of Compact MIMO Antenna for the 5G Communication in C-Band

Dhyey Ashar[1], Ajay Kumar yadav[2] and Mamta Sharma[3]

[1] Department of ECE, Global Institute of Technology, Jaipur, India

[2] Department of ECE, Jaipur Engineering College and Research Center, Jaipur, India

[3] Department of ECE, Global Institute of Technology, Jaipur, India

E-mail: ashar.dhyey7up@gmail.com

Abstract. This paper presents a CPW fed 4 × 4 configuration Multiple-Input-Multiple-Output (MIMO) antenna is proposed for 5G New Radio (NR) Sub-6 GHz band. The antenna consists of four hexagonal-shaped antenna elements with an overall area of 61 × 61 × 1.6 mm^3. The pattern diversity of the proposed MIMO is obtained by embedding an H-shaped stub in the ground plane and an I-shaped stub is integrated with the ground plane to obtain high isolation (<20 dB). The value of ECC for the proposed four-port antenna is less than 0.002. The proposed antenna covers the frequency band from 3.6 to 3.8 GHz (5G n78 band) effectively. The result guarantees the excellent diversity performance of the proposed four-port antenna. The performance of this antenna is examined in terms of port separations, diversity gain, envelope reflection coefficient, mean effective gain, channel capacity losses.

Keywords: 5G, MIMO antenna, ECC, DG, TARC

Paper ID: 216

SAR Evaluation of Flexible UWB Antenna for Wearable Applications

Dhyey Ashar[1], Ajay Kumar yadav[2] and Mamta Sharma[3]

[1] Department of ECE, Global Institute of Technology, Jaipur, India
[2] Department of ECE, Jaipur Engineering College and Research Center, Jaipur, India
[3] Department of ECE, Global Institute of Technology, Jaipur, India
E-mail: ashar.dhyey7up@gmail.com

Abstract. This manuscript appearance a compact and Ultra-Wideband (UWB) antenna for wearable applications. The proposed coplanar waveguide (CPW) feed circular configuration patch antenna is simulated on two different dielectric materials one flexible polyamide based Cordura fabric and other is FR-4, with small footprint of size 36 × 46 mm2. The antenna works in complete UWB band from 3.1 to 10.6 GHz. The performance of the antenna was examined in free space and three-layer human body phantom. This research work also presents the flexibility analysis of structure for both substrates. These examinations exhibited that proposed UWB antenna is an appropriate contender for wireless body area network (WBAN) operation.

Paper ID: 230

Energy Efficient Ant Colony System for Packet Routing in Wireless Sensor Network

Husna Jamal Abdul Nasir[1],Ku Ruhana Ku-Mahamud[2] and Eiji Kamioka[3]
[1]Faculty of Electronic Engineering Technology, Universiti Malaysia Perlis, Malaysia.
[2]School of Computing, UUM College of Arts and Sciences, Universiti Utara Malaysia, Malaysia.
[3]Graduate School of Engineering and Science, Shibaura Institute of Technology, Japan.
Email: husnajamal@unimap.edu.my

Abstract. Routing packets in Wireless Sensor Network (WSN) are complicated due to the heterogeneous nature and distribution of sensor nodes. Inefficient routing may lead to higher failure rate, higher latency and higher energy consumption. One of the common approaches to solve this problem is by using bio-inspired routing algorithms due to their abilities to adapt with dynamic environment. This paper proposed an improved ant colony system for packing routing in WSN that focuses on exploration and exploitation techniques. In the proposed routing algorithm, the best path to be used for packet transmission will be determined by considering the remaining energy of each sensor node to reduce the hotspot problem. Local pheromone update and global pheromone update are used in the proposed routing algorithm with the aim to prevent the energy depletion of sensor nodes and to balance the packet distribution. The proposed routing algorithm was validated against several bio-inspired routing algorithms in medium and large sized networks. The results suggested that it has outperformed in terms of success rate, packet loss rate, latency and energy efficiency.

Track 5-Mechanical, Mechatronic, Marine
Paper ID: 63

Ergonomic Assessment in Textile Machinery Manufacturing Industry

Punitharani K[1], Jayachitra R[2] , Deva Surya S[3], Kannan B[4]

1,2Associate Professors, PSG College of Technology, Coimbatore
3 PG student, PSG College of Technology, Coimbatore
4 General Manager, U K Engineering Works, Erode
punithapsgtech@gmail.com, jayachitrapsg@gmail.com(corresponding author), devasurya03@gmail.com

Abstract. Workers in textile machine manufacturing industries, especially those who work at specific workstations, face a risk of potentially developing musculoskeletal disorders (MSDs). This is because their work is often performed with heavy weight raw materials or in dusty areas, and it frequently requires an awkward body posture because physical space may be limited. In order to reduce the risk of MSDs, the following steps were performed which includes an ergonomic assessment using the RULA/REBA method directly at a workstation in the target area. Simulations were run using 3DSSPP software to evaluate the strength capability, balance of the worker, maximum voluntary contraction and fatigue analysis. This statistical study proved that work systems can be improved through the addition of specific tools, and that a worker's posture can be improved through the application of ergonomic principles. Software simulation provided a comprehensive solution for work-system development.

Keywords: ergonomic intervention, works posture, assessment, MSDs, RULA, REBA.

Paper ID: 93

Improvement of facility layout design using Systematic Layout planning methodology

P.Vijay Kumar, V. Naga Malleswari*,

Department of Mechanical Engineering, GITAM Institute of Technology, GITAM (Deemed to be University)

Visakhapatnam, Andhra Pradesh

*Corresponding Author: nvangipu@gitam.edu

Abstract

A plant layout design is one of the essential tasks for improving industry performance and the wellbeing of the production process. Kharagpur railway station is one of the biggest railway stations in INDIA, and the motorcoach shop is one of the workshops for the maintenance and repairing of the coaches. This workshop consists of the various department for serving the purpose of repairing works. Around ninety employees work for maintenance which comes for repair and maintenance work. It observed that the working area spread through the space and did not utilize it to the maximum extent, and material flows are not systematic. This study aims to redesign the facility layout of the motorcoach shop using Systematic Layout Planning (SLP) to maximize the utilization area and reduce idle space. Two design alternatives were proposed and compared the performance of each design with the initial layout. Based on the calculation of total area facility layout chosen since proposed layout able to improve the utilization by 30% and material flow rate by 20%.

Keywords: Facility Layout Problem, Systematic Layout Planning, Material Handling, plant layout

Paper ID: 97

Computational cooling performance of electronic chips on printed circuit boards

Shankar Durgam*
Department of Mechanical Engineering, College of Engineering Pune - 411005, India
E-mail: *sodiitm@gmail.com

Abstract. Effect of cooling performance of heated modules resembles integrated circuit (IC) chips on printed circuit boards (PCBs) under natural and forced convection is investigated. Commercially available four different types of substrate materials viz. silica glass, glass epoxy FR4, bakelite, and copper-clad board (CCB) is used for the simulation study. natural and forced convection cooling scenarios are used for thermal performance with a power input of 7.5 W and 15 W for heaters equipped on a substrate. The main motive of this work is to present and compare thermal performance using different substrate materials on heated modules. Results of FR4 and bakelite with a power input of 7.5 under natural convection are compared with forced convection results at Re = 500 and the same power input. The results show that copper clad boards give a better cooling performance in natural convection scenarios for both the power inputs of 7.5 W and 15 W.

Keywords: Computational heat transfer, Heated modules, Printed circuit boards, Silicon circuit boards, Natural convection, Forced convection, Electronics cooling, Thermal performance.

Paper ID: 161

Investigation of The Dynamic Deflection of Conveyor Belts Via Simulation Modelling Methods on Idler Factor

Handy Ali Munir1, Ammar Zakaria1, Asmarashid Ponniran3, Md Tasyrif Abdul Rahman2, Thenesh Marimuthu1,

1 Centre of Excellence for Advanced Sensor Technology, Faculty of Electrical Engineering Technology, Universiti Malaysia Perlis
2Faculty of Mechanical Engineering Technology, Universiti Malaysia Perlis
3Faculty of Electrical and Electronic Engineering, Universiti Tun Hussein Onn Malaysia.
Email: handyalimunir@yahoo.com

Abstract.
Belt conveyor is today's very important mechanism in material handling industries and is most commonly used to transport bulk materials such as grain, salt, coal and sand. Belt deflection indicates belt is loosening. It occurs between the idler roll sets due to the self-weight of the belt and the forces from the bulk material. This paper includes detailed analysis of the conveyor belt deflection under pragmatic load conditions. The aim of the project is to develop a Finite Element Method (FEM) simulation model for the deflection analysis of a conveyor belt using load data for bulk material calculated by a coupled Discrete Element Method (DEM) simulation. The scope of this project is on idler roll aspects. Two types of three-trough idlers were used in this project which were made of steel and plastic respectively. A variety of idler spacing were used to determine the most efficient configuration for the belt. This paper will explain the FEM procedures for the modelling of the belt behavior and the working principle of a coupled FEMDEM analysis. Experimental results were presented and compared based on parameters. Comparisons showed plastic idler-rollers with smaller gap is better than the rest and it could be optimized to improve the performance and efficiency.

Paper ID: 166

Analysis and Simulation of Temperature Distribution and Stress Development in Wire EDM of Tungsten Carbide

Ali Imran bin Awaludin[1], S H Tomadi[1], Rosdi D[2] and Mas Ayu H[3]

[1]Department of Manufacturing and Materials Engineering, Kulliyyah of Engineering, International Islamic University Malaysia, 53100 Gombak, Selangor, Malaysia
[2]Faculty of Mechanical & Automotive Engineering Technology, Universiti Malaysia Pahang, 26600 Pekan, Pahang, Malaysia
[3]Faculty of Manufacturing and Mechatronic Engineering Technology, Universiti Malaysia Pahang, 26600 Pekan, Pahang, Malaysia

Abstract. The main objectives of this research are to investigate the performance of temperature distribution and equivalent Von- Mises stress development on tungsten carbide, determine the effect of different machining parameters on the tungsten carbide workpiece, prepare a set of parameters, temperature distribution and stress development that can be compared with the experimental result and to optimize the machining parameters for machining tungsten carbide using wire EDM. However, wire EDM is a complicated stochastic nature process mechanism and it has a very large number of parameters that should be considered. It is quite hard to select the best set of parameters in experimenting. In this research, the Ansys software was used to simulate the maximum temperature and maximum equivalent (Von-Mises) stress result of machining the tungsten carbide by wire EDM. The input parameters selected in conducting the simulation are pulse- on time and servo voltage. The wire diameter, convective coefficient, thermal expansion coefficient, current, thickness of the workpiece and wire material is taken as fixed parameters. By using Taguchi's L9 orthogonal array, the optimal value is obtained for maximum temperature and maximum equivalent (Von-Mises) stress. Additionally, the analysis of variance (ANOVA) is a useful technique to identify the most important factor that affecting the output response.

Paper ID: 170

Damage Prediction of Pre-cracked High-Pressure Pipelines

B Kundu, D Ghosh, I Chatterjee, K Saha, S Ghosh and S Ghosh

Mechanical Engineering Department, JIS College of Engineering, Kalyani, West Bengal 741235, India

Abstract. The motive of this paper is to present the stress intensity factor, maximum normal stress and total deformation generation for semi elliptical crack in pipelines under internal pressure. The stresses are calculated by FEM method for cracked pipelines. The dispersal of normalized stress intensity factor along the crack front for a specified pre generated crack geometry with definite length and depth in a specified coordinate is analysed at different range of pressure application. This research has also focused on different material property analysis and a comparative study for a relatively better material for the sake of industrial use.

Paper ID: 173

Investigation of water recovery from sewage using solar thermal technology

M Easwaramoorthi[1], B Manibarathi[2], R Mathesan[3], M Mithiran[4] and R Rajesh[5]
[1]Professor, Department of Mechanical Engineering, Nandha Engineering College (Autonomous), Erode - 638 052, Tamil Nadu, India, eswaramoorthi65@gmail.com
[2,3,4,5] Graduate Students, Department of Mechanical Engineering, Nandha Engineering College (Autonomous), Erode -638 052, Tamil Nadu, India.

Abstract. The availability of pure water for drinking, irrigation and industrial use is a great challenge in underdeveloped as well as developing countries. Along with food and air, water is considered as vital for human life and majority of people dependent on non-purified water from rivers, lakes and underground water reservoirs. Oceans are the only available source of large amount of water. Since they contain high levels of salt, desalination of the water is necessary. But, the increase in population, urbanization and industrialization resulted in higher release of sewage and industrial effluents into water bodies and subsequent water pollution. It leads to scarcity of pure water in many towns and villages even though they are located near lakes and rivers. Water scarcity is expected to increase in the upcoming years, and the majority of the world's population will face water scarcity in the near future. Potable water is not only important for life but also required for industrial and agricultural activities. Physical, chemical, and biological processes are normally used to remove contaminants from wastewater and produce pure water. In this context, an attempt is made in this paper to use the concept of solar still for sewage treatment. The experimental setup was developed to investigate the performance of a solar still integrated with evaporator and condenser and results are presented.

Keywords: Active solar still, passive solar still, water pollution, solar thermal energy, Condenser, evaporator

Paper ID: 220

Numerical Investigation on Advanced Heat Sink Material for Thermal Management of Electronics

Shankar Durgam, Bharati Ghodake, Suhas Mohite

Department of Mechanical Engineering, College of Engineering Pune - 411005, India
E-mail: _sodiitm@gmail.com

Abstract. This article reports a numerical investigation on advanced heat sink material for thermal management of electronics. We investigated heat transfer enhancement using di_erent heat sink materials. The working uid used for analysis was water. Forced water convection in copper alloy and aluminum alloy Al6060, Al6063 material micro-channel heat sinks cooling was studied numerically using Ansys Fluent. The heat sink is an essential element in a PC. The total e_ciency, price, and size of the electronic device depend on the heat sink material. The heat dissipation rate is a direct function of heat sink material. The simulation used three di_erent velocities, 3, 5, and 7 m/s; the constant heat ux value taken is 8 _ 105 W/m2. Four criteria for selecting heat sink material are thermal conductivity, thermal expansion coe_cient,density, and price. The ceramic materials have a low thermal expansion coe_cient and higher thermal conductivity hence used as a substrate. Results show that aluminum alloys are suitable materials for heat sinks because of their cost, weight, and ease of machinability.

Keywords: Computational Fluid Dynamics, Electronic cooling, Forced convection, Thermal conductivity, Heat sink, Thermal management.

Paper ID: 223

Homogenization of Green SiO2 from Rice Husk Burn through Potassium Hydroxide Solid-Liquid Extraction

Lydia Anggraini[1*], Rivaldo Agung Hendriawan[2], Putri Laila Anggraina[3] and Rijal Hakiki[4]
[1,2] Study Program of Mechanical Engineering, President University
[3,4] Study Program of Environmental Engineering, President University
Jl. Ki Hajar Dewantara, Jababeka Education Park, Cikarang, Bekasi 17550, Indonesia

*corresponding author: lydia.anggra@president.ac.id

Abstract. In the agricultural countries, rice husk is an abundant waste, especially as one of the largest sources of silica (SiO_2) production that can be produced. By complete combustion, to about 87% - 97% SiO_2 content can be produced from rice husks. Alkaline solution is used as a solvent in the solid-liquid extraction process of rice husk ash. The mass of 10 grams of rice husk ash was weighed for the extraction process added with 80 ml of potassium hydroxide (KOH) solution with 10%, 15% and 20% various concentration for 60 minutes to extract the SiO_2 content. The solution was added with 1 N hydrochloric acid (HCl) solution to precipitate the SiO_2, after the extraction process was complete. The SiO_2 formed is then separated from the rest of the solution by filtration. Next step is the drying process which aims to remove the moisture content of the resulting SiO_2. In a systematic study, for 60 minutes the rice husks were soaked and washed using HCl and then heated in a muffle furnace. The results of this study showed that all samples are succeeded in homogenizing SiO_2 with a purity close to 90%. Furthermore, through X-Ray Fluorescence (XRF) analysis was proven these results obtained through solid-liquid extraction of KOH from rice husks. Green SiO_2, known as biosilica, is useful and has potential in reinforcing compounds, including applications as filler in tires and natural rubber compounds.

Paper ID: 229

Effect of Build Parameters on Process Energy Consumption and Material Usage in Fused Deposition Modelling Method

N W Y Omar, N A Shuaib*, A I Azmi and M H J A Hadi

Faculty of Mechanical Engineering Technology, Kampus Alam Pauh Putra, Universiti Malaysia Perlis, 02600, Arau, Perlis, Malaysia

Email: norshahaizat@unimap.edu.my

Abstract. Fused deposition modelling (FDM) process is one of popular 3D printing technologies, especially on printing polymer materials for a rapid prototyping. The process is well known for its resource saving, with no tooling cost required and minimum energy demand. However, the challenge is that the process performances are highly influenced by selection of parameters. From literature, consideration on material usage and process energy demand in FDM processes is still limited. This study used an L9 Taguchi orthogonal array design in investigating effect of build orientation, printing speed and layer thickness on process energy consumption and total material usage in FDM processes. The p-values from ANOVA analysis revealed that only layer thickness and build orientation had significant effect on the outputs. In minimising material usage, the strategy is to select the correct build orientation to avoid need of support structure. For reducing energy demand, optimum layer thickness needs to be determined by considering other factors such as mechanical properties and surface roughness. This study provides preliminary findings which will benefit FDM users in using resources efficiently. Further studies are required to complement the findings from the aspects of mechanical and physical properties of the printed products.

Fourth International Conference on
Emerging Electrical Energy, Electronics and Computing Technologies 2022 (ICE4CT 2022)

ICE4CT 2022

Faculty of Electrical Engineering Technology, Universiti Malaysia Perlis is pleased to announce the Fourth International Conference on Emerging Electrical Energy, Electronics and Computing Technologies 2022 (ICE4CT 2022) which will be conducted jointly with the Nandha Engineering College, Erode, Tamil Nadu, India on 2022. ICE4CT 2022 aims for a great gathering of both industrial and academic professional from across the world. It provides a major forum for the exchange of information among practicing professionals from all over the globe in the areas of greater importance in Engineering & Technology, such as, Intelligent Systems, Soft Computing and Optimization. The first ICE4CT was held at The NOVOTEL, Melaka, Malaysia and had been well received by the researchers and academicians across the world. The second and third ICE4CT was held virtually.

The scope of the ICE4CT 2022 is a wonderful opportunity which provides a platform to scientists, researchers, professors, scholars and academicians from the different parts of the world to discuss their latest innovative research results and the most recent cutting edge technologies and trends in the fields of Electrical Engineering and Computing Sciences. ICE4CT motivates the scholars and researchers to gain confidence in the area they are working for. With the excellent coverage and potential authors, the proceedings of this conference provide outstanding support to the participants to support their research works. ICE4CT promotes research and development activities and to provide a global forum of discussion for academicians, leading technologies and engineers in the above technologies. ICE4CT is an excellent platform to build a strong research network thereby providing a unique platform to its presenters to get into the network.