PROGRAM BOOK

5th International Conference on Electrical, Electronic, Communication and Control Engineering (ICEECC 2021)

http://conf.fke.utm.my/ICEECC2021

DoubleTree by Hilton Hotel, Johor Bahru, Malaysia
15-16 December 2021

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Welcome to ICEECC 2021

On behalf of the organizing committee, it is my great pleasure to welcome all participants from around the globe to attend the 2021 International Conference on Electrical Electronics Communication and Control Engineering (ICEECC 2021).

This conference is organized by School of Electrical Engineering, Faculty of Engineering UTM, and IEEE UTM JB Student branch which is the 5th event after a successful event in the last four years. The main objective of this conference is to provide an international platform for researchers, engineers, academicians as well as industrial professionals from all over the world to share the findings from latest research and developments in Electrical Engineering subject area, which covers control and instrumentation, communication, electronics and power engineering. It is also hope that this conference would create diverse opportunities in networking as well as knowledge and ideas sharing for future collaborations. A total of 57 papers have been submitted to this conference. After the reviewing process, the best 48 papers are accepted for oral presentation which is organise in hybrid mode (face to face and online platform presentation) due to COVID-19.

I would also like to express my sincere thanks to our keynote speakers, Prof Dr Ir Hazlie bin Mokhlis from Universiti Malaya, Prof R Vilanova from Universitat Autonoma de Barcelona, Barcelona, Spain, Prof. Dr. Mehmet Ertugrul from Atartuk University Turkey, and Prof. Dr. Bulent Cavusoglu from Atartuk University Turkey. Also thanks to the authors and attendees for their technical contributions to ICEECC 2021. I would like to extend my appreciation to all the sponsors, the supporters, the committee members and the secretariats of this conference. Finally, I wish you will completely enjoy the conference and your stay in Johor Bahru Malaysia.

Professor Ts. Dr. Mohamad Kamal A Rahim
General Chair
ICEECC 2021

Welcome to the 5th International Conference on Electrical, Electronic, Communication and Control Engineering 2021. It is a great pleasure for me to welcome all participants from all over the world in the spirit of knowledge sharing and experience exchange in this event. This conference represents an important part of our commitment to provide a platform for all to maintain an active networking and productive collaborative alliances in future. It is our hope, and I am sure it is yours as well, that this ICEECC 2021 will bring us opportunities to share and to start a good professional relationship and networking, as well as possible research collaboration among us, and our institutions in future.

I also hope that this conference will continue to be held annually to ensure continuity in the endeavor for excellence for all the ICEECC participants, committees, sponsors and all the collaborators involved. I would like to acknowledge the organizing committee and hardworking team members for their relentless effort in successfully organizing ICEECC2021. To all participants, kindly use this precious opportunity to your fullest and expand your network which may accelerate in building network in your research journey, and I sincerely hope that you will find the conference both valuable and enjoyable. May this be a continuous annual event due to its significance in the 21st century and in realizing Industry 4.0 vision.
Thank you all.

Have a great and exciting day!

Prof. Ts. Dr. Ruzairi Abdul Rahim
Dean,
Faculty of Engineering
Universiti Teknologi Malaysia

With great pleasure, I warmly welcome our honorable guests, invited speakers, participants, committees, sponsors and all the collaborators involved to this exciting and beneficial event International Conference on Electrical, Electronic, Communication and Control Engineering (ICEECC) 2021.

The ICEECC 2021 which is the 5th event is organized by School of Electrical Engineering, Universiti Teknologi Malaysia, dedicated to bringing together a significant number of diverse scholarly events for presentation within the conference program. ICEECC2021 aims to bring together leading academic scientists, researchers, and research scholars to exchange and share their experiences and research results on all aspects of Electrical Engineering, Electronic Engineering, Communication Engineering and Control Engineering. It also provides a premier interdisciplinary platform for researchers, practitioners, and educators to present and discuss the most recent innovations, trends, and concerns as well as practical challenges encountered, and solutions adopted in the fields.

My sincere appreciation and gratitude for the contributions and support by the secretariat committee members, the sponsors, industrial partners, invited speakers, the participants and lastly, but not the least, to the Dean of Engineering Faculty, Professor Ts. Dr. Ruzairi Abdul Rahim, for his presence and support to this event. Thank you.

Prof. Ir. Dr. Mohd Wazir Bin Mustafa
Chair
School of Electrical Engineering
Faculty of Engineering, UTM

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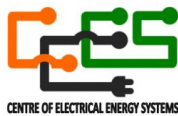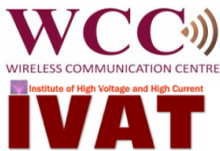Muhammad Luqman Min Mohd Radzri

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KEYNOTE SPEAKERS

KEYNOTE 1

Research Opportunities in
Distribution Systems Resilience
Enhancement
Date: 15 Dec 2021 Time: 11.30 am

**PROF. IR. DR. HAZLIE BIN
MOKHLIS**
Department of Electrical
Engineering
Faculty of Engineering
Universiti Malaya

KEYNOTE 2

Analytical approach to PID Tuning:
Design Tradeoffs and Unified
Perspectives
Date: 15 Dec 2021 Time: 02.00 pm

PROF. R. VILANOVA

Universitat Autonoma de Barcelona
Barcelona, Spain

KEYNOTE 3

Ambipolarity Effect in Field Effect
Transistors
Date: 15 Dec 2021 Time: 02.45 pm

PROF. MEHMET ERTUGRUL
Department of Electrical Electronics
Engineering
Engineering Faculty
Ataturk University
25240 Erzurum, Turkey

KEYNOTE 4

5G and Vehicle Communications

Date: 15 Dec 2021 Time: 03.30 pm

PROF. DR. BULENT CAVUSOGLU

Department of Electrical Electronics
Engineering
Ataturk University
25240 Erzurum, Turkey

KEYNOTE SPEAKER 1

PROFESSOR IR. DR. HAZLIE BIN MOKHLIS
Department of Electrical Engineering
Faculty of Engineering
Universiti Malaya

Tittle
Research Opportunities in Distribution Systems
Resilience Enhancement

Biography

Hazlie Mokhlis received the Bachelor of Engineering (B. Eng. (Hons)) degree and Master of Engineering Science (M. Eng.Sc) in Electrical Engineering from University of Malaya in 1999 and 2003 respectively. He received PhD degree from the University of Manchester in 2009. He is currently Professor at Department of Electrical Engineering, University of Malaya. He held several important positions; Deputy Dean Research (2013-2014), Deputy Dean Postgraduate Studies (2014-2015, 2017-2018), Deputy Dean Undergraduate Studies (2018-2019) and Head of Department (2015-2017) at the Faculty of Engineering. Dr Hazlie is actively involved in research as a principal investigator with a total amount of research grant worth more than RM 2.5 million. He is the author and co-author of more than 300 publications in international journals and proceedings in the area of Power Systems and Energy. Up to now, he had successfully supervised 32 PhD, 10 Master (by research) and 56 Master (Mix-mode and Course Work) candidates. He is also active as reviewer for many reputable journals such as IEEE transaction on Power Systems, IEEE transaction on Sustainable Energy, IET Generation, Transmission & Distribution and International Journal of Electrical Power & Energy Systems and several international conferences. His outstanding research outcomes had been recognized when listed in top 2% scientists by Stanford University in 2020. Besides being involved with research, he is also active in the development of Malaysian Standard as a member of Working Group in Development of Malaysian's Power System Analysis and Studies (WG6) and Expert Representative in IEC for project TC 8/PT 62786. Prof Hazlie is a Chartered Engineer with the Engineering Council UK and a Professional Engineer with the Board of Engineers Malaysia. He is also an external examiner/assessor for many local universities for the Electrical Engineering programme. Currently, he is Chair for IEEE Power Energy Society, Malaysia Chapter (2020-2021). His research is focusing on improving the efficiency and resiliency of power system operation.

Abstract

Catastrophic events such as hurricanes, flash floods and earthquakes in recent years have become a major threat to the whole world. It not only causes losses in economic and human life, it also led to significant damage to the critical infrastructures, mainly electrical supply systems. Failure in this system

disrupts the functionality of many other critical infrastructures such as healthcare, banking, water supply and national security. Realising the importance of electricity supply system, remarkable efforts are made by power utilities and researchers to achieve a resilient electrical supply system. The aim is to ensure the system can resist the sudden changes and quickly recover after the occurrence of catastrophic events so that electricity can be supplied as maximum as possible. Distribution system has a great potential for resiliency improvement in a power system. This talk will discuss the concept of power system resilience and research opportunities to improve the resiliency of a distribution system. Overview of the current climate conditions that lead to catastrophic events will also be presented to show the needs of a resilience power system

KEYNOTE SPEAKER 2

PROF. R. VILANOVA
Universitat Autonoma de Barcelona
Barcelona, Spain

Tittle
Analytical approach to PID Tuning: Design
Tradeoffs and Unified Perspectives

Biography

Prof. R. Vilanova is at present Full Professor of Automatic Control and Systems engineering, Dean of the School of Engineering at the Universitat Autonoma de Barcelona, (Barcelona, Spain) and head of the research group on Advanced Control Systems. He has published more than 80 papers in international indexed journals. Also co-author/editor of three Springer books. He's main research interests are on the control and operation of wastewater treatment plants, topic where he has been awarded national research projects since 2010 and also on PID control in its different perspectives. He's been PI of a number of national and European projects and also devoted a lot of effort on actions/projects with an educational perspective within the European Higher Education area (SOCRATES, TEMPUS; ERASMUS MUNDUS, etc). He is a member of IFAC and IEEE-IES, he's also member of the Technical Committee on Factory Automation.

Abstract

It is an indisputable fact that the proportional-integral-derivative, PID, controller has been, and it still is, the workhorse of control at process industries. Even if more advanced control solutions are permeating into the control rooms, the PID continues to be the preferred solution at field level. Therefore, the reliability of those advanced, plant-level solutions, depends on the appropriate performance of such PID level. One of the cornerstones of activity in PID control is that of adjusting the PID gains: tuning the PID controller. Being this a basic need in control practice, the goal of obtaining simple, powerful and as generalist as possible tuning rules has been one of the major drivers of research for improvements on PID control. In this lecture attention is focused on model-based tuning of single-loop PID controllers in terms of the robustness/performance and servo/regulator trade-offs. Although the robustness/performance compromise is commonly considered, it is not so common to also take into account, for example, the conflict between input and output disturbances, referred also as the servo/regulator trade-off. As interested in providing a unified tuning approach, it is shown how the proposed methodology allows to deal with different process dynamics in a unified way. The proposed approach to design is completely analytical and motivated by the solution to a conveniently stated H-inf problem.

KEYNOTE SPEAKER 3

PROF. MEHMET ERTUGRUL
Department of Electrical Electronics Engineering
Engineering Faculty
Ataturk University
25240 Erzurum, Turkey
Tittle
Ambipolarity Effect in Field Effect Transistors

Biography

Prof. Dr. Mehmet Ertugrul was born in Trabzon, Turkey, in 1966. He received the B.Sc. degree from the Department of Physics, in 1986, and the M.Sc. and Ph.D. degrees in physics, in 1990 and 1994, respectively. From 1994 to 1996, 1996 to 2001, and 2001—2002, he was, respectively, an Assistant Professor, an Associate Professor, and a Full Professor at the Department of Physics, Ataturk University, where he has been a Full Professor at the Department of Electrical and Electronics Engineering since 2003. He is the author or co-author of more than 200 papers published in international journals and also over 200 publications in national and international conference proceedings. His current research interests include carbon nanostructures and composites, energy storage systems employing 2D structures such as graphene, dichalcogenides and MXenes, biomedical and gas sensors, ultraconducting and superconducting cables, covetics, radar absorber materials, superconducting and semiconducting devices. He worked as a visiting scientist at Oak Ridge National Laboratory between 2001-2003, 2005-2006, and 2008-2009. He has been working as a visiting profffessor at University Putra Malaysia (UPM) since 2019. Prof. Ertugrul has received several awards such as Encouragement award by The Scientific and Research Council of Turkey (TUBITAK), The Successful Young Scientists Award by the Turkish Academy of Sciences, and the best project award. He was also awarded with NATO-C scholarship in 2001 and TUBITAK scholarship in 2009. He has served as a supervisor to many masters and PhD students. He has worked for several committees such as the Higher Education Council, The Scientific and Research Council, The Ministry of Science, Technology and Industry of Turkey.

Abstract

Ambipolarity has become important for many applications in recent years. In addition to device fabrication from materials with ambipolar behavior, many factors such as the controllability of ambipolarity and the degree of ambipolarity have attracted the attention of researchers. Many factors causing ambipolarity have been reported in the literature. Especially, 2D dicalgonites such as WS2 and MoS2 are the leading materials for FET devices with ambipolar behavior. Besides the properties of these 2D materials, the geometry of the device also has an effect on ambipolarity. In this study, the effect of geometric properties of the FET device, such as channel width, on

ambipolarity was investigated. For the FET device, it was seen that the instability starts from a few layers of channel thickness and then decreases again as the thickness increases. It was observed that as the thickness increased, the degree of ambipolarity approached zero. The degree of ambipolarity approaching zero indicates that the WS2 channel exhibits natural n-type behavior and the ambipolar effect disappears.

KEYNOTE SPEAKER 4

PROF. DR. BULENT CAVUSOGLU
Department of Electrical Electronics Engineering
Ataturk University
25240 Erzurum, Turkey

Tittle
5G and Vehicle Communications

Biography

Dr. Cavusoglu has received his BSc from Electronics and Communication Engineering, Yildiz Technical University, Istanbul, Turkey in 1994, Msc from Electrical Engineering, Illinois Institute of Technology, Chicago, USA in 1998 and Ph.D degree from Electrical and Computer Engineering, University of Illinois at Chicago (UIC), Chicago, USA in 2005. He has been with Ataturk University since 2005. His research interests are mainly in the fields of communication, signal/image processing, networking, 5G and IoT areas.

Abstract

The vehicle sector has seen significant changes with the Intelligent Transportation System (ITS) over the last decade. New technologies are being integrated into vehicles to detect possible road hazards and enhance the driving experience. In today's digital world, ITS plays a critical role in modern life mobility as vehicle connectivity grows. An important component is being integrated into cars is that communication technologies to establish vehicle connectivity. VANETs (Vehicular Ad-hoc Networks) are intelligent transportation system that enable vehicles to communicate each other directly through a wireless network. Each vehicle acts like node and equipped with transceiver to send and receive data. Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) communications are the two types of VANETs. In V2V communication, every vehicle exchanges traffic-related information to reduce traffic congestion, increase passenger safety, and enable efficient vehicle management. In V2I communication, on the other hand, the communication is between vehicles and wireless access points to make an early informed decision to the situation that could cause untoward incidents. The focus of this talk is on 5G and its expected usage on Vehicle Communication. In this context, recent research developments that must be provided to allow a safe communication in Vehicle communication are discussed.
Recent research developments in VANETs consist of traffic management, road safety and infotainment applications. Road safety applications are designed to provide information to drivers about different possible risks such as collision avoidance (safe distance), road sign notifications (curve speed warning), incident management (emergency vehicle warning). Traffic management

applications designed to improve road traffic management that make the users awere of local traffic information such as speed management and vehicle tracking. Traffic management and road safety applications are more of V2V interest. As for infotainment applications, these applications help provide internet access to the vehicles such as finding the nearby gas station or parking booking. Recently, studies for V2V communication are popular. Research and testing of communication technologies used in the VANETs environment is gaining attention. Reliable information exchange between vehicles depends on using V2V communication technology. Dedicated Short-Range Communication (DSRC), Wireless Access in Vehicular Environments (WAVE) and Cellular Systems are types of communication technology in VANETs. An alternative solution for V2V communication technology is cellular systems. Cellular Systems covers the technologies that is already in use for V2V communications such as Long-Term Evolution (LTE) or Fifth Generation (5G) technologies. Different communities, such as the 5G Automotive Association (5GAA) and the Third Generation Partnership Project, are supporting the Cellular Systems. Each of communication technologies have their own set of advantages. For example, DSRC is effective for a short-range application (about 300 m) such as collision avoidance and other security applications, but Cellular Systems are better for applications that require longer coverage ranges.

TENTATIVE PROGRAM

DAY 1: 15 DECEMBER 2021 (WEDNESDAY)

08.00 am – 05.00 pm	**CONFERENCE REGISTRATION**
09.00 am – 10.40 am	**PARALLEL SESSION 1 ****
10.40 am – 11.00 am	**NETWORKING AND MORNING BREAK**
11.00 am – 11.15 am	**WELCOMING REMARKS** **Prof. Ts. Dr. Mohamad Kamal A. Rahim** Conference Chair 5th International Conference on Electrical, Electronic, Communication and Control Engineering
11.15 am – 11.30 am	**OPENING AND OFFICIATING SPEECH** **Prof. Ir. Dr. Mohd Wazir Mustafa** Chair, School of Electrical Engineering Universiti Teknologi Malaysia
11.30 pm – 12.15 pm	**KEYNOTE SESSION 1** **Prof. Ir. Dr. Hazlie Bin Mokhlis** Department of Electrical Engineering Faculty of Engineering Universiti Malaya Title: Research Opportunities in Distribution Systems Resilience Enhancement
12. 15 pm – 02.00 pm	**PHOTO SESSION AND LUNCH BREAK**
02.00 pm – 02.45 pm	**KEYNOTE SESSION 2** **Prof. R. Vilanova** Universitat Autonoma de Barcelona Barcelona, Spain Tittle: Analytical approach to PID Tuning: Design Tradeoffs and Unified Perspectives
02.45 pm – 03.30 pm	**KEYNOTE SESSION 3** **Prof. Mehmet Ertugrul** Department of Electrical Electronics Engineering, Engineering Faculty, Ataturk University, 25240 Erzurum, Turkey Tittle: Ambipolarity Effect in Field Effect Transistors

03.30 pm – 04.15 pm	**KEYNOTE SESSION 4** **Prof. Dr. Bulent Cavusoglu** Department of Electrical Electronics Engineering Ataturk University 25240 Erzurum, Turkey Tittle: 5G and Vehicle Communications
04.15 pm – 04.30 pm	**PHOTO SESSION**
04.30 pm – 05.00 pm	**TEA BREAK**
	END OF DAY 1

DAY 2: 16 DECEMBER 2021 (THURSDAY)

08.00 am – 09.00 am	**CONFERENCE REGISTRATION**
09.00 am – 10.20 am	**PARALLEL SESSION 2 – PART 1 ****
10.40 am – 11.00 am	**BREAK AND NETWORKING**
11.00 am – 12.40 pm	**PARALLEL SESSION 2 – PART 2 ****
12.40 pm – 02.00 pm	**LUNCH BREAK**
02.00 pm – 03.00 pm	**NETWORKING**
03.00 pm – 03.30 pm	**TEA BREAK**
03.30 pm – 05.00pm	**NETWORKING**
	END OF DAY 2

**PLEASE REFER TO THE PRESENTATION SCHEDULE FOR PARALLEL SESSION

PARALLEL SESSION 1 – ROOM 1A
ELECTRONIC & COMPUTER ENGINEERING

<u>**Session Chair: Dr. Shahidatul Saadiah Abd. Manan**</u>

09:00 am Pedestrian Attribute Recognition: Upper Body Clothing Classification
Syahmi Syahiran Bin Ahmad Ridzuan; Zaid Omar; Usman Ullah Sheikh

Pedestrian Attributes Recognition has become more prevalent and important in safeguarding the community from the crimes. It is the solution to replace the old, cumbersome method of Criminal Characteristics Identification with a more advanced, efficient and accurate framework. The widespread usage of Closed-Circuit Television (CCTV) and the emergence of Big Data prepares a perfect ground for an advanced analytic tool to dissect and understand the massive collection of video footage for various purposes. Therefore, the aim is to tackle the issue of pedestrian identification using one of the attributes, upper body clothing classification. For this purpose, P-DESTRE dataset is chosen due to the multiple attributes of the pedestrians available including upper body clothing classes. A few pre-preprocessing steps are also necessary before feature extraction such as DeepLab for background removal and AlphaPose for body parts recognition. In this paper, two major elements are used in classifying upper body clothing, type of sleeves and type of collar. The type of sleeves requires the calculation of skin over arm section pixels percentage meanwhile the type of collars needs Features from Accelerated Segment Test with Non Maximal Suppression (FASTNMS). The findings show that the classification accuracy rate of both two elements achieved a over 90% which shows the effectiveness of the two methods, thus helped to establish a framework to recognize a pedestrian based on upper body clothing.

09:20 am Reverse Engineer 5 Degrees of Freedom Robot Arm Using Programmable Logic Controller
Nurul Huda Abd Rahman, Zulfakar Aspar; Izam Kamisian and Abdul-Malik Saad

Many types of robot arms have been developed in the market. Whenever a robot arm broke down, it is a challenge to do reverse engineer and repair the robot arm. This project has successfully reused the existing 5 degrees of freedom robot arm structure and electronic components while replacing the controller with a new Programmable Logic Controller (PLC). The project uses the existing DC servo motor, encoder, sensors, power supply, and interface board. Since a low-cost PLC is used, it is not possible to move all axes at the same time. Instead, the robot arm can only move one axis at a time. Additionally, the robot arm has been improved to be able to be programmed manually or automatically and repeating previously predetermined position sequences. In total, 90 rungs, 96 built-in commands, and custom functions have been used. The developed system is very stable and reliable.

09:40 am Bird Sound Detection with Binarized Neural Networks
Muhammad Mun'im A Zabidi; Wong Kah Liang; Usman Ullah Sheikh; Shahidatul Sadiah and Afiq Hamzah

Effective approaches for bird species monitoring and recognition help to protect avian biodiversity. Deep Neural Networks (DNNs) has been shown to outperform conventional bird-recognition methods. However, the DNN suffers from high storage and processing power requirements. One of the latest approaches to address this limitation is the use of Binarized Neural Networks (BNNs). The architecture based on the XNOR-Net model is used for bird sound detection in this paper. A performance analysis of XNOR-Net in terms of the number of hidden layers used was performed and the configuration with the best accuracy was constructed. Some data augmentation technique were applied to improve the generalization of the model. Finally, the system was evaluated using urban sound (UrbanSound8K) and bird sound (Xeno-Canto) datasets. We achieved a training accuracy of96.06% and validation accuracy of 94.08%.1 We believe that BNNs are an effective approach to low-power bird sound detection.

10:00 am High-Throughput and Low-Latency ASIC Implementation of Lightweight Cryptography
Shahidatul Sadiah, Mohd Usairy Syafiq, Ismahani Ismail, Mohd Shahrizal Rusli, Lee Jiah Chun

This paper presents high throughput and low latency ASIC implementation of lightweight cryptography. Most of the lightweight algorithms are round-based designs, whereby the high throughput is achieved via the pipeline of the round functions. However, the response time is not ideal as such algorithms were designed crucially on area-based. The PRINCE cipher is developed to speed up the latency of the algorithm while managing competitive area utilization. Therefore, it is a promising choice for low-resource devices that emphasize response time. In this work, the PRINCE cipher is designed and synthesized in a single-cycle, reduced multi-cycle, and compared with the round-per-cycle implementation as a baseline. The synthesis results reveal that the single-cycle PRINCE cipher is achievable with an almost 40% reduction in encryption latency. Further analysis on optimization of RTL designs and data path constraints have also been carried out to improve the implementation in terms of gate count, delay, and power consumption, which is based on a 32nm SAED Cell Library using Synopsys tools

10:20 am Hybrid Non Scan with BIST for Fault Coverage Improvement
Azra Ahmadi, Norlina Paraman, Mohd Shahrizal Rusli and Suhaila Isaak

Conventional design for testability (DFT) method that implements scan designs requires long test application time and costly automatic test equipment (ATE). On the other hand, built-in self-test (BIST) methods reduce the test time, but with low fault coverage. In this paper, we propose a DFT method that combines two DFT methods which is BIST and a non scan method in order to improve the fault coverage at register transfer level (RTL). BIST architecture with a standard linear feedback shift register (LFSR) is implemented as the test pattern generator. Non

scan method is implemented to tackle the problem of poor testability at the internal circuit. R-graph that represents the connection of the circuit is used to derive the circuit at RTL. The self-loop register from the generated R-graph is selected so that the thru function is added to the self-loop in order to improve the testability of the circuit. The performance of the proposed DFT method will be measured on several circuits to show the effectiveness of the proposed DFT method. It will be compared to a stand-alone BIST method in terms of fault coverage. The results show that the proposed DFT method achieves higher fault coverage compared to the stand-alone BIST method.

PARALLEL SESSION 1 – ROOM 1B
POWER ENGINEERING

Session Chair: Assoc. Prof. Ir. Dr. Tan Chee Wei

09:00 am Analysis on the DC Source Lifetime and Conduction Losses of a Single-Phase Nine-Level Non-Isolated DC Source Symmetric (NDS) Multilevel Inverter
Naziha Ahmad Azli and Lili Mohammadalibeigy

The Non-isolated DC Source Symmetric (NDS) multilevel inverter in general features reduced number of power devices requirement when compared to conventional multilevel inverter topologies. It has been designed as such the circuit itself can simply be extended if higher output voltage levels is required. This paper presents an analysis on the DC source lifetime and conduction losses of a single-phase nine-level NDS multilevel inverter. From the analysis conducted, the NDS multilevel inverter has been justified to offer advantages in terms less conduction losses which in turn provides better efficiency and equal life time for each DC source.

09:20 am Optimal Design of Thermoelectric Generator with Vertically Aligned PEDOT: PSS Thermoelements
Md. Nazibul Hasan and Mohamed Sultan Mohamed Ali

Estimating the performance of a thermoelectric generator with an optimal design is vital for energy harvesting applications. This paper presents a numerical simulation of a thermoelectric generator with vertically aligned PEDOT: PSS thin film (p-type) and aluminum wire (n-type)-based thermoelements using finite element analysis. It also determines the optimal length of thermoelements to achieve highest temperature gradient and lowest internal resistance, resulting in improved thermoelectric generator output performances. The thermoelectric generator with five pairs of thermoelements produced an open-circuit voltage of 3.22 mV at a temperature gradient of 50 °C. Following that, the generator provided a maximum power of 2.54 μW and a power density of 394 nW cm-2, at

temperature gradient of 50 °C. The proposed design concept may provide a better temperature gradient as well as higher output performances.

09:40 am Power Consumption in the DSL Access Network System
Dang Fillatina Hashim, Fauziahanim Che Seman, Ahmad Fateh Mohamad Nor, Siti Amely Jumaat and Ansar Jamil

Nowadays, people have been living with a rapid growth of telecommunication networks and Internet access globally. It has a significant role that is used by various industries, companies, governments, universities and other sectors. Malaysia also experiences the penetration of this technology year-by-year. Fixed broadband Internet access provides high-speed data transmission and it uses a variety of technologies such as Digital Subscriber Line (DSL), fiber optics and wireless. DSL technologies are widely used to transmit data using twisted-pair telephone lines and it includes DSL modem to provide Internet connection. In accessing the Internet, electricity is required to power the related devices such as DSL modem as associated devices located at subscriber's premises. This project describes the analysis of correlation between power consumption and customer-premises equipment (CPE) in DSL network systems to understand how traffic data demand may affect the changes of power consumed by equipment like DSL modem over time. The investigation is made at an actual VDSL access network-based model and output power of the modem is measured using an IoT-based measuring tool to monitor and understand the power consumption of the access system depending on modem's part and Internet user activities.

10:00 am Sizing Optimization Algorithm for Vehicle- To-Grid System Considering Cost and Reliability Based on Rule-Based Scheme
Abdulgader Alsharif, Chee Wei Tan, RazmanAyop, Mohamed Nuri Hussin, Abba Lawan Bukar

The most widely two Renewable Energy Sources (RESs) used are solar and wind as naturally found sources due to the provided merits as clean, free of charge, and environmentally friendly. However, they are facing limitations in intermittency. This article aims to utilize natural resources integrated with the utility grid and Electric Vehicle (EV) to provide a hybrid system with a minimum of two objectives namely Cost of Electricity (COE) and reliability using the Losses Power Supply Probability (LPSP) method. The two mentioned objectives are considered to satisfy the residential load demand with EV in terms of Vehicle-to-Grid (V2G) as this article considered. The mentioned objective has been addressed by the Improved Antlion Optimization Algorithm (IALO) and coupled with a high supervisory control method called Rule-Based Energy Management Strategy (RB-EMS) to guarantee to spread the power among the system component. Optimization results show the hybrid integration of the utilized RESs with the Battery (BT) gives the most economic and reliable system for the study area integrated with the EV battery. The gained result was validated with a natural-inspired metaheuristic algorithm called Particle Swarm Optimization (PSO). This

article assesses the effect on the RESs generators to achieve an economic and reliable system.

10:20 am The coordination of overcurrent relay in distribution system - power
Rasyidah Mohamad Idris

The overcurrent phenomena are a dangerous condition that can be occurred in the electrical system and equipment. The condition of the overcurrent will cause the short-circuited current flows through the system and affect the other distribution line. The purpose of this study is to investigate the coordination of the overcurrent relay in different types of the distribution network which are radial distribution system, ring distribution system, and interconnected distribution system during line to ground fault occur at the bus. The generation of the overcurrent and directional overcurrent flow in the distribution network will damage the nearest equipment and reduce the power stability. The installation of the IDMT overcurrent relay in the distribution system will clear the faulty section from affecting the other distribution line. This protective device also operates to detect the abnormal condition with proper time current characteristic condition that involves the optimum time speed, accurate coordination, and sensitivity. The simulation of the IDMT overcurrent relay in the one-line diagram of the distribution network is executed by using ETAP software meanwhile the IDMT relay setting is calculated via MATLAB.

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PARALLEL SESSION 1 – ROOM 1C
COMMUNICATION ENGINEERING

</div>

Session Chair: Assoc. Prof. Ir. Dr. Sharifah Hafizah Syed Ariffin

09:00 am Performance Analysis of Cooperative Diversity on UAVs-Based FANET
Muhammad Nauman Bashir, Kamaludin Mohamad Yusof, and Mohd Rizal Jasman

Flying ad-hoc networks (FANETs) using unmanned aerial vehicles (UAVs) are becoming popular in various civilian and military applications. UAVs can support the network and area coverage using a good level of cooperation. Due to the typical features of UAVs, the associated communication channels are intermittent and unreliable. To make a maximum of the UAVs channels, channel and packet diversity may be utilized in FANETS. To achieve cooperative diversity (CD), the direct single-hop path between source and destination and an indirect dual-hop path through a relay UAV are considered in this work to improve system efficiency by devising a suitable channel adaptation algorithm. We propose and analyze a buffer aided incremental relaying (IR) transmission scheme on amplify and forward half-duplexed relaying UAV in area monitoring application. The closed-form expressions for the system outage probability, maximal ratio combining (MRC), and diversity gain (DG) on Rayleigh fading channels among FANET nodes

are studied. The analytical results are given as asymptotic expressions based on the upper bound on the end-to-end SNR. The impact of various parameters on receiver performance is described by the numerical analysis. The results show that the proposed scheme provides better system performance. Simulation results validate the analysis and prove that the proposed buffer-aided transmission scheme is efficient in the considered application scenario.

09:20 am Data Management System of IoT for Stingless Bee Monitoring
Noor Hafizah Khairul Anuar; Mohd Amri Bin Md Yunus; Muhammad Ariff Baharudin; Salehuddin Ibrahim; Shafishuhaza Sahlan; Mohammad Yusuf Been Hashem; Mohammad Abdullah Siddique

This project presents the stingless beehive monitoring and data collection system remotely using Firebase as a real-time database and googles cloud functions at the backend. An Android app was developed to show the analytical graphs and monitor the parameters, including the behavior of stingless bees inside the hive through smart devices. The system was designed to allow the user to collect data through two modes: manual data insertion by the users or the implementation of hardware and sensors (Internet of Things (IoT)). For the manual mode, the user must insert the data manually into developed apps every time. In the IoT modes, each hive has been equipped with embedded hardware that collects and sends data continuously in real-time to the Firebase database. The collected data are temperature, humidity, and honey weight. In addition, the IoT provides alert notification services that send critical alerts through Firebase function features. Overall, this project acts as a baseline for integrating a mobile application with Firebase, which can be extended to include an administration website for the beekeepers in the future.

09:40 am Fiber Mach-Zehnder Interferometer Based on Double Cladding Fiber for High Curvature Measurement
Siti Musliha Aishah Musa, Asrul Izam Azmi, Ahmad Sharmi Abdullah, Muhammad Yusof Mohd Noor, Raja Kamarulzaman Raja Ibrahim and Jianzhong Zhang

This study proposes a Mach-Zehnder interferometer (MZI) based on double cladding fiber (DCF) for high curvature measurement. In this proposed design, two optical paths are paved in the core and in the inner cladding of the DCF. The outer cladding of DCF provides confinement of light in the inner cladding, hence enabling higher curvature to be imposed without any significant optical loss. The experiment revealed that the sensor exhibited the highest sensitivity values at 1.3484 nm/m-1 and -0.1367 nm/m-1 for low and high curvature ranging from 0.0 to 3.32 m-1 and from 62.5 to 142.8 m-1, respectively. With such capability, the proposed sensor displays exceptional potential to be deployed in applications that involve high curvature measurement, such as in soft robotic, wearable medical device, and structural health monitoring system.

10:00 am A Slotted Planar Antenna for 5G Applications
Hussam H Keriee, Mohamad Kamal A.Rahim, Osman Bin Ayop, Nawres Nayyef,
Mustafa Ghanim; Omar Al-Obaidi, Bashar Esmail

This paper presents a slotted planar microstrip patch antenna for the 5th generation communication. The planar microstrip patch antenna is designed with a square patch and two longitude slots at 3.5 GHz, using FR4 substrate and feds by a coplanar waveguide structure (CPW). The proposed antenna was simulated, analyzed, and optimized using computer simulation technology (CST) software. Simulation results show a good return loss of greater than 10 dB and impedance bandwidth of about 650MHz, which meet the requirements of future 5G applications. In this work, the geometry of the presented antenna and its related parameters are presented and discussed.

10:20 am Microstrip Series Feed Array Antennas for Millimeter Wave 5G Applications
Abd al menam Ahmed Al Azzawi, Mohamad Kamal A. Rahim,
Osman Bin Ayop, Norsaidah Muhamad Nadzir

Modern wireless communication systems require high bandwidth to meet with the recent 5G technology requirements. With an increasing number of devices, sensors, and IoT systems, an exponential growth of the technology is bound to happen. 5G technology opens a new millimeter wave spectrum, and efficient antennas are needed to achieve low losses to accommodate huge amount of data flow. This paper discusses a series feed antenna and out-of-line series feed antenna at 26 GHz. An optimized eight element structures for both antennas with high gain and wide bandwidth performance. Initial results shows that the series feed antennas yield 45% bandwidth wider, and the out-of-line series feed antennas increased the gain from 12.3dB to 16.1dB.

PARALLEL SESSION 1 – ROOM 1D ** VIRTUAL PRESENTATION
POWER ENGINEERING**

<u>Session Chair: Assoc. Prof. Ir. Dr. Pauzi Abdullah</u>

09:00 am Solving Unit Commitment Problem Using MILP for Demand Side Management
Abubakar Ahmed and Habibuddin Hafiz

The implementation of Demand Side Management (DSM) for an industrial plant by solving a Unit Commitment Problem (UCP) is hoped to solve imbalances between electricity supply limitations and demand requirements which many times to lead to partial or total shutdown of the plant because of trips due to under voltage or high frequency when the supply is overloaded or a unit is suddenly stopped while maintaining production. For the purpose of this study, a cement industry was divided into operating units and simulated under two scenarios and

solved using Mix Integer Linear Programming (MILP) in an Excel solver. The result shows that there is a reduction in cost by 30 percent from 1,203 to 880 for same production requirement.

09:20 am Energy Cost and Carbon Emission Minimization for Hybrid Grid-Independent Microgrid Using Rule-Based Energy Management Scheme
Chee Wei Tan; Kwan Yiew Lau; Chuen Ling Toh; Razman Ayop; Ahmed Tijjani Dahiru;Baba Abbagoni; Abba Lawan Bukar

This article presents a rule-based energy management (EM) scheme for a hybrid autonomous microgrid comprising of photovoltaic (PV), wind turbine (WT), battery (BT) bank, and diesel generator (D_gen). The rule-based algorithms had been widely applied in electric vehicle research because they are preferable for real-time EM and are computationally efficient. Based on this motivation, the application of the rule-based algorithm is applied to the design microgrid in this paper. The features EM scheme includes uninterrupted electricity supply to demand, minimize fuel consumption and minimize BT bank degradation. To simulate the microgrid, models for WT, PV, D_gen, and the state-of-charge (SOC) estimation of the BT bank are developed. The uninterrupted supply and BT degradation are achieved by managing the energy flow of the various system components and setting the minimum SOC of the BT bank at 30%. The resiliency of the scheme is validated under fluctuating demand and weather conditions, considering cold, hot, and rainy seasons. Simulation results have demonstrated the capability of the rule-based EM scheme in achieving high feasibility and effectiveness despite the intermittent sources and fluctuating demand. Additionally, the proposed EM scheme has significantly minimized CO_2 emission from 56.3 tons/year to $0.43/kWh. The cost of energy is also reduced from $1.8/kWh to $0.43/kWh. This led to a reduction of 92.4% in the CO_2 emission which helps to preserve the green environment and 76.11% in COE is achieved.

09:40 am Temporal and Wavelet Analysis on Narrow Bipolar Pulse and First Return Stroke Recorded in Malaysia Thunderstorm
Noraishah Bahari, Mona Riza Mohd Esa and Amirul Aiman Razman

In this study, only the first return stroke of CGs and NBPs lightning waveform are thoroughly analyzed using two different methods in wavelet and temporal. 4 characteristics which are the pulse duration (PD), rise time (RT), zero-crossing time (ZCT) and full width half maximum (FWHM) are applied for temporal analysis meanwhile the frequency and power spectrum are using for wavelet analysis. Comparison according to criteria were included as well to differentiate lightning properties. 50 data from negative cloud to ground (NCG), narrow negative bipolar pulse (NNBP) and narrow positive bipolar pulse (NPBP) were used in wavelet transform along with 40 data from positive cloud to ground (PCG). The result of the wavelet has shown that narrow bipolar pulses (NBPs) radiate energy at a higher frequency than any other cloud to ground (CGs) lightning. However, in terms of the peak power spectrum, CGs has a 4 times higher value than NBPs. In temporal analysis, 100 data from NCG, NNBP and NPBP have been

extracted accordingly, while PCG has only 40 data available to be extracted. From the time domain characteristics value extracted, NBPs have a much smaller value in every aspect tested than the CGs.

10:00 am A Novel Intelligent Tracking Controller Based on Human Reaction Towards Light

Alaa Omran, Dalila Mat Said, Siti Maherah Hussin, Mohamed Shahriman Mohamed Yunus and Mohd Hanif Bin Jamaludin

The tremendous development of technology led to increase the consumption of energies. Whereas, this consumption motivate the researchers to start looking for alternative energy sources that inexhaustible such as solar thermal, wind and tidal energies. However, this paper presents a novel intelligent controller that similar to the behavior of human brain in processing and producing the necessary commands to control the body's members. This controller has been trained and used in the solar tracking system to facilitate the process of controlling direction of the solar cell based on the intensity of the light throughout the day. Moreover, the intelligent controller processed the received signal from the LDR sensors similar to the behavior of the human brain that processed the received signals from the human eyes to enforce the neck to move towards the required direction. The processes of training and evaluating the performance of the controller carried out using of MATLAB. Furthermore, The simulation results show that the proposed system satisfies the required aims; where a few consumption associated with an increasing rate of 35% to 40% in the generated energy are achieved. This improvement leads to present solar tracking system that controlled by an intelligent controller with a higher efficiency at a lower cost

10:20 am Policies Support and Constraints in Developing Innovation Products of Electrical Energy in Indonesia

Jangkung Raharjo, Jaspar Hasudungan,Kharisma Bani Adam and Efri Suhartono

Various studies have been conducted for solving problems in the field of electrical energy have been published. Many of these studies are related to the development of technology to solve the problem of electrical energy alone or to solve the problem of electrical energy and consider the environmental impact, often referred to as green technology. This paper discusses government policy support in encouraging technology development to have an economic impact and specific constraints in technological development in electrical energy concerning the economic impact compared to the technology in communication and information.

PARALLEL SESSION 2 PART 1– ROOM 2A
COMMUNICATION ENGINEERING

Session Chair: Dr. Kamaludin Mohamad Yusof

09:00 am Intrusion Detection System (IDS) Accuracy Testing for Software Defined Network Internet of Things (SDN-IOT) Testbed

Sharifah Hafizah Syed Ariffin, Jia Le Chong,Nurul Mu'azzah Abdul Latiff, Sharifah Kamilah Syed Yuso,Kamaludin Mohd Yusoff, Nik Noordini Nik Abd Malik, Muhammad Ariff Baharudin and Rashidah Arsat

Intrusion detection system (IDS) are considered as one of the best solutions for network security as it can detect intrusion and alert the network administrator on possible intrusions. However there are possible false alert that could cause unnecessary trigger of the network to the administrator. This paper provides a proof of concept of the accuracy test of an intrusion detection system (IDS) using software defined network IoT platform. The testbed uses UNSW-NB15 dataset that feeds the testbed and the traffic are mirror in a Ryu Controller that is installed with Snort IDS to monitor any DDoS attacks. For proof of concept false positive and false negative tests are run to ensure that the IDS are well configured. The experiment shows that the SDN-IoT platform with Snort IDS is accurate in both false positive and false negative test.

09:20 am Circular Complementary Split Ring Resonator Rotation for Linear Array Millimeter Wave Microstrip Patch Antenna

Norsaidah Muhamad Nadzir, Mohamad Kamal A. Rahim, Noor Asniza Murad, *Mohamed Himdi and Osman Bin Ayop*

This paper proposes multiple linear array millimeter wave MPAs that could operate at various frequencies depending on the angular rotation of the CSRR structure. The main contribution of this work is the range of frequencies of the linear array MPA found when the position of the CSRR structure is changed angularly. This is achieved by positioning the CSRR structure on the ground plane of the MPA and rotate it to an incremental of 22.5°. Computer Simulation Technology software is used to simulate the antenna designs. The performance of the antenna is evaluated against the single element millimeter wave MPA with similar angular rotation to the CSRR structure. The results between the single element MPA with circular CSSRR and the linear array MPA with circular CSRR shows similar behavior in which the rotation of the CSRR did not affect the antenna differently even with an increase of the number of elements. The millimeter wave MPA with CSRR angular can be utilized in various applications as it covers multiple frequencies depending on the angle of rotation of the CSRR structure.

09:40 am Supervisory Mobile Application for Guard Expert PRO Security System

Rozeha A. Rashid and Muhammad Afiq Kamaruzaman

GuardExpert Pro (GEP) is an Internet of Thing (IoT) based Guard Touring System (GTS) which replaces the conventional GTS with real-time data upload from checkpoint scan, online reporting, and summons using GEP's mobile application installed on the mobile device carried by the guards on patrolling duty. For the guards' supervisors, they can monitor all guards' activities by browsing the GEP website. However, browsing the website using smartphone sometimes is a hassle because it offers low Quality of Experience (QoE) as the website display is normally unorganized and not mobile friendly. Therefore, the purpose of this project is to develop a supervisory mobile application for the GEP security system. From the comparison with different development tools, Flutter is selected for the mobile application development in this project as it can build applications for Android and iOS with a single codebase effortlessly and with high performance. From the performance investigation, it is observed that the developed Flutter based mobile application achieves full QoE factor score of 5 as it is free from the analyzed browsing experience issues. The average response time for the user interfaces also shows an improvement of 7.43% through the developed mobile application as compared to through the website.

10:00 am New Reconfigurable Transmitarray Unit Cell Design at Ku-Band Using PIN Diodes

Muhammad Naeem Iqbal, Mohd Fairus Mohd Yusoff, Mohamad Kamal A. Rahim, Mohamad Rijal Hamid, Zaharah Johari and Khawaja Hamood Ur Rahman

Beam reconfigurable Transmitarray antennas require the unit cell phase variation capability. This paper presents a new reconfigurable Transmitarray unit cell design using PIN diodes at the Ku-band. The unit cell is comprised of three layers having four PIN diodes used in every unit cell layer. This results in phase controlling by switching the PIN diodes on every layer individually. The unit cell s-parametric analysis shows a high transmission coefficient magnitude (> -3.6dB) at a design frequency of 12.5GHz and maximum wide impedance bandwidth (17.5%). Four different switching states configurations are used, which result in phase variations over the range of 150.5 degrees. The transmission coefficient magnitude remains high for all four switching states. The proposed reconfigurable unit cell can be used in designing beam switched Transmitarray antennas for satellite communications and beam steering applications.

PARALLEL SESSION 2 PART 2 ** VIRTUAL PRESENTATION
ROOM 2A - COMMUNICATION ENGINEERING**

Session Chair: Dr. Mohd Fairus Mohd Yusoff

11:00 am Performance Evaluation of A Deployed Radio - LTE Network Using Turbo Equalization Technique
Elarbi Abderraouf

The 4G-LTE(Long Term Evolution) mobile radio communication system generally requires the transmission of large amounts of information in the narrowest possible frequency bands. The optimization of the throughput/bandwidth ratio requires the use of high state number modulations. These modulations are quite sensitive to the inter-symbol interference introduced by the frequency selectivity of the multipath transmission channel. This constraint requires communication system designers to implement processing methods to combat the inter-symbol interference generated by these channels. To achieve this goal, which allows to totally avoid the interference between symbols, there is a very efficient processing technique called turbo equalization which is an iterative reception process between the equalization and the decoding of the channel; the soft information generated by each reception function is improved during the iterations until the optimal behavior of the system is achieved. In this paper, we will try to improve the performance of 4G-LTE mobile radio transmission by using turbo equalization techniques. To do this, we will validate the theoretical concepts by simulations performed on the Matlab software

11:20 am Flexible Frequency Reconfigurable Antenna Using Reed Switch for Health Monitoring Application
Ng Zhong Ying, Noor Asmawati Samsuri, Noor Asniza Murad, Mohamad Kamal A Rahim, Bambang Setia Nugroho and Lukman Hendrajaya

Wearable device usages are increasing tremendous recently, the common wearable devices including the fitness and health monitoring applications. The limited bandwidth of 4G could no longer support to this huge demand from the consumers. In order to solve the problem of limited bandwidth, 5G need to be implemented into the wearable devices. This project proposed a frequency reconfigurable meander bowtie antenna for health monitoring application that operates at 2.3 GHz and 3.5 GHz (5G frequency band in Indonesia and Malaysia). The proposed antenna can be switched between the 5G frequency band using reed switches. The antenna is made of flexible materials, semi-transparent film as substrates of and shield-it fabric as radiating element. Parametric studies on the location of the slots and reed switch representation by copper strips are made to see the effects on the antenna performance. The results show that the resonant frequency of antenna can be switched between 2.3 GHz and 3.5 GHz with the bandwidth of 6.6 % and 12.4 %. The results are further verified by replacing the reed switches with copper strips. For the future works, antenna fabrication and measurements can be done for results validation. Other switching methods such

as PIN diode and varactor diode which depends on the biasing circuit can also be implemented into the design.

11:40 am The Effect of Biasing Line in Frequency Reconfigurable Metamaterial Antenna Design
Adamu Y Iliyasu, Mohamad Rijal Hamid, Mohamad Kamal A. Rahim, Mohd Fairus Mohd Yusof, Murtala Aminu-Baba and Kabiru Ibrahim Jahun

This paper presents the design of frequency reconfigurable metamaterial antenna showing the effect of biasing line in operating frequency of the antenna. The design started by enhancing the bandwidth of the antenna to allow frequency sensing. Bandwidth enhancement was achieved by optimizing the position of the slot in top patch. to cover more bands. The antenna is reconfigured by creating two slots along shorted strip. Biasing line is introduced to protect the effect of RF signal. Also, effect of biasing line on antenna bandwidth is investigated and analyzed to avoid the overlap above -10dB across operating band. Two PIN diode switch were used for reconfiguring the wideband antenna which covered 2.3 GHz to 5.4 GHz to narrow band that resonate at 5.2 GHz. The software used for the simulation work is Computer Simulation Technology (CST). By considering the results obtained, the antenna can be used for indoor WLAN application for shorter range connections.

12:00 pm Waveguide Coupler Using Direct Coupling Aperture for Ka-Band Applications
Hatem Oday Hanoosh, Mohamad Kamal A. Rahim, Noor Asniza Murad and Yaqdhan Hussein

This paper presents a waveguide coupler realized by direct coupling aperture at Ka bands. At high frequency planar coupler structures are expected to exploit a higher propagation loss and components losses. Therefore, a waveguide with direct coupling technology is proposed. A waveguide coupler is designed using direct coupling between two waveguide structures and cutting in narrow walls. This cutting in waveguide narrow walls controls the coupling and the phase differences of the coupler outputs. The simulated reflection and isolation coefficients are observed to be less than -20 dB at 26 GHz, with transmission coefficients ranging between -2.97 dB and -3.04 dB. The phase differences -90° is observed at the outputs. Overall, the waveguide coupler shows a great potential for Ka bands applications.

12:20 pm Microstrip Patch Antenna Miniaturization Using Metamaterial Structure for 5G Communication
Levy Olivia Nur; Samuel Wicaksono; Bambang Setia Nugroho; Edwar Edwar; Harfan Hian Ryanu

Fifth Generation (5G) is a technology that is currently developing rapidly, 5G become more important because of it's ability to provide data speeds and bandwidth better than its predecessor (2G, 3G, 4G). In addition, 5G also supports the 4.0 industrial revolution, in Indonesia itself 3.5 GHz is set as one of the 5G

operating frequencies. To provide relatively large data rates and bandwidth, communication devices with good performance are needed, in this case antennas. In this research the author makes a microstrip antenna with a metamaterial structure, this metamaterial structure can reduce the dimensions of the antenna and increase the bandwidth of the antenna. In this research the author also uses 3D electromagnetic software and realizes an antenna for 5G communication. This microstrip antenna with a metamaterial structure uses FR-4 as a substrate material with a thickness of 1.57 mm and a permittivity of 4.3. The realized antenna works at an operating frequency of 3.508 GHz, has gain of 1.78 dBi, VSWR of 1.097, bandwidth of 335.4 MHz, and return loss of -26.662 dB, and with total dimension of 26.281 x 26.281 mm2. This antenna also has an omnidirectional radiation pattern, so it can be utilized optimally for mobile communication

PARALLEL SESSION 2 PART 1 – ROOM 2B
COMMUNICATION ENGINEERING

Session Chair: Dr. Osman Ayop

09:00 am Frequency Responses of the Breathing Sound Signals
Mokhtar Harun, Muhammad Zulhairy Ramli, Muhammad Aasim Asyafiie bin Ahmad, Musa Mohd Mokji, Azli Yahya, Siti Abdul Hamid and Johari Kasim

The response of the breathing signal of an individual is different with respect to activities such as phonation and physical, and the condition of the lungs itself. This response can be gauged in terms of amplitude and frequency of the breathing signals. Compare to doing the physical activities alone, one's duration of inhalation is twenty percent lower when ones commit physical actives and talking at the same time. The purpose of this paper is to investigate the pattern and its significance of three types of breathing signals in terms of amplitude and frequency that was derived from its power spectral density (PSD). PSD response of eighteen breathing signals had been investigated for the purpose. The samples were six each of normal breathing, wheeze, and crackles. The amplitude and its corresponding frequency of the PSD responses of these samples were taken from the highest first and second peak. For the frequency, two additional terms had been derived from the half-power amplitude of the PSD response. In terms of amplitude, for both the first and second peak, wheeze has manifested the highest value, while crackles breathing signals possess the lowest. On the other hand, among the three types of breathing signals, the frequencies of normal breathing are the highest both at the first and second peaks. There are no significance pairs, in terms of the amplitude and frequency at the second peak of the PSD responses. In terms of amplitude, at 5% significance level, there is one significance pair at the first peak of the PSD response, which is between wheeze and crackle breathing signals. There are two significance pairs in terms of the frequency of the PSD response, which are at fPSD1 and f(low)1. However, at 10% significance level there are three significance pairs in terms of the frequency. In conclusion, the frequencies of the PSD responses carry more information than the amplitude for

pattern recognition of the normal breathing and the abnormal breathing signals wheeze and crackle.

09:20 am Second Iteration of Slotted Fractal Log Periodic Dipole Antenna for UHF Digital TV Band Application

Muhammad Hafeez Bin Rosmin, Mohamad Kamal A. Rahim, Nur Syahirah Mohd Yaziz, Osman Bin Ayop, Muhammad Amir Haziq Kamarusshahrin, Muhammad Naeem Iqbal

This paper discusses the simulations and measurements of the antenna with and without slot implementation in terms of reflection coefficient (S11) and radiation pattern. The slot implementation on each of the radiating elements on the 2nd iteration log periodic fractal Koch antenna (LPFKA) was described in this paper. This method is utilised to reduce the antenna's size while also preventing the lower designated frequencies from shifting to the higher band as the iteration increases. The antenna is designed to test and observe performance in the Ultra High Frequency (UHF) band, which ranges from 0.6 GHz to 2.5 GHz. Computer Simulation Technology (CST) software is used to design and model the antenna, which was then built using the wet etching technique. The antenna's substrate is made of FR-4 laminated board with a dielectric constant of 4.6, tangent loss of 0.019, and a thickness of 1.6mm. The results demonstrate good agreement, with a steady radiation pattern over the operational bandwidth and a reflection coefficient of less than -10 dB for the frequency range of interest. The antenna is being tested with Digital TV decoder and the result is observed towards the picture of the Digital TV.

09:40 am 4G Signal Strength Measurement and Simulation for Outdoor Environment at 1.8 GHz and 2.6 GHz

Muhammad Amir Haziq Kamarusshahrin and Mohamad Kamal A. Rahim

This paper presents the signal strength measurement of the 4G network for an outdoor environment. The signal strength is measured at the Universiti Teknologi Malaysia (UTM) at 1.8 GHz and 2.6 GHz. The signal measurement is compared with the simulation using WinProp software. The database was created for the simulation, and the received signals were recorded at certain locations. The measured and simulated results show that the signal is comparable, where the highest signal is -56 dBm at 1.8 GHz and -49 dBm at 2.6 GHz.

10:00 am Analysis on the Effect of Metamaterial Structure Number on Microstrip Antenna Ground Plane

Sri Ayu Amalia, Dewi Septia Anzani, Airlangga Baihaqi Wicaksono, Fariz Muhammad, Edwar Edwar and Dharu Arseno

Radar is a tool that works using electromagnetic waves. The antenna is one of the supporting components on the radar to transmit and receive signals from its object. This paper investigates the effect of metamaterials on rectangular microstrip antennas with the addition of a Complementary Split Ring Resonator (CSRR) metamaterial that focuses on the ground plane with a frequency of 3.2

GHz. The effect of adding a CSRR metamaterial cell to the antenna ground plane was shown to affect the bandwidth and gain. This is because the addition of metamaterial cells results in permittivity and permeability values and increases the possibility of the resonant frequency. Metamaterial affects the dimensions of the antenna. In general, the measurement results show a lower value than the simulation results.

PARALLEL SESSION 2 PART 2 ** VIRTUAL PRESENTATION**
ROOM 2B - POWER ENGINEERING

<u>**Session Chair: Dr. Razman Ayop**</u>

11:00 am Network Topology Optimization for Improved Wind Penetration and Reliability
Olatunji Lawal

The traditional fixed topology of transmission networks is prone to power congestions, which can cause load curtailment and reduce the integrations of wind power, leading to more dispatching of conventional generators and higher overall dispatch cost. This can be overcome by improving the operation flexibility of transmission networks to enhance wind integration level. This is achieved in this paper by employing the network topology optimization technique to optimize network topology by flexibly altering the connections of lines and busbars. The proposed evaluation framework is generic and applicable on any networks. Case studies performed on the IEEE 24-bus test system show that the proposed technique is effective in reducing the three costs considered here, namely the load curtailment cost, generator dispatch cost and wind curtailment cost.

11:20 am Day-Ahead Scheduling of CNG Station and Hybrid CNG and Plug-In Electric Vehicles in the Form of Virtual Power Plant
Mohammad Seyfi, Mehdi Mehdinezhad, Behnam Mohammadi Ivatloo, Heydar Ali Shayanfar and Zulkurnain Abdul Malek

Integrating plug-in hybrid electric vehicles (PHEV) with power systems and supplying their required energy is a challenging issue. Decentralized operation of the power systems can decrease the impacts of PHEVs on power systems. One of the high potential options for developing decentralized networks is the virtual power plant (VPP). In this paper, day-ahead scheduling of VPP consisting of PHEVs, which use compressed natural gas (CNG) as their alternative option for electrical energy, and CNG station is presented. VPP can supply the CNG needed by HPEVs by compressing the natural gas (NG) in the CNG station. Therefore, two sources of energy for HPEVs are provided by participating in the scheduling of the VPP. This structure can improve the flexibility and ability of HPEVs to participate in the scheduling. Also, because of using the CNG instead of gasoline, the developed model reduces the pollutant emissions of the transportation system.

11:40 am Development an Algorithm of Magnitude Changes of Frequency Response Analysis for Transformer
Muhamad Aizuddin Mohd Kamel

In the event of failure or short circuit occurs, the transformer will experience mechanical stress, electrical stress and thermal induced. Frequency Response Analysis (FRA) is one of diagnostic techniques used to determine the transformer condition after the failure event. It measures the transfer function of the transformer over a wide frequency range from 2Hz to 2MHz. Changes in measured response will indicates that mechanical deformation has occurred on transformer winding. However, not much research has been conducted on the severity of winding deformation as establish decision factor for the safe operation of in-service transformer. This research has analyzed the FRA response on several winding deformation on 33/11kV transformer and 11/0.433kV transformer. The winding has been modelled and algorithm was developed to determine the allowable limits for the changes in of FRA Signatures. Based on the experiment and researched conducted, the magnitudes are allowed to change within 9% and the maximum changes is 11% of its response.

12:00 pm Demand Side Management Strategies and Tariffs in Distributed Grids
Ahmed Tijjani Dahiru, Chee Wei Tan, Sani Salisu, Kwan Yiew Lau, Chuen Ling Toh, Abba Lawan Bukar

A major challenge in renewable energy planning and integrations with existing systems is the management of intermittence of the resources and customer demand uncertainties. In emerging distributed grids, state-of-the-art optimization techniques were used for cost and reliability objectives. In the existing literature, power dispatch and demand side management schemes were implemented for various techno-economic objectives. In renewable energy-based distributed grids, power dispatch is strategic to distributed grid operations. However, demand side management is preferred, as it allows more options for customer participation. Moreover, the demand side management can simply follow supplies. This paper investigates the functions of demand side management as it affects the planning and operations of renewable energy-based distributed grids. Integration of demand side management with tariff regimes is conceptualized for improved economic performance, reliability enhancement, and mitigation of environmental implications.

PARALLEL SESSION 2 PART 1 – ROOM 2C **VIRTUAL. PRESENTATION CONTROL AND MECHATRONIC ENGINEERING

Session Chair: Dr. Mohd Ariffanan Mohd Basri

09:00 am State Estimation of Mobile Robot Navigation in Intermittent Measurements

Hamzah Ahmad, Ts.Badaruddin Muhammad, Mohd Syakirin Ramli, Maziyah Mat Noh and Zainah Md Zain

This paper aims to analyze the behaviour of estimation using Extended Kalman Filter in mobile robot navigation during intermittent measurement. The study focuses on a case of mobile robot moving in an environment and has lost its information on measurement data intermittently. Two cases of different noises are examined which are environment with Gaussian and non-Gaussian noise. The measurement data for specific landmarks is assumed to be unavailable for a specific period. The measurement error, measurement innovation and state covariance characteristics are observed when measurement data is missing for certain landmarks to understand how the state estimation behaves. Theoretical analysis and simulation results are presented to illustrate the EKF performances which are consistent with the literatures. Results indicated that the EKF performance can be preserved at bounded error for different environment noise conditions.

09:20 am Design of Industrial Internet of Things System on Mini-Plant Oil Separator Level Control Based on Industrial Wireless Sensor and Actuator

Suyanto Suyanto, Ando Subakti Detak Pratama, Juwari Sutikno and Purwadi Agus Darwito

One of the high-level risks of work accidents in the oil and gas industry is the separation process of the oil phase after the drilling process. Crude oil, which is flammable, become very dangerous to the field workers who are tasked to monitor the separation process. To monitor and control the oil separation process safely, IoT has become the solution. Furthermore, IoT can be a solution to reduce operational and maintenance costs in the petroleum exploration process. Research has been carried out on the implementation of IIoT-based control and monitor systems and optimization of level control systems using fuzzy PID controllers on a three-phase separator mini plant. The results showed that the IWSAN communication system using the Zigbee IEEE 802.15.4 protocol at the mini plant communicated in real-time at a distance of 100m with a delay time of 16ms. The PID-based fuzzy level control system can produce a better dynamic response than PI and PID control systems. The mixed level control shows a maximum overshoot of 2%, a settling time of 587 seconds, a steady-state error of 1%, a rise time of 466 seconds, and IAE 2546. Meanwhile, the control of an oil level shows a maximum overshoot of 3%, a settling time of 362 seconds, a steady-state error of 1 %, a rise time of 226 seconds, and IAE 1429.4.

09:40 am Path Tracking of Wheeled Robot Prototype Using Artificial Neural Network

Suyanto Suyanto, Falentin Tri Yulianto,Bambang W; Iwan Cony Setiadi, Andi, Rahmadiansah, Muhammad Samsul Arifin

There are many repetitive activities in agriculture such as plowing the fields, sowing seeds and sowing fertilizers. Repetitive activities performed using robots will provide better durability and precision. The use of robots in agriculture (robofarming) to follow the specified path (path tracking) can make agricultural activities more efficient. There are many methods of path tracking that can be used. One of the methods used is to use an artificial neural network (ANN). The development of ANN on devices with limited memory and low computing such as microcontrollers will provide a faster response because it reduces the latency of data transfer from the microcontroller to the central computer/cloud. To be able to run on devices with small memory, it is necessary to optimize memory usage and algorithms on the ANN model used. This research implements an artificial neural network-based path tracking on a wheeled robot prototype by controlling the speed on both wheels. Feed-forward ANN is used as an approximator to predict the direction and speed required for the robot to maneuver according to the target point of the map. The ANN model uses the input error heading and the difference between the position of the robot and the trajectory. Tests were carried out using 3 points, 4 points and 5 target points. Based on the test, obtained an average error of ±72.49mm with a standard deviation of 50.40mm and a maximum error of ±236.63mm.

10:00 am Position and Attitude Control of MAV Quadrotor Using Super Twisting Sliding Mode Control

Aminurrashid Noordin; Mohd Ariffanan Mohd Basri; Zaharuddin Mohamed; Izzuddin Mat Lazim

This paper addresses the problem of robust actuated and under-actuated control of a Parrot Mambo Minidrone using super twisting sliding mode control. The dynamic model of the quadrotor was formulated using the Newtonian model by considering nonlinearity factor and perturbation. To test the robustness of the control method, this small-scale MAV is simulated without and with the presence of normal Gaussian white noise and pulse of force as external disturbances. Compared to classical PID control, simulation results proved that the super twisting sliding mode controller provides good performance and robustness against perturbation with less chattering input signal.

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**PARALLEL SESSION 2 PART 1– ROOM 2D ** VIRTUAL PRESENTATION
ELECTRONIC & COMPUTER ENGINEERING**

<u>Session Chair: Dr. Nor Aini Zakaria</u>

09:00 am Performance Comparison of CMOS and NMOS GNRFET Full Adder
Tan Zheng Hong, Muhammad Faidzal Muhammad Rasol, Zaharah Johari, Michael Tan, Afiq Hamzah, Suhana M. Sultan, Yusmeeraz Yusoff, N. Ezaila Alias and Suhaila Isaak

Transistor makes up the cornerstone of modern computing. As the technology advances at an unprecedented pace, the demand for chip that has higher performance and lower power consumption is also increasing. In this work, a SPICE model of GNRFET was used to simulate the performance of a NMOS and CMOS binary full adder. The performance of this adders was evaluated in terms of its average power consumption and propagation delay. Three variables, namely the resistance value, dimer lines and channel length were varied and the impact on its performance was assessed. It was observed that a linear improvement in propagation delay was accompanied by an exponential increase in power consumption and only a small range of values of resistance was able to deliver a relatively reasonable trade-off between power consumption and propagation delay. These values range from approximately 110 kΩ to 130 kΩ. Markable effect in propagation delay can be seen when the dimer line was change from 8 to 12 for gate length of 16 and 32 nm respectively. About 25.25 % of improvement in propagation delay at approximately similar power consumption was found. The outcome provides compelling evident on the use of advance material such as graphene for future high speed device and low power application.

09:20 am Malicious Traffic Classification Using Hybrid Heuristic-Payload Based Technique with Machine Learning
I*smahani Ismail, Nurul Aze Alia Bahar and Shahidatul Sadiah*

With the emergence of new malware variants, the existing intrusion detection are no longer effective as most of the methods are not capable of detecting unknown traffic. In this paper, we proposed malicious traffic detection using hybrid heuristic-payload based technique with machine learning classification. Heuristic classifier classifies network traffic to two classes, malicious and non-malicious. 5-gram features are extracted from the traffic payload as the training set and trained to generate the classifier model. The performance of the classification in terms of accuracy and efficiency for different algorithms are analyzed and the results indicate that Random Tree algorithm shows the best performance. The proposed method is benchmarked with classification using payload based only and signature based malware detection, Snort. Results show that the proposed method is 16.06% and 6.48% more efficient than classification using payload based only for cross validation and supplied test set test options, respectively and two times more accurate than Snort. The proposed method is found effective as it

has high accuracy and good efficiency compared to payload based only and signature based malware detection.

09:40 am A 16-Bit Brent-Kung Adder Scheme for Linear Array Photon Counting Circuit

Suhaila Isaak, Norlina Paraman, Yusmeeraz Yusof, Afiq Hamzah and Abu Bakar Ndottiwa

The development in photon counting discipline has progressed quite remarkably for precise data accumulation. The elevated volume in detected photon is demanded a new rapid and quantitative module to count a large number of uncorrelated time photon signal. In lab measurement, the photon proportion is determined by trivial observation of the count rate, system delay, area consumption and transistor technology, which encountered with inaccurate results. This progress has prefaced to a comprehensive number of activities exploiting adder design for many applications within the photon counting domain. As data acquisition demand increases and the photon count rates database broaden, an improved data processing mechanism to assemble the counted photon database, have also been emerged. In this work, the integrated circuit design on 16-inpust parallel photon counting module with adder circuit is reported. The limitation to establish high-speed counter module is configured using 16-bits Brent-Kung Adder on Field Programmable Hardware Array implementation. The characterization was conducted with various degree of input frequency to enhance the design specification focusing on the parallel counter and wavelengths range, respectively. This method has discovered the proposed Field Programmable Hardware Array based photon counting system with 16-bits Brent-Kung Adder scheme with two-staged pipelining improved with increased frequency of 42.7 % compared with 385 MHz due to high critical path delay. This result suggested that compared with generalized cross-correlation-based time-difference measurement methods, the proposed method produced a higher time-difference resolution and accuracy. The proposed method provides a new solution for solving compact and weak analog signal processing with cost-effective and robust technology high-speed and real-time on field instruments.

10:00 am Laser Line Detection for Groove Butt-Joint Type Based on Vision System

Nurul Fatiha Johan, Hairol Nizam Mohd Shah and Marizan Sulaiman

An extraction of weld seam groove image gave huge impact in weld seam tracking to produce a quality welding system. The big challenge to deal with vision and image processing normally come from a lighting, workstation environment uncertainty, reflection from material surface or metal surface imperfections. Differences in either laser images or work environment may require different methods to achieve an outperformed result. In line detection field, Hough transform is a trend where it can detect all possible lines which exists on the image but somehow does not suitable at certain images when too many lines detected. This paper introduced a new approach of line detection based on pixel scanning and find out the reference row index as a guidance to track the weld

seam position and groove joint from V-shape image. The results showed that the proposed line detection is more applicable to be used compared to Hough transform if the lines are not consistent throughout the laser layer, consequently, can be used to fix the laser line image.

10:20 am Performance Analysis of Digital Video Broadcasting – Second Generation Terrestrial (DVB-T2) Propagation for Fixed Reception in the Central Region of Malaysia
Ahmad Fesol Mansor, Darmawaty M Ali and Yusmardiah Yusuf

Due to the increasing demand of services and content, Quality of Service (QoS) has become an important aspect in digital broadcasting industry especially with the implementation of Digital Terrestrial Television (DTT) in Malaysia. Thus, the performance of DVB-T2 in Malaysia should be investigated because there are areas which are not in the coverage due to variety of terrain, where some areas received weak DVB-T2 signals. Apart from geological and topographic factors in Malaysia, the selection of DVB-T2 parameters is also an important factor in determining signal strength and coverage This research has proposed to study the performance analysis of DVB-T2 propagation for fixed reception in Malaysia's central region. The Field Strength Measurement (FSM) was set up to evaluate the QoS of DVB-T2 signal such as Field Strength (E), Modulation Error Ratio (MER), and Carrier to Noise Ratio (C/N) at specific test points across Malaysia's central region. The FSM was simulated at the designated test points using CHIRplus_BC software to evaluate the performance of Single Frequency Network (SFN) at three locations of transmitter. The DVB-T2 Modulation and Forward Error Correction (FEC) code rate parameters were simulated in order to evaluate the improvement in terms of coverage area . It can be concluded that the coverage of DTT is reduced with the increase in the distance of the measurement area to the transmitter. The finding also shows that the field strength value obtained from FSM and simulation was comparable. Furthermore, from the simulation results. it can be perceived that the coverage area across the central region of Malaysia could be improved by optimizing the modulation and FEC code rate. However, there is a trade off between the signal coverage and channel capacity. The greater the signal coverage the less the channel capacity.

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