

# IC CEREEC

The International Conference on  
Control, Electronics, Renewable Energy, and Communications 2016

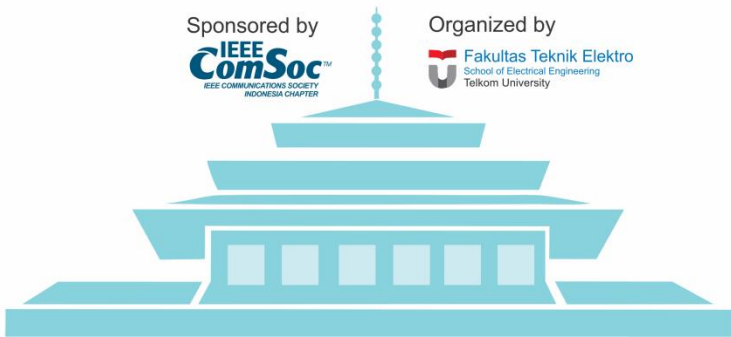
## PROGRAM BOOK

13-15 September 2016, Grand Royal Panghegar Hotel, Bandung - Indonesia

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## Welcome Message from the Conference Chair

Dearest Scientists, Engineers, Colleagues, Ladies and Gentlemen,

It is our great pleasure and honor to welcome you to ICCEREC 2016, The 2<sup>nd</sup> International Conference on Control, Electronics, Renewable Energy, and Communications and also to our beautiful Bandung. This city was nicknamed "City of Flowers" and "Paris Van Java" (*"The Paris of Java"*).



ICCEREC 2016 is organized by School of Electrical Engineering Telkom University and technical co-sponsored by the IEEE Communications Society Chapter Indonesia, so that ICCEREC has a strong foundation of bringing together industry and academia.

This conference provides an international forum for researchers, academicians, professionals, and students from various engineering fields and with cross-disciplinary interests in **Control and Automation, Electronics, Renewable Energy, and Communications**.

Accepted papers on ICCEREC 2016 are published in the ICCEREC 2016 Conference Proceedings and presented papers will be submitted to **IEEE Xplore**. As information, the Proceedings of ICCEREC 2015 has been published in **IEEE Xplore** and indexed by **SCOPUS**.

In this moment, I would like to thank, all those who have contributed to the success of ICCEREC 2016, such as Organizing Committee from School of Electrical Engineering Telkom University, IEEE Communications Society Chapter Indonesia. We also say thank you to the TPC Chair, the TPC Members, the Keynote Speakers, Tutor Speaker and the Technical-sessions Moderator of ICCEREC 2016.

The last, we hope all participants will have valuable and also enjoyable experience during this event and very pleasant stay at Bandung.

Sincerely Yours,

General Chair  
Muhammad Nasrun



## Welcome Message from TPC Chair

Dear Ladies and Gentlemen,



On behalf of the ICCEREC 2016 Technical Program Committee, we are very delighted to welcome you to the 2nd edition of International Conference on Control, Electronics, Renewable Energy, and Communications (ICCEREC 2016), in Bandung, Indonesia. Located right in the middle of West Java, Bandung is a beautiful, multi-cultural and multi-ethnic city, and the temperature is mildly warm. Modern buildings intertwined with colonial architecture, parks with full of color, streets, markets, mosques, and houses mingle in an exotic blend, which are active during the day and night.

In this conference, we are trying hard to make a high quality technical committee that will feature three plenary talks to enlighten the audience with world-class speakers on the latest topics on Signal Processing, Renewable Energy and Telecommunications, tutorial sessions presenting hot topics on several subjects, and technical sessions with high quality papers. We set a high standard for a paper, that each paper should have been reviewed by minimum 4 international reviewers. Our professional team is committed to establishing a conference for sharing the latest technical/research advancements. In addition, the conference will also feature with the launching of a new Indonesian Chapter of IEEE Signal Processing Society.

We would like to thank all the authors who submitted their papers to ICCEREC 2016. It is our pleasure to know that you will appreciate the high quality and wide variety of the ICCEREC 2016 technical programs, have fruitful discussions with other researchers, and enjoy the beautiful venue. We would like to express our sincere appreciation to the Technical Program Committee members and paper reviewers for their great work in shaping the technical program and handling the paper review process. The TPC particularly wish to thank the organizing committee colleagues. You have all helped to create a technical program of the greatest interest. We hope you all enjoy it!

Sincerely Yours,

TPC Chair,  
Dr. Ing. Fiky Yosef Suratman



## Program at a Glance

Day One: Tuesday, 13 September 2016

TIME	AMARTAPURA C	MADHUKARA A	AYODYA C
07.00 - 08.30	Table Registration		
08.30 - 08.45	Opening Speech		
08.45 - 09.00	Speech from the Chair of ICCEREC and APWiMob		
09.00 - 09.15	Launching IEEE SPS Indonesia Chapter		
09.15 - 10.00	Keynote Session I		
10.00 - 10.30	Coffee Break & Photo Session		
10.30 - 11.15	Keynote Session II		
11.15 - 12.00	Keynote Session III		
12.00 - 13.00	Lunch Break		
13.00 - 15.00		Tutorial Session I	Technical Session I
15.00 - 15.15		Coffee Break	Coffee Break
15.15 - 17.00		Tutorial Session II	Technical Session II

## Program at a Glance

Day Two: Wednesday, 14 September 2016

TIME	MADHUKARA A	AYODYA C	AYODYA D
08.00 - 09.30	Tutorial Session III	Technical Session III	Technical Session IV
09.30 - 09.45	Coffee Break	Coffee Break	Coffee Break
09.45 - 11.00	SPS (Signal Processing Society) Indonesia Chapter 1 <sup>st</sup> Meeting	Technical Session V	Technical Session VI



## Keynote Sessions



**Prof. Abdehak M. Zoubir**

Signal Processing Group, TU Darsmtadt, Germany

**Advances in Robust Statistics for Signal Processing**

Day One, 13 September 2016,  
MADHUKARA A (09.15-10.00)

**Abstract:** Robust statistics continue to gain importance due to an increase of impulsive measurement environments and outliers in practical engineering systems. Classical estimation or detection theory does not apply in such situations and robust statistical methods are sought for. The talk aims at discussing the most recent advances in robust statistics and at showing their power to solving signal processing problems. First, we highlight the motivation for using robust statistics in real-life situations and how robust statistics can be expected to remedy problems in such practical systems. We then introduce some definitions of robustness and discuss some robust estimators. We briefly touch upon robust detection in the fixed sample size case. The theoretical treatment is supported by applications in various areas of signal and antenna array processing.



## Keynote Sessions



### Prof. Haruhito Fujita

Niigata University of International and Information Studies, Japan

#### Variable Renewable Energies for Development

Day One, 13 September 2016,

MADHUKARA A (10.30-11.15)

**Abstract:** The Fukushima nuclear accident caused by unforeseen tsunami events and human errors have forced to change the highly nuclear dependent Japanese government energy policy, stopping all nuclear power plants for rebuilding disaster tolerance and emergency governance. The lecture covers the global efforts to build “nuclear and carbon free” renewable energies, largely referencing the “Renewables 2016, Global Status Report” of Renewable Energy Policy Network for the 21st Century, the international efforts on summarizing the global trends. Due to the huge national investments on the renewables, China leads the world both in total renewable powers with and without the hydro generation. However, if one considers per capita, Denmark is leading the world, followed by other EU members of Germany, Sweden, Spain and Portugal. The share of renewable electricity was 23.7% of the global electricity generated in 2015, of which the hydro power was 16.6%, followed by the wind of 3.7%, the biomass of 2.0, the solar PV of 1.2%, and others (geo-thermal, concentrating solar thermal and ocean powers) of 0.4%, illustrating the high share of the hydro power among the renewables due to the high outputs of hydro power plants. The variable renewable energies have been recently focused as methods to compensate fluctuate natural energies such as the solar PV and the wind, via some energy storage system(s). A simple design of the variable renewables applying the solar PV for pumping water up to an upper reservoir and on demand hydro power generation by discharging stored water to a down reservoir, being deployed in Sado island, the largest but off grid one, previously reported in ICCEREC 2015. An estimation of 3.5 households’ power independency can be achieved by a 1200 m<sup>3</sup> micro-pump storage system using two nearby reservoirs, very common in hilly regions of Asia. The lecture will be closing by introducing two development projects of biomass powers from human and agricultural wastes (waste cooking oil and empty fruit bunch of Oil Palm) in Indonesia and Thailand, which solve social and environmental problems in the region, followed by the conclusions.



## Keynote Sessions



**Sigit P. Wigati Jarot, PhD**

School of Electrical Engineering, Telkom University, Indonesia

5G-IoT: Challenges and Opportunities

Day One, 13 September 2016,

MADHUKARA A (11.15-12.00)

**Abstract:** Mobile communication continues to evolve rapidly. 5G and Internet-of-Things (IoT) are among the most important topics in the mobile communications today. 5G will be the key enabler for massive Internet of Things (IoT), particularly the cellular IoT. It is predicted that by 2024 around 10 million IoT connections will be 5G-based. This keynote will explore the challenges and requirements of 5G-IoT from technological and policy perspectives, and also discuss the potential research directions of 5G-IoT.



## Tutorial Sessions



**Prof. Abdehak M. Zoubir**

Signal Processing Group, TU Darsmtadt, Germany

**Time-Frequency Signal Analysis and Applications**

Day One, 13 September 2016,  
MADHUKARA A (13.00-15.00)

**Abstract:** Signal processing is the art to extracting information from measurements for further analysis and interpretation. In some situations where the spectral content of signals does not vary with time, Fourier based methods suffice to perform such a task. However, many signals encountered in engineering practice today are non-stationary in that their spectral content is time-varying. These measurements maybe deterministic frequency modulated signals in noise or non-stationary stochastic signals. Thus, Fourier based methods are unable to extract the useful information. Time-frequency signal analysis methods have been an area of extensive research for several decades. They have proven their power to solving problems that traditional signal processing is unable to tackle. This tutorial covers fundamentals of both parametric and non-parametric time-frequency signal analysis, as well as recent advances, including robust time-frequency array processing. The tutorial will also provide some examples of modern real-life engineering problems we encounter in today's advanced applications.



**Prakash Suthar,**

Principal Architect, Cisco Systems Inc, USA

**Deploying Information Centric Networking in Mobile Networks**

Day One, 13 September 2016,  
MADHUKARA A (15.15-17.00)

**Abstract:** Mobile networks using 2G, 3G, or Long Term Evolution (LTE) are complex, and managing mobility and seamless handover are the key characteristics which result in protocol heavy and very complex architecture. For delivery of multimedia contents to end devices, IP unicast streams are used from server to clients where each user gets separate stream. From bandwidth and routing perspective it is highly inefficient. Multicast and broadcast technologies have emerged recently for content delivery but their deployments are very limited or experimental due to complex architecture and radio spectrum issues. Information Centric Networking (ICN) is a rapidly evolving technology for efficient multimedia contents delivery to end devices but majority of the research is focused on fixed devices. In this tutorial we will discuss about ICN features. Protocols details and how it can be deployment in mobile network for efficient delivery of contents.



## Tutorial Sessions



**Dr. Muhamad Reza,**

Power System Specialist and Business Development Manager, Solvina International, Sweden

**Smart Grid: Reliable Power Systems with Integration of Renewable Energy**

Day One, 13 September 2016,  
MADHUKARA A (15.15-17.00)

**Abstract:** Electricity is very crucial for modern society. Especially in urban areas, people are becoming more dependent on electricity supply to perform activities within businesses, commercials, industries, transportations and households.

In the past few decades, the electricity power grid has experienced rapid developments. On one hand, the massive utilization of sensitive electronic equipment within industries and households request reliable electricity supply with both adequate quantity as well as quality. On the other hand, people's awareness to go green towards preservation of environment demand that electricity should be supplied sustainably including with renewable energy sources. This combination has challenged engineers who later, among other things, come with Smart Grid concept. Smart Grid concept focuses on integrating renewable energy generation and other new technology likes electric vehicles to existing power grid while keeps and improves whenever necessary the reliability and stability of the grid. In some countries, the concept includes to design and to operate power grid that is robust against natural disasters as well as sabotages from internal- or external sources. The complexity of the matters around Smart Grid requires cross-disciplinary approaches. In this tutorial, introduction to power systems will be given, followed by presentation about trends and challenges of smart grid and the grid integration of renewable energy.



## Technical Session I

Tracks: Communications

Day One, 13 September (Room: AYODYA C)

**[13.00]** Comparison with HTTP and MQTT on Required Network Resources for IoT  
*Tetsuya Yokotani and Yuya Sasaki (Kanazawa Institute of Technology, Japan)*

**Abstract:** HTTP has been widely applied for data transfer. However, in networks for IoT, this protocol causes a large overhead. To solve this problem, named based transfer protocols have been discussed. This paper compares the performance of HTTP with that of MQTT, a type of named based transfer protocol. Additionally, the paper proposes enhancements to MQTT for better performance.

**[13.15]** A Low Cost Internet of Things (IoT) System for Multi Patient ECG's Monitoring

*Mochamad Ryan Fajar Nurdin (Telkom Applied Science, Telkom University, Indonesia); Sugondo Hadiyoso (Telkom University, Indonesia); Achmad Rizal (Universitas Gadjah Mada & Telkom University, Indonesia)*

**Abstract:** This paper discussed one application of IOT as media data transmission for the electrocardiogram (ECG) signal. The ECG signal taken from body's patients is acquired by the ECG machine, and then raw data is sent serially to the computer server. Furthermore, the data can be accessed by other authorized parties via the web pages for the purpose of treatment or consultation. By using this application, patients with heart can interact and consultation with a cardiologist anytime and anywhere.

**[13.30]** Efficient and Secure Data Delivery in Software Defined WBAN for Virtual Hospital

*MD Shayokh (Kumoh National Institute of Technology, Bangladesh); Abebe Abeshu (La Trobe University, Australia); Gandeve Bayu Satrya (Telkom University & Kumoh National Institute of Technology, Indonesia); Muhammad Arief Nugroho (Telkom University, Indonesia)*

**Abstract:** Sedentary lifestyle and recent advancement in physiological low powered sensors triggers the concept of Wireless Body Area Networks (WBAN) for efficient healthcare system. Proliferation of Cloud computing technology merged into WBAN become a new trend for smart healthcare. To manage the complexity in network infrastructure new technology named as Software Defined Networking (SDN) has been introduced recently. In terms of quality of service (QoS), medical data needs to be sent securely for a trustworthy system where every single data is sensitive for patient. In this paper, efficient data delivery system with a secured networking authentication protocol named as Kerberos has been proposed for software defined virtual hospital systems. This paper also demonstrate with simulation results for a better data delivery system with adequate networking security through Kerberos system for the next generation smart healthcare architecture.

## Technical Session I

Tracks: Communications

Day One, 13 September (Room: AYODYA C)

### [13.45] Controlling and Monitoring Project Based on Android Application for Fiber Optic Infrastructure

*Akhmad Hambali, Rizky Pratama, Ridha Negara and Mohamad Ramdhani (Telkom University, Indonesia); Arina Fadhilah (Telkom University, Indonesia); Rohmat Tulloh (Telkom University, Indonesia)*

**Abstract:** Fiber optic has an important role in the development of telecommunications infrastructure in Indonesia. Better network performance and quality of the speed that offered by fiber optic can support the data requirement which continues to increase every year. In Indonesia, Fiber Optics is used as the primary network infrastructure Backbone and Access and still continue to develop the fiber optic network in Indonesia. Therefore, the process of reporting, controlling and monitoring are imperative for network deployment of fiber optic network by using an application system to be more efficient and accelerate the decision-making process. In this study FOMAApps is made, an android-based application that facilitates the requirements of monitoring, controlling and reporting the fiber optic project between the Government and fiber optic deployment provider. In particular, FOMAApps include different reporting formats for each type of job. The test results of reporting system Optical Fiber Cable (Outside Plant) has a speed in delivering the report amounted to 257.516 seconds. So from the results that are obtained, the application is feasible for use in reporting the deployment of Outside Plant Fiber Optic. With the existence of this application, we expect the process of controlling and monitoring between the Government and fiber optic deployments providers are achieved.

### [14.00] Digital Forensics Study of Internet Messenger: Line Artifact Analysis in Android OS

*Gandeva Bayu Satrya (Telkom University & Kumoh National Institute of Technology, Indonesia); Muhammad Arief Nugroho (Telkom University, Indonesia); La Ode Harisman (Feelance Engineer, Indonesia)*

**Abstract:** This paper provides a description of how to get artifacts generated by Line messenger applications such as user activities, contact information, chatting, and deleting the messages. It also provides correlation and interpretation of messages that are formed during the conversation scenario. This paper can be used as a guidance for investigators and forensics analysts in conducting investigation process. Furthermore, this paper also shows how the acquisition processes were done logically and physically. Android forensics processes were done in forensically sounds manner using three different models of smartphones and Android OS versions as the experiment objects.



## Technical Session I

Tracks: Communications

Day One, 13 September (Room: AYODYA C)

**[14.15] Anonymous Sender Data to Kleptocharger Using Android Malware**  
*Arief Ikhwanul, Surya Michrandi Nasution and Fairuz Azmi (Telkom University, Indonesia)*

**Abstract:** Smartphone usage nowadays can't be separated from our daily lives. Almost every daily activity can be supported by smartphone. Aside from its general uses like communication purpose, smartphone also used to store private data. Technological advance also change the way people do their activities, one of them is financial activities. Daily activity be easier with the technology of the internet. Along with the increasing of our needs for android usage, inflict danger about user's data stealing. Some malware have been developed to be a splendid data stealer by utilizing the fault in the system or even in the user itself. The targets of those malware itself are varying. The data stolen can be exploited for their personal use or be sold at the black market. What makes world security system concerned is that the malware was designed and developed to be able to communicate with microcontroller device via serial communication. The designer of this malware is able to combine malware and microcontroller to stage his action. That kind of malware has become popular issue nowadays and it can be said that those malware is very dangerous because of the impact it caused for the user.

**[14.30] Inter-regional Voice Bandwidth Calculation on IMS Network**  
*Danu Sanjoyo and Rendy Munadi (Telkom University, Indonesia); Fidar Laksono (Telkom Indonesia, Indonesia); Tjahjo Adiprabowo (Telkom University, Indonesia)*

**Abstract:** The inter-regional telecommunication network design in Indonesia is strongly influenced by the bandwidth of Voice over Internet Protocol (VoIP), where 40% of the national bandwidth is used to pass voice communication. Indonesia region is divided into seven regional areas, each of these is supported by two IMS Cores, which serves as the active core and the stand-by core.

Regionals are interconnected with each other through an IP backbone network. It serves to get through a number of bandwidth when there is communication between the regionals. The bandwidth requirement can be obtained through the calculation of traffic in regional, inter-regional traffic, and along with demographic data as well as the number of customers who have registered on the IMS network.

Since voice traffic is passed in IP networks, the voice bandwidth is calculated in bps (bits per second) units. Standard voice codecs used for the conversion are G.711 and G.729. The national bandwidth load for voice traffic on the IMS backbone network can be obtained using mathematical calculations. The results of the calculation are presented in bandwidth matrices of the seven regions traffic for each standard (G.711 and G.729).





## Technical Session I

Tracks: Communications

Day One, 13 September (Room: AYODYA C)

**[14.45] Performance Analysis of DLife Routing in a Delay Tolerant Networks**

*Zulkhan Kurniawan and Tody Wibowo (Telkom University, Indonesia); Leanna Yovita (Bandung, Indonesia)*

**Abstract:** Delay Tolerant Network (DTN) is a wireless network that connected in an intermittently manner and have dynamic topology. In DTN to design protocol routing is a big challenge due to there is no end-to-end path. To overcome this challenge there is protocol routing dLife. dLife is a protocol routing in DTN that use two utility function to determine forwarding decision, namely TECD and TECD importance. In this paper we study the impact of buffer size and message size on the performance of dLife routing. For the simulation we used Opportunistic Network Environment (ONE) Simulator. The performance that is analyzed are Average Cost, Delivery Probability and Average Latency. Based on simulation result, buffer and message size affect the performance of dLife routing.



## Technical Session II

Tracks: Communications

Day One, 13 September (Room: AYODYA C)

**[15.15] Performance Analysis of Social-aware Content-based Opportunistic Routing Protocol on MANET Based on DTN**

*I Gede Agus Surya Negara (Telkom University, Indonesia); Leanna Yovita (Bandung, Indonesia); Tody Wibowo (Telkom University, Indonesia)*

**Abstract:** Nowadays, almost all telecommunication devices use TCP/IP to communicate with each other. However, it is difficult for the mobile ad-hoc network to support the type of end-to-end connectivity required by TCP/IP-based communications due to disruptions, frequent topology changes and network partitions caused by the movement of the nodes. DTN is an emerging paradigm in the telecommunication network which able to provides data communication in areas with intermittent connectivity, long delay communication, and high error rate. SCORP (Social-aware Content-based Opportunistic Routing Protocol) is a routing protocol on DTN which works by taking account of social proximity and content interests on each node before replicating the message to the other node in order to improve the ability of network in sending messages.

In this paper, we show the performance analysis of SCORP by using Braga and Asia-Afrika area in Bandung as the simulation area in The ONE Simulator. We use the message delivery probability, overhead ratio, and average latency as the evaluation metrics. The experimental results show that the message delivery probability increases with the buffer size and number of nodes in simulation, the average latency decreases with increasing buffer size and number of nodes in simulation, and the overhead ratio is zero for same types and an equal number of interests per node. The results also show that different types and number of interests per group of nodes increases the value of message delivery probability and overhead ratio, and reduce the value of average latency of the same types and an equal number of interests per node.



## Technical Session II

Tracks: Communications

Day One, 13 September (Room: AYODYA C)

**[15.30]** Analysis Secure Socket Layer Protocol with Heartbleed Bug and Distributed Denial-of-Service

*Jafar Alim Habibi and Rendy Munadi (Telkom University, Indonesia); Leanna Yovita (Bandung, Indonesia)*

**Abstract:** One-way communications such as video streaming nowadays are easier to be used. One of service which eases those communications is Internet Protocol Television. By easiness of service packet-based that has entered in the whole of world made simplifies access of IPTV services. The regulation of IPTV, which needs high performance, makes these services interesting to any people. However, the easier access requires secure services for protecting data and information. This research simultaneously uses 2 types of attacks. Those are Distributed Denial-of-Service and Heartbleed Bug, with hacker or penetration tester does not belong to examiner. In this research, the experiments of analysis are taken from 3 scenarios: using VLC program, web page-interface, and web page-interface after being attacked by penetration tester or hacker, with Open-Shortest Path First as routing protocol, and Protocol Independent Multicast as grouping of videos IP.

**[15.45]** Wideband Parasitic Antennas Design and Realization to Improve Laptop Antenna Reception

*Max Alexander Rura Patras (Telkom University, Indonesia); Adit Kurniawan (ITB, Indonesia); Bambang Nugroho (Institut Teknologi Telkom, Indonesia)*

**Abstract:** In laptop antenna reception, the received signal frequently experience decrease significantly when laptop antenna is located exactly on a deep fading position in multipath environments. In this paper, we propose a method of using parasitic antenna elements to improve the reception of laptop antennas which can be incorporated (pasted) at the back panel of laptops. The proposed antennas have a wide frequency band, 2265 MHz to 6233 MHz, to serve all frequencies in WLAN operation. The proposed parasitic antennas exhibit the gain improvement of 1.21 dB to 2.68 dB. These antennas are able to cover all the frequencies in the 2.4 GHz band and the 5.2 / 5.8 GHz band for the WLAN systems, and it can be applied to all types of laptops.



## Technical Session II

Tracks: Communications

Day One, 13 September (Room: AYODYA C)

**[16.00] Design of Attitude Determination and Control System Using Microstrip Magnetorquer for Nanosatellite**

*Defrandi Haryadi, Heroe Wijanto, Budi Syihabuddin and Agus D. Prasetyo (Telkom University, Indonesia)*

**Abstract:** Magnetorquer is a type of active control used on nanosatellite. Magnetorquer can be made by using microstrip line with a circular spiral patch. Magnetorquer system in previous research used a coil of wire wrapped around the conductor crosssection is electrified which will generate a magnetic field. The magnetic field generated from magnet orquer will interact with the Earth's magnetic field, so it is capable to generate a torque to maintain nanosatellite motion in its orbit. The designed magnetorquer requires 5 V voltage and 0.5 - 1 A current. With the current variation supplied the magnetorquer, it can be obtained that the minimum magnetic field values is 0.811  $\mu\text{T}$  and maximum is 1.596  $\mu\text{T}$ . With the magnetic field, magnetorquer can generate a minimum torque at 13.1382 nNm and maximum torque at 51.7104 nNm. According to the results, the torque value has been able to maintain the nanosatellite stability at its orbit.

**[16.15] Modified Wilkinson Power Divider 1 to 4 At S-Band**

*Christian Mahardika, Bambang Nugroho, Budi Syihabuddin and Agus D. Prasetyo (Telkom University, Indonesia); Dwi Andi Nurmantris (Telkom University - Jl. Telekomunikasi Terusan Buah Batu Bandung 40257 Indonesia, Indonesia)*

**Abstract:** Changing the value of current amplitude, phase or distance between antenna can make different radiation pattern in antenna array system. Using those principles, a smart antenna system can be made by using butler matrix which has configuration consisting of multiple power combiner and phase shifter. The power divider can be used in order to change the input values of the buttler matrix. A power divider has been designed in this research to support the smart antenna system for satellite tracking, telemetry, and command (TT&C). This research designed the modified Wilkinson Power Divider 3 port to be 5 ports with 4 output ports which can work at a frequency of 2.3 - 2.45 GHz with the insertion of each port is < -8 dB, the maximum value theoretically amounted to -6 dB. This is because the power divider works by dividing power into 1:4 ratios.



## Technical Session II

Tracks: Communications

Day One, 13 September (Room: AYODYA C)

### [16.30] Robust Blind Beamforming for LTE in Multipath Environment

*Osama Mohamed (Aast, Egypt); Hassan El Kamchouchi (Alexandria University, Egypt); Darwish Mohamed and Wael Ali (AAST, Egypt)*

**Abstract:** A robust blind beamforming algorithm is proposed for Long Term Evolution (LTE) system in the uplink direction by using Uniform Linear Array (ULA) in the base station (eNodeB) to remove the effect of multipath. There is no knowledge about the incoming signals, so a robust estimation of the Direction of Arrival (DOA) of the signals is performed first. The robust Re-iterative Superresolution (RISR) DOA estimation algorithm is used to estimate the DOA and to separate the coherent signals impinging from different directions in multipath environment, then a proposed robust RISR beamforming exploiting this DOA estimation is performed for the estimated directions followed by time delay estimation of signals by using the correlation function between them to know and extract the signal in the desired direction. Finally applying the beamforming in the desired direction to correctly receive the signal and reject the multipath effect as well as enhancing Bit error rate (BER). The results show the effectiveness of the proposed algorithm when compared to other traditional beamforming algorithms especially for coherent sources.

### [16.45] Scaling Technique of Triple Play Services in Passive Optical Network Using Subcarrier Allocation Algorithm

*Mihya Zaki (Telkom University & Telkom Indonesia, Indonesia); Adit Kurniawan (Bandung Institute of Technology, Indonesia); Rina Pudjiastuti (Telkom University, Indonesia)*

**Abstract:** Data consumption increased sharply, all triple play services such as Voice, Data-Internet & Video can be performed on one communication path, even fiber optic has also bandwidth limitations, therefore the allocation of data transmission must be optimized as their needs. A Passive Optical Communication in downstream direction is presented. Modify current burst methods to scheduling distribution SC on system OFDM from OLT to ONU by utilize FDMA to allocating SubCarrier based on the services are applied. Significant gain of bandwidth efficiency up to 37.5% obtained when link is being congested.



## Technical Session III

Tracks: Controls and Automations

Day Two, 14 September (Room: AYODYA C)

**[08.00]** Mapping Algorithm Using Ultrasonic and Compass Sensor on Autonomous Mobile Robot

*Aulian Fathan, Agung Nugroho Jati and Randy Saputra (Telkom University, Indonesia)*

**Abstract:** Mapping is the process of representation of the environment into other forms such as a sketch map or the other. Process mapping provides the solution of the problem of how a robot can automatically recognize the environment and how robots can provide information such as maps representations of the environment around the robot. To do the mapping there are many choices of sensors that can be used, depends on what method will be used. In this paper will be discussed on mapping algorithm with a simple sensor and a simple method. This paper will discuss the mapping algorithm will use ultrasonic sensors and compass sensors.

**[08.15]** Maximum Allowable Time Delay on Networked Control System Using Guaranteed Cost Method

*Prasetya Dwi Wibawa, Erwin Susanto and Favian Dewanta (Telkom University, Indonesia)*

**Abstract:** In this paper, a robust filter is designed using guaranteed cost method to deal with the problem on networked control system (NCS). NCSs are modeled by neutral-type systems with differentiable time-delay uncertainties. The control and gain filter are derived from LMI feasible solution. A numerical example is provided for illustration of the proposed condition.

**[08.30]** Autonomous Quadruped Robot Locomotion Control Using Inverse Kinematics and Sine Pattern Methods

*Aditya Hidayat, Agung Nugroho Jati and Randy Saputra (Telkom University, Indonesia)*

**Abstract:** In this paper explained how to solve robot locomotion using inverse kinematics and sine pattern methods on autonomous quadruped robot with 3 DOF on each leg using geometrical approach and python code examples included. By using inverse kinematic method, we can find the angle of each actuator from end effector position, with combined with the method of sine pattern that can generate values group of end effector position in a pattern of sine wave that can be used to solve multi value problem on inverse kinematics.



## Technical Session III

Tracks: Controls and Automations  
 Day Two, 14 September (Room: AYODYA C)

**[08.45]** Design and Implementation of Water Level Control Using Gain Scheduling PID Back Calculation Integrator Anti Windup

*Sony Cahya Pratama, Erwin Susanto and Agung Surya Wibowo (Telkom University, Indonesia)*

**Abstract:** Conventional PID controller is a simplest known controller and has been used in almost all process industries for controlling process parameter at desired set point. However, the weakness of the controller is largely depend on the parameter of the controlled object. As the dynamics process of a water tank is nonlinear, it also has nonlinear behavior between the input and output. This paper demonstrates that Gain Scheduling PID with Back Calculation Integrator Antiwindup enables to enhance the response of automatic water level control system performance. A mathematical model of a first order tank system is considered and simulated to determine fine tunes and schedules for the controller parameter based on trial and error experiment so as to adapt with all operating points. The system performance comparison of various set point given to the system is performed to prove that the Gain Scheduling PID with Back Calculation Integrator Antiwindup is superior to conventional PID controller.

**[09.00]** Self-configuring Home Automation Networks Based on Psychophysical Principles

*Jannik Fleßner and Melina Frenken (Jade University of Applied Sciences Oldenburg, Germany)*

**Abstract:** Home automation networks are designed to meet standards of comfort and energy efficiency. Hence, the interaction between home automation and the inhabitant is based on rudimentary knowledge about the condition and the perception of the human. In order to improve the human-to-automated home interaction, psychophysical measurements can be helpful to design a human-oriented home automation network. In particular elderly residents and people with impairments may have specific requirements and altered expectations towards comfort as defined in the standard guidelines. In this paper, a the concept of a systematic process model, leading to an improved interaction between human and building environment, is presented. This process model has the purpose to create a self-configuring home automation network by using already existing psychophysical knowledge about the inhabitant.

## Technical Session III

Tracks: Controls and Automations

Day Two, 14 September (Room: AYODYA C)

**[09.15]** Design of on Board Data Handling Using Raspberry Pi for Nanosatellite Payload

*Aditya Urandra, Burhanuddin Dirgantoro and Budi Syihabuddin (Telkom University, Indonesia)*

**Abstract:** In this research, design and analysis of On Board Data Handling by using raspberry pi, temperature sensor, accelerometer, servo motors and a camera. The use of servo motors to aim object although nano satellite has or has not crossed the object to be photographed. In this research also design the guard dog to manually and automatically avoid a system error due to accumulation of data from sensors or cameras. One of the tests made in the form of testing distances of 50, 100 and 200 meters with an average time of 4 minutes 11 seconds and the smallest accuracy at a distance of 200 meters at 86.67%.





## Technical Session IV

Tracks: Electronics

Day Two, 14 September (Room: AYODYA D)

### [08.00] A Novel Driver Fatigue Monitoring Using Optical Imaging of Face on Safe Driving System

*Iman R Tayibnapis, Dong-Young Koo, Min-Kook Choi and Soon Kwon (Daegu Gyeongbuk Institute of Science and Technology, Korea)*

**Abstract:** One of the global main goal of the safety driving system is protecting the driver, passenger(s), car, and surrounding environment against accident which are caused by external and internal factors. Driver fatigue, one of the major internal factors, is a leading reason of vehicle breakdown according to a survey done by National Highway Traffic Safety Administration (NHTSA). Thus, it is necessary to build driver fatigue monitoring system. We, then, propose a technique based on optical imaging through digital camera that installed on the car dashboard. The camera detects and tracks the driver face. From the driver face, we can apply non-contact photoplethysmography (PPG) in order to get multiple physiological signals such as brainwave, cardiac and respiration pulses. Those physiological signals can be utilized to measure fatigue level. Alteration in facial features like eyes, mouth, and head, can be used to observe the driver fatigue as well. We propose to use supervised descent method (SDM) with scale-invariant feature transform (SIFT) to excerpt information from the facial features. To classify the fatigue level from those multiple parameters, support vector machine (SVM) will be implemented.

### [08.15] Configuring SmartGLCD as Universal Data Logger for Monitoring Sound and Movement

*Mohd Amir Abas (Universiti Kuala Lumpur, Malaysia); Maznah Dahlui (Maznah, Malaysia)*

**Abstract:** Simple and fast are the two terms that could describe the process of configuring a readymade SmartGLCD into a unique data-logger. The Universal data-logger uses sound and PIR sensors to monitor sound and movement of human or any subjects that trigger the two signals. The devices have been configured through MicroC development tools and Visual GLCD. Initially Visual GLCD is used for creating the graphic for control object, logo and text. While MicroC is a C compiler for building the coding for all the functions of the objects. The process of configuration requires good understanding of C programming and good knowledge in microcontroller structure. Two proposals of measurement have been described for data measurement and subject monitoring. The first proposal is to monitor baby's condition in an incubator. The second proposal is to monitor mental patient in a rehab room. The experimental results of the data logging were displayed on the large graphic display 240 x 128 pixel and saved in SD card



## Technical Session IV

Tracks: Electronics

Day Two, 14 September (Room: AYODYA D)

**[08.30]** Implementation of Low Interaction Web Server Honeypot Using Embedded System

*Dandy Rahmatullah, Surya Michrandi Nasution and Fairuz Azmi (Telkom University, Indonesia)*

**Abstract:** Today's Internet technology is not free from many problems or security holes. This security hole could be exploited by an unauthorized person to steal important data. The case of the attacks occurred because the party that was attacked also did not realize the importance of network security to be applied to the system. Honeypot is a system that is designed to resemble the original production system and is made with the intention to be attacked or compromised. Honeypot implemented using low interaction honeypot as well as using other supporting software. Durability test conducted with direct attacks to determine the safety of the system. The purpose of this research is to create a low interaction honeypot implemented on embedded systems (Cubieboard) which will provide secured system to deceive and detect attacks, and is intended for web server security.

**[08.45]** Low Pass Filter Installation for Reducing Harmonic Current Emissions From LED Lamps Based on EMC Standard

*Fajar Karim, Mohamad Ramdhani and Ekki Kurniawan (Telkom University, Indonesia)*

**Abstract:** Light Emitting Diode (LED) lamp has been widely using in Indonesia for a lighting system. However, LED lamp is a nonlinear load that caused high harmonics current. This paper is focused on reducing the harmonics current that caused by LED lamp with a driver. In order to reduce the harmonic current, low pass filter is applied to the system. The experiment result revealed a significant reduction of current harmonic which is fit in with IEC 61000-3-2 class C standard and good power quality of the system.

**[09.00]** A Multiuser Vital Sign Monitoring System Using ZigBee Wireless Sensor Network

*Ilham Berliandhy and Sugondo Hadiyoso (Telkom University, Indonesia); Achmad Rizal (Telkom University); Rony Febyarto (BPPT, Indonesia)*

**Abstract:** This paper discussed one application of ZigBee as media data transmission for patient's vital sign monitoring. The ECG signal, Temperature, and blood pressure taken from patient's body by the vital sign monitoring device, and then raw data is sent serially by ZigBee to 2 computers as monitoring device wirelessly. Furthermore, the data can be accessed by other authorized parties via monitoring devices for the purpose of monitoring. By using this application, patient's vital sign monitoring can be done from distance wirelessly.



## Technical Session IV

Tracks: Electronics

Day Two, 14 September (Room: AYODYA D)

**[09.15] Prototype of Kleptocharger for Android Device**

*Fahmi Siddiq, Surya Michrandi Nasution and Fairuz Azmi (Telkom University, Indonesia)*

**Abstract:** Power bank is a device used to support charging up a device battery, especially a mobile phone's battery. Since design of common power bank contain of battery cell and power controller, it will have some empty space to create a modified power bank. We could implement a tiny Micro controller named teensy. Teensy will create power bank detected as a storage media and all the selected data will be copied into media card in the power bank. Beside of teensy implement, we could also implement SD card shield for storing all the captured data. This concept is a proof concept that modified power bank could be implemented. The results of this research prove that a modified power bank only works one mode at a time.



## Technical Session V

Tracks: Controls and Automations

Day Two, 14 September (Room: AYODYA C)

**[09.45]** An Evaluation of 2D Indoor Localization and Mapping Using FastSLAM

*Mia Amanda, Agung Nugroho Jati and Unang Sunarya (Telkom University, Indonesia)*

**Abstract:** In this work we evaluate the exploration of an unknown environment using FastSLAM for virtual mobile robot. Mapping and localization can be done simultaneously by FastSLAM algorithm. FastSLAM is an alternative to solve the previous algorithm—SLAM. The result obtained by simulation of robotic 2D mapping and localization using FastSLAM that will be using RANSAC (Random Sampling Consensus) for its feature extraction. In order to draw the performances of FastSLAM and provides insight of weaknesses and strength of this algorithm.

**[10.00]** A Study of 2D Indoor Localization and Mapping Using FastSLAM 2.0

*Dwi Kurniawan, Agung Nugroho Jati and Unang Sunarya (Telkom University, Indonesia)*

**Abstract:** FastSLAM 2.0 is a Simultaneous Localization And Mapping (SLAM) framework that provides an algorithm for calculating robot's pose and map the environment concurrently. It consists of calculation that include getting data from sensor, associate the data, and update the map. SLAM is a challenging problem in Robotics because it is considered a chicken-and-egg problem. In this paper we will study the FastSLAM 2.0 algorithm that will be using RANSAC (Random Sampling Consensus) for its feature extraction.

**[10.15]** Heart Disorder Detection Based on Computerized Iridology Using Support Vector Machine Classification Method

*Lintang Permatasari and Astri Novianty (Telkom University, Indonesia); Tito Purboyo (Institut Teknologi Bandung & Telkom University, Indonesia)*

**Abstract:** The ability of the human iris can provide a sign of organ disorders based on iridology science. Now, iridology science has developed not only by the medical expert who carried out manually, but can also be detected automatically using implementation methods from artificial intelligence based on desktop applications. In this study focused on cardiac diagnosis where necessary on the left iris mapped on clockwise direction around 2:00 to 3:00. There are several methods of feature extraction and classification, one of them is feature extraction method Principal Component Analysis (PCA) and Support Vector Machine (SVM) for the classification, which is derivative from ANN method. In this study, the accuracy of SVM method is 100% for training, and 80% for testing.



## Technical Session V

Tracks: Controls and Automations  
Day Two, 14 September (Room: AYODYA C)

**[10.30]** Wireless Sensor and Actuator Network for Aeroponics Monitoring and Control

*Muhammad Ikhsan Sani, Simon Siregar, Aris Kurniawan, Rakhmi Jauhari and Chintya Nermelita Mandalahi (Telkom University, Indonesia)*

**Abstract:** This paper presents a design of a system prototype for plant water and nutrients distribution. Furthermore, it has been implemented to support the optimal application of aeroponics system. It is based on a monitoring system which was used to observe the chamber's parameters such as temperature and humidity. Meanwhile, the control system was used to manage actuators i.e. mist maker and fan for delivering water moisture. Sensor's data are transmitted via internet into server in order to facilitate easier monitoring for user. The prototype of the system is successfully implemented and provide a series of sensor's data.

**[10.45]** Position Estimation and Fire Detection Based on Digital Video Color Space for Autonomous Quadcopter Using Odroid XU4

*Muhamad Abdullah, Inung Wijayanto and Angga Rusdinar (Telkom University, Indonesia)*

**Abstract:** Autonomous Aerial Fire Extinguisher is one of the categories in Indonesian Aerial Robot Contest (Kontes Robot Terbang Indonesia). This is a national contest for Unmanned Aerial Vehicle (UAV). In this category, the UAV needed to detect and determine a fire position placed in an indoor area which then will be extinguished. The fastest UAV managed to extinguish the fire will be crowned as the champion. To support the detection process, we need to find the best fire detection algorithm to be implemented in the autonomous quadcopter. By analyzing the color space from RGB, we got the average accuracy on real time flight testing is of 72,94%. This value is fit for the contest condition which required minimum accuracy is 70%.

**[11.00]** Implementation of PID Controller and Pre-Filter to Control Non-Linear Ball and Plate System

*Agung Adiprasetya and Agung Surya Wibowo (Telkom University, Indonesia)*

**Abstract:** In this paper, the authors try to make PID controller with Pre-filter that is implemented at ball and plate system. Ball and plate system will control the position of ball's axis in pixels' value by using servo motor as its actuator and webcam as its sensor of position. PID controller with Pre-filter will have a better response than conventional PID controller. Even though the response of PID with Pre-filter is slower than conventional PID, Pre-filter in the system will give the less overshoot response.



## Technical Session V

Tracks: Controls and Automations

Day Two, 14 September (Room: AYODYA C)

**[11.15] Beef Cattle Weight Determine by Using Digital Image Processing**

*Zein Pradana and Bambang Hidayat (Telkom University, Indonesia); Sjafril Darana (Padjadjaran University, Indonesia)*

**Abstract:** Based on the livestock size are divided into two parts, where firstly the small one and the other the large one. Whereas the small one consists of poultry, sheep, goats, rabbit, etc. Measuring in the small animal weight could be directly weight, because very easier than the large one. To measure the weight of large animal, especially beef cattle, there are some differences. The body length, chest circumference, height and width of this animal is could be estimated. Any kinds of method in measuring the weight of livestock are calculated systematically. However the measurement is not entirely accurate when predicting the weight of beef cattle life. That is why, it is possibly to get a simply method to estimate the weight of beef cattle meat. The technical information for analyzing of beef cattle weight which call a digital image processing could be used, because it can analyze via photograph system. By using digital image processing with specific algorithms could be recognized certain objects easily. The accurate yield depends on the photograph capability estimation on body length, chest circumference, height, and the width of beef cattle itself. This system can perform 73.21% accuracy with computation time in 187.2812 second.



## Technical Session VI

Tracks: Communications and Renewable Energy  
Day Two, 14 September (Room: AYODYA D)

**[09.45]** Forecasting Formulation Model for Amount of Fault of the CPE Segment on Broadband Network PT. Telkom Using ARIMA Method

*Sonny Yuhensky, Rendy Munadi and Hafiddudin Hafiddudin (Telkom University, Indonesia)*

**Abstract:** This research was conducted with the order or lags monthly data, run two scenarios, first; 24 observation data lag with 12 forecast lag, second; 30 observation data lag and 6 lag forecasts. This research resulted in the value of  $AR = 5$ ,  $d = 1$  and  $MA = 4$  for any type of Fault CPE and for the each scenario. It appears that more observation data and the shorter lag forecast, and then the results produced ARIMA will be more accurate. This can be seen in comparison error deviation and/or CMSE for each scenario.

**[10.00]** Delay Estimation Using Compressive Sensing on WSN IEEE 802.15.4

*Asdianur Hadi and Ida Wahidah (Telkom University, Indonesia)*

**Abstract:** In this paper we studied effectiveness in using Compressive Sensing (CS) algorithm in order to reduce measuring in IEEE 802.15.4 Standard Wireless Sensor Network (WSN). As well known, in common WSN work system, Base Station (BS) gather some information from available nodes, which the process itself consumes a lot of energy from each node. We also use an existing CS algorithm, the Basis Pursuit. Furthermore, we used and did several existing transformation methods combination to find the best method combination. Our results show that, signal recovery using Basis Pursuit by performing data transformation by 2D-DCT is the best combination with the lowest MSE at 10% and 20% missing entries. However, the entry delay with lost 30%, signal recovery using Basis Pursuit by performing data transformation by DWHT is the best combination.



## Technical Session VI

Tracks: Communications and Renewable Energy

Day Two, 14 September (Room: AYODYA D)

[10.15] Digital Image Steganography with Encryption Based on Rubik's Cube Principle

*Sevierda Raniprima (Institut Teknologi Bandung, Indonesia); Bambang Hidayat (Telkom University, Indonesia); Nur Andini (Institut Teknologi Telkom, Indonesia)*

**Abstract:** Information exchange between sender and receiver becomes very fast and easy. The quality of message transmission, especially the security, must be noticed. Data hiding is important for securing message. It can be done using cryptography and steganography. This paper describes the result of investigation on image steganography system using secret gray scale image and RGB image as a cover. Before the secret image is embedded into the cover, the encryption process is done to provide a more reliable security. The encryption method used is based on rubik's cube principle, by moving the pixels position in a digital image. The steganography uses LSB substitution method that works in spatial domain. The objective of this scheme is to obtain a high quality hidden secret image in order to keep message secret. Finally, effectiveness of the proposed scheme is tested using histogram analysis, Avalanche effect, Brute-Force attack, visual attack, statistical attack of Chi-Square analysis, and size and embedding position differences analysis.

[10.30] Skewing and Notching Configurations for Torque Pulsation Minimization in Spoke-Type Interior Permanent Magnet Motors

*Gadafi M romalan and Erwan Sulaiman (Universiti Tun Hussein Onn Malaysia, Malaysia)*

**Abstract:** Interior permanent magnet (IPM) motors become popular and commonly used in industry and domestic applications. One of them is spoke-type IPM. Spoke-type interior permanent magnet (IPM) machines are an attractive topology for high-performance electric motors. In most of the applications, the high strength of permanent magnets causes the undesirable effects of high cogging torque that can aggravate motor performance. Consequently, the reduction of cogging torque becomes an important topic in IPM motor. In this paper, to minimize the effect of cogging torque in IPM motor, two common techniques for cogging torque reduction such as skewing, and notching, has been analyzed in order to compare the cogging torque, back EMF and efficiency effect. 3D finite element analysis (FEA) by JMAG software is carried out for each technique. The results showed the reduction of cogging torque up to 98.6%, followed by 81.84%, 45.24% and 36.79% compared to the initial model design.





## Technical Session VI

Tracks: Communications and Renewable Energy  
Day Two, 14 September (Room: AYODYA D)

### [10.45] Design of A Hybrid Permanent Magnetic Flux Switching Machine with Compound Rotor Configuration

*Mohd Fairoz Omar (Universiti Tun Hussien Onn Malaysia, Malaysia); Erwan Sulaiman (Universiti Tun Hussein Onn Malaysia, Malaysia)*

**Abstract:** Hybrid Permanent Magnet Flux Switching Machine (HPMFMSM) is a machine that uses two permanent magnets which are Ferrite Permanent Magnet (FPM) and Rare Earth Permanent Magnet (REPM). The REPM had being implemented widely in HEV nowadays. So, HPMFMSM is created in order to reduce the volume of REPM itself. Three designs had created which are PM, PMH and SMH design. PM only consist of REPM, meanwhile PMH and SMH consist REPM and FPM. The difference of the PMH and SMH is the arrangement of permanent magnet. The machine can generate higher performance by combining FPM and REPM. The HPMFMSM load analysis is conducted in order to verify the 7pole/6slot/7pole HPMFMSM machine performances. Through the analysis, the performances of the machine are able to identify. The PMH design can compete with the PM design which gives higher torque density.

### [11.00] Design Improvement of Flux Switching Permanent Magnet Using Combined Local and Global Method

*Gadafi M romalan and Erwan Sulaiman (Universiti Tun Hussein Onn Malaysia, Malaysia)*

**Abstract:** Recently, outer-rotor electric machine has been research attention to be applied for in-wheel motor either in electric or hybrid electric vehicles (EVs). The in-wheel motor definitely requires for high torque and power density. Among the competing in-wheel machines, permanent magnet synchronous machine (PMSMs) with an outer-rotor have been used widely, due to their high torque density, excellent efficiency and overload capability. However, there will be a cause of demagnetization and mechanical damage of the rotor magnets in extreme driving conditions. To solve the problems, in-wheel machines with permanent magnets (PMs) in the stator are gaining popularity for easier heat dissipation and smaller rotational inertia. So, this paper is present the analysis of outer-rotor flux switching permanent magnet machine (ORFSPMM) for in-wheel drive applications. Therefore, the initial design improvement of 12S-14P outer-rotor flux switching permanent magnet machine (ORFSPMM) in-wheel machine is proposed. Then, optimize using combine local and global optimization methods in order to reach the maximum torque. Finally, the optimized 12S-14P ORFSPM has achieved much higher performance compared to initial design.



## Technical Session VI

Tracks: Communications and Renewable Energy  
Day Two, 14 September (Room: AYODYA D)

**[11.15] Optimization of 6Slots-7Poles & 12Slots-14Poles Flux-Switching Permanent Magnet Machines for Plug-in HEV**

*Mohd Fairoz Omar (Universiti Tun Hussien Onn Malaysia, Malaysia); Erwan Sulaiman (Universiti Tun Hussein Onn Malaysia, Malaysia)*

**Abstract:** Plug-in hybrid electric vehicle (PHEV) is independent of the internal combustion engine but acts as the auxiliary unit mostly on the electric drive system. Main while, the Flux-switching permanent magnet machine (FSPMM) has been studied in terms of structure with its operation principle been analyzed. To achieve a higher torque with a corresponding high power density and lower torque ripple, FSPMM with 6Slots-7Poles and 12Slots-14Poles, according investigations, are optimized based on their objective functions. Moreover, it analyzes several typical performance curves, such as cogging torque, flux linkage and back-EMF. Finally, the torque and corresponding power, efficiency and rotor mechanical strength analysis of optimized designed are obtained. The results indicate that FSPMM is a viable candidate for PHEV and also has good mechanical robustness with strong flux-weakening ability.



## Venue

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Email: [reservation@grandroyalpanghegar.com](mailto:reservation@grandroyalpanghegar.com)

Grand Royal Panghegar Hotel is located within walking distance of the historic Braga Street (Jalan Braga). It provides free Wi-Fi, a restaurant and ATMs for guest convenience.

### The Location

Enjoying a central location in Bandung, Grand Royal Panghegar offers convenient access to the Asia Africa Museum. The property is a 5 minute drive from Bandung's business district and a 15 minute drive from Husein Sastranegara International Airport.

### Inside the Rooms

Rooms at Grand Royal Panghegar have a TV, safe and tea/coffee making amenities. Attached bathrooms come equipped with a bathtub and shower. The studios have kitchenettes, a dining area and a flat-screen TV.

### Property Highlights

For guests' travel and professional needs, the hotel has a tour desk and a business center. Laundry and dry cleaning services are available.

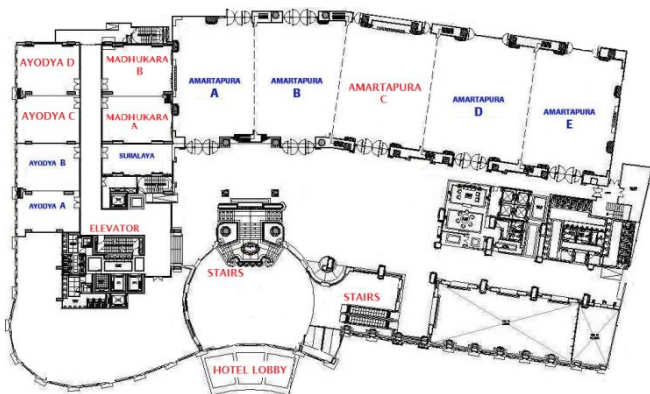
### Food & Drink

Grand Royal Panghegar's restaurant serves Indonesia, Chinese and Western dishes. Room service is also available.

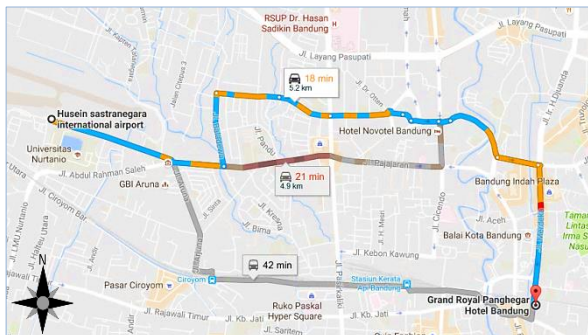


## Floor Map of Conference Rooms

The picture below shows the layout of the ICCEREC 2016 conference rooms:



## Transportation To and From Hotel



In downtown, this refined, art deco-inspired, Grand Royal Panghegar Hotel is a 5-minute walk from the chic cafes and boutiques of Braga Street, a 12-minute walk from Bandung train station and 6 km from Husein Sastranegara International Airport.

From here, guests can enjoy easy access to all that the lively city has to offer. With its convenient location, the hotel offers easy access to the city's must-see destinations.

