ROBOTICS SESSIONS

No.	Time	Session
1	11:30 - 12:30	Robotics 1 - Biomedic
2	12:30 - 14:00	Lunch
3	14:00 - 15:40	Robotics 2 - Implementation
4	15:40 16:10	Coffee Break
5	16:10 - 17:50	Robotics 3 – Artificial Intelligence

Robotics 1			
No	**Time**	**Paper**	**Abstract**
1	11:30 - 11:50	**Controlling an Exoskeleton with EMG Signal to Assist Load Carrying: a Personalized Calibration** B. Treussart (Univ. Paris-Saclay & CEA, France); F. Geffard (CEA, France); N. Vignais (Univ. Paris Sud, France); F. Marin (University of Technology of Compiegne (UTC), France)	Implementing an intuitive control law for an upperlimb exoskeleton to perform force augmentation is a challenging issue in the field of human-robot collaboration. The aim of this study is to design an innovative approach to calibrate electromyography (EMG) data in order to detect the intention to lift or put down a charge while wearing an upper-limb exoskeleton. Based on a low-cost EMG sensor bracelet placed around the arm (Myo armband, Thalmics Lab, Ontario), a subject-specific mapping procedure is implemented to discriminate motion intentions during lifting tasks with a 1-DoF upper-limb exoskeleton. The processing is divided into two main parts: (i) direction estimation with an artificial neural network, and (ii) a model-based intensity prediction. The mapping procedure has been tested on 7 healthy participants with a precision of 96.9±3.1% for the classification and a RMS Error of 3.8 ± 0.8N at the end effector. This study opens up the way for fast-deployment applications involving exoskeletons or cobots.
2	11:50 - 12:10	**Comparison of neural biomarker assessmentmethods for early detection of Alzheimer's disease** D. Yang and K.-S. Hong (Pusan National University, Korea)	With growing age, the cognitive ability degrades gradually as an aging factor. For a portion of people, the cognitive capability diminishes to a great extent, which will eventually result in Alzheimer's disease (AD). Mild cognitive impairment (MCI) is considered as an intermediate stage of AD. Diagnosis of AD patients at an early stage can reduce the chance of developing into a severe condition for cognition. This study aims to investigate the MCI assessment methods (statistical analysis and individual classification) for distinguishing the healthy control (HC) and MCI patients via functional nearinfrared spectroscopy (fNIRS). This study evaluated ten digital biomarkers from three brain regions and three mental tasks (Nback, Stroop, and verbal fluency task). Among these three tasks, the N-back task achieved the best accuracy (76.67 %) with biomarker 2 (HbO mean from 5 to 25 sec) and 7 (HbO slope from 0 to peak value) in the middle prefrontal cortex by linear discriminant analysis (LDA). Additionally, the statistical analysis results also indicated that a significant difference (pvalue< 0.05) existed between MCI and HC. However, the biomarkers, which achieved an individual classification accuracy more than 70%, could not be consistent with the biomarkers with p-value < 0.05. It reveals that statistical analysis technique still should be improved for diagnosing MCI individuals. Machine learning (LDA) can contribute as a tool by early prediction of AD via analyzing digital biomarkers using a non-invasive technique.
3	12:10 - 12:30	**Brain Tumor Classification with Fisher Vector and Linear Classifier for T1-weighted Contrast-enhanced MRI Images** A. F. Al Mubarok, A. H. Thias, A. Handayani, D. Danudirdjo, T.E. Rajab, (Bandung Institute of Technology, Indonesia	This paper presents the development of a computational method for classifying three types of brain tumors – i.e. meningioma, glioma and pituitary – from T1-weighted contrast-enhanced MRI images. The proposed method performs feature extraction on a specified set of tumor pixel intensity and uses the extracted information to determine the corresponding type of brain tumor. In feature extraction, the specified tumor area was first augmented to incorporate the sample of the surrounding tissue, prior to intensity extraction with dense local patches. Afterwards, the extracted intensity from each patch was fitted to a Gaussian Mixture Model (GMM) and processed into Fisher Vector representation. Furthermore, we applied four linear classifiers to the Fisher Vector representation and evaluated their classification performance. Our experiments showed that the logistic regression gave the best performance with average accuracy, sensitivity and specificity of 89.9%, 95.2%, and 89.0% respectively.

Robotics 2(Implementation)			
No	**Time**	**Paper**	**Abstract**
1	14:00 - 14:20	**Design and Kinematics Analysis of Parallel Robotic Arm for Urological Surgery** K. Tan, H. Shi, Y. Wang, and L. Yang (Xi'an Jiaotong University, China)	In this paper, a novel 4-DOF parallel surgical robot with parallelogram remote center-of-motion mechanism is proposed for transurethral resection of bladder tumors in urology. The emergence of minimally invasive surgery robots has enabled surgeons to achieve more dexterous and more reliable surgical procedures, but general surgical robot platforms have some shortcomings, such as high cost and complicated maintenance, which is not conducive to promotion in a wide range. Based on analysis of the manual operation characteristics of the surgeons in the current operation, the kinematics model of the surgical tool with D-H coordinates is established, and the Jacobian matrix of the cutting points in the instantaneous motion analysis is solved. A robotic arm scheme, including parallelogram remote center-of-motion mechanism, rope drive module and parallel actuator module, is designed. A kinematic model of the surgical robot is established. A calculation method of Jacobian matrix with numerical methods is provided. The Kinematic Conditioning Index defined to measure the operational dexterity of the robot in the global and local space is described. With the index as the optimization goal, optimized selection of parameters and configurations are performed. And the final physical model of surgical robot is shown. The novel surgical robot system can maintain good surgical performance, while greatly reducing system development costs and complexity.
2	14:20 - 14:40	**Mapping and Navigation with Four-wheeled Omnidirectional Robot Based on Robot Operating System** H. D. Quang (Univ. Eco. Technol. for Industries Hanoi); T. N. Manh, C. N. Manh, D. P. Tien and M. T. Van (Vietnam Acad. Sci. & Tech. Hanoi, Vietnam); D. H. T. Kim (Hanoi Univ. of Industry); V. N. T. Thanh, D. H. Duan (Hanoi Vocational College of High Tech., Vietnam)	The paper presents the Simultaneous Localization and Mapping, and navigation stack for the movement of Omni-directional self-driving robots based on the programming operating system for robots - Robot Operating System. The autonomous robot model used in the article is a four-wheeled Omnidirectional robot model, with Jetson TX2 high-performance processor for central processing tasks, with a depth camera and RPLIDAR sensors being simulated and building realistic models. Monitoring results of map, positioning, and navigation of robots are built based on mass of data obtained from Laser Scan, depth camera, and Point Cloud during the robot movement conducted by simulation based on GAZEBO software, and test experiment on ROS's RVIZ software. The achieved results show the efficiency, research direction of using ROS for controlling and monitoring autonomous robots, self-driving cars as well as developing intelligent robot systems.
3	14:40 - 15:00	**Preliminary Design of Seed Spreading Robot as an Educational Mechatronic Project** B. Arthaya, C. Naa, and Roinaldo (Parahyangan Catholic Univ., Indonesia)	Agriculture has gained a lot of attention from researcher recently. So many activities involve in preparing the plant, preserving, monitoring and harvesting. To maintain the quality of the crop product, a dedicated method and system have to be developed. This work focuses on developing a robot that capable of moving across an agriculture field while spreading the seed at a certain spreading distance or at every desired distance. Structural analysis has been carried out and a simple movement is investigated.
4	15:00 - 15:20	**Collector: A Vision-Based Semi-Autonomous Robot for Mangrove Forest Exploration and Research** M.D. T. Shahria and A. Rahman (North South Univ., Bangladesh); H. Zunair (Concordia Univ., Canada); S. B. Aziz (North South Univ., Bangladesh)	Sundarban, the largest mangrove forest in the world and one of the UNESCO's World Heritage site is considered to be in danger due to the effect of climate change which may lead to possible extinction of its wildlife such as Royal Bengal Tigers, due to the recent establishment of coal-fired power station near the forest and other man-made and natural hazards. To protect and save the forest, there is not enough data for researchers to understand the change of the micro-climate and how it's affecting its fauna and flora. Moreover, to understand how the coal-fired power plant is affecting this forest, the forest has to be constantly monitored. As of now, there is no constant patrolling robot specialized for mangrove forest or research program that is functioning in Sundarban, Bangladesh sector. To mitigate this problem, we propose a mangrove forest research robot that can traverse both semi-autonomously and manually to constantly monitor the forest. The robot collects weather data as well as PH level of soils and water, CO level, SO, air quality and water quality data and store in memory on the robot which can later be analyzed by the researchers accordingly. The paper also introduces a novel wheel design that can traverse in forest terrain. The robot is also able to make sense of its surroundings using computer vision. And finally, it is equipped with a LIDAR to measure forest density by 3D mapping. Overall, the paper proposes the design and implementation of a research robot that is specially designed for the mangrove forest environment.
5	15:20 - 15:40	**Experimental Implementation of Fixed-Time Leader-Follower Axial Alignment Tracking** P. Anggraeni (Bandung Polytechnic for Manufacturing, Indonesia); W. Candra, M. Defoort and M. Djemai (Polytechnic University Hauts-de-France, France)	In this paper, the fixed-time leader-follower axial alignment tracking problem for a group of cooperative agents is investigated. The leader is dynamic and only transmits its position and velocity to its neighbors. A fixed-time algorithm is proposed to solve the consensus tracking problem. Each follower estimates the leader state in a fixed-time using distributed observers. To solve the consensus problem, based on the leader estimate, the followers collectively align their positions with the leader position in a fixed-time which does not depend on the initial positions. The experimental results show the effectiveness and robustness of the proposed fixed-time leader-follower consensus algorithm even in the presence of physical limitations such as packet loss, information delay, etc.

Robotics 3(Artificial Intelligence)			
No	**Time**	**Paper**	**Abstract**
1	16:10 - 16:30	**Modeling and Simulation of a Multi-Robot System Architecture** A. R. Sadik, C. Goerick and M. Mühlig (Honda Research Institute Europe, Germany)	A Multi-Robot System (MRS) is the infrastructure of an intelligent cyber-physical system, where the robots understand the need of the human, and hence cooperate together to fulfill this need. Modeling the MRS is a crucial aspect of designing the proper system architecture, because this model can be used to simulate and measure the performance of the proposed architecture. However, an MRS architecture modeling is a very difficult problem, as it contains many dependent behaviors that dynamically change due to the current state of the system. In this paper, we introduce a general-purpose MRS case study, where the humans initiate requests that are achieved by the available robots. These requests require different plans that use the current capabilities of the available robots. After proposing an architecture that defines the solution components, three steps are followed. Firstly, modeling these components via a proper Architecture Description Language (ADL). Business Process Model and Notation (BPMN) is used as an ADL to represent the behaviors of every component, which is an essential need to model the solution. Secondly, simulating these components behaviors and interaction in form of software agents. Java Agent DEvelopment (JADE) middleware is used to develop the proposed model. JADE is based on a reactive agent approach, therefore it can simulate the dynamically interaction among the solution components. Finally, analyze the performance of the solution by defining a number of quantitative measurements, which can be obtained while simulating the system model, therefore the solution can be analyzed and compared to another architecture.
2	16:30 - 16:50	**Adaptive Dynamic Surface Control for Car Driving Simulator Based on Artificial Neural Network** K.N. Tien, D.H.T. Kim (Hanoi Univ. Industry); T.N.Manh & C.N. Manh (Vietnam Acad. Sci. & Tech.); N.P.V. Bach (VAST, Vietnam); H.D. Quang (Univ. Eco.-Tech. Ind., Vietnam)	This paper presents an adaptive controller for a four degrees of freedom car driving simulator. The actual model of the simulator is often deficient in the system's parameters or has the nonlinear uncertainties. Therefore an adaptive dynamic surface control based on radial basis function neural network is proposed to approximate the uncertain elements and ensure the stability of the system at the same time. The stability of the system is proved based on Lyapunov theorem. Simulation results verify the effectiveness and accuracy of the proposed algorithm and the comparison between using neural network and not using this element indicates the superiority of the proposed controller.
3	16:50 - 17:10	**Mamdani Based Fuzzy Logic Controller for A Wheeled Mobile Robot with Obstacle Avoidance Capability** A. Najmurrokhman, Kusnandar, U. Komarudin and Sunubroto (Univ. Jend. Achmad Yani, Indonesia); A. Sadiyoko (Parahyangan Catholic Univ., Indonesia); T. Iskanto (Univ. Jend. Achmad Yani, Indonesia)	Mobile robot is a type of robot that can move freely because it is equipped with motion elements such as wheels or legs. In guiding its motion, a mobile robot is equipped with a navigation system so that it can avoid obstacles. This paper describes the design and implementation of a wheeled mobile robot using fuzzy logic principles with Mamdani's fuzzy inference system so that the robot has the obstacles avoidance capability. Mobile robot is equipped with three pairs of HC-SR04 ultrasonic sensors to detect the distance between the robot and the obstacles. Fuzzy logic controller is installed in the Arduino microcontroller to generate an actuating signal for the DC motor mounted on each robot wheel. The whole fuzzy system is designed using three distance inputs obtained from ultrasonic sensors with each variable having three fuzzy sets with triangular and trapezoidal membership functions. Meanwhile, the output variable is the speed of movement of each wheels with each output variable has three fuzzy sets with triangular and trapezoidal membership functions. Based on the appropriate rule bases, fuzzy logic controllers are designed to achieve robot motion with the obstacle avoidance capability. The experimental results show the wheeled mobile robot can move along the trajectory without hitting the walls so that it has an obstacle avoidance capability. Compared to simulation results under Matlab, the accuracy of the speed value that rendered by the fuzzy inference system installed in Arduino microcontroller for some experimental data is approximately 96 %.
4	17:10 - 17:30	**Bottled Water Identification and Fraud Detection Using Spectroscopy and Convolutional Neural Network** P. Q. Thai (Ho Chi Minh City Univ. Tech., Vietnam); P.T. Dat (National Institute of Information& Comm. Tech., Japan)	In this paper, a sensing system using absorption spectroscopy and convolutional neural network to identify and classify bottled water was realized and demonstrated. With proper system design and measurement method, both systematic error and random noise were mitigated. Moreover, the implemented convolutional neural network was able to identify highly collinear samples with correct prediction probability of more than 99%. Consequentially, the system could accurately identify counterfeit bottled water samples.
5	17:30 - 17:50	**Development of Virtual Firefighting Robots Using Breitenberg and Fuzzy Logic Method** M. D. Putra and Y. Y. Nazaruddin (Bandung Institute of Technology, Indonesia)	Virtual robotics is an alternative way to test many methods effectively and quickly using artificial environments. Firefighting robot's model is an example of virtual robotics case in which virtual robot is developed to help firefighters in extinguishing the fire. In this paper, development of a maze solver simulation in artificial environment with a target to put out the fire is presented. For the control algorithm, Braitenberg and fuzzy logic methods have been developed in the system, and a comparison of the performance of both methods in firefighting case is examined and the results are presented. Virtual Robotics Experiment Platform (V-REP) and Python software is applied in the development. Two different scenarios in fire extinguishing case with several initial starting points are implemented in the test. The results show how the developed virtual firefighting robots work satisfactorily for the intended purposes and which techniques yield a faster time in solving the problem.

MECHATRONICS SESSIONS

No.	Time	Session
1	11:30 - 12:30	Mechatronics 1: Design & Control
2	12:30 - 14:00	Lunch
3	14:00 - 15:40	Mechatronics 2: Design & Control
4	15:40 16:10	Coffee Break
5	16:10 - 17:50	Mechatronics 3: Power & Renewable Energy

Mechatronics 1: Design and Control			
No	**Time**	**Paper**	**Abstract**
1	11:30 - 11:50	**Generic Linear ESO for the State Observation of Unknown Nonlinear SISO Systems** F. Amokrane, E. Piat, J. Abadie and A. Drouot (FEMTO-ST Institute, France); J.-A. Escareno (XLIM Laboratory, France)	This paper introduces a generic procedure for the state estimation of unknown nonlinear SISO systems, i.e. when no information is available on their structure, possibly time-varying parameters and potential disturbances. Such systems are met for instances for systems based on complex micro and nano mechatronic designs that are interacting in an unknown way with their environment at nano scales. This procedure relies on the choice of an arbitrary linear model and the use of a Generic Linear Extended State Observer, whose principle is also introduced in the paper. The proposed approach overcomes wellknown model-based nonlinear techniques in the sense that it is easy to implement, all the while avoiding any identification step and mathematical complexity. Simulation results involving nonlinear systems, subject to external disturbances, compare the performance of the proposed approach to the one of some modelfree nonlinear observers described in the literature.
2	11:50 - 12:10	**Attitude Control of Satellites Actuated by Hybrid Actuators** D. K. Giri (IIT KANPUR, INDIA, India)	This paper proposes combined attitude control algorithm for satellites which are actuated by a combination of magnetic and magneto-Coulombic actuators. Magnetic actuators are the ones which are responsible for providing magnetic control torques and are produced as an interaction between the current flowing through magnetic coils placed along the principal moment of inertia axes and local orbital magnetic field. The torques produced by magnetic actuators are constrained in a plane perpendicular to the local orbital magnetic field thereby resulting in an underactuation problem. The underactuation problem is overcome by using magneto-Coulombic actuators along with magnetic actuators. The magneto-Coulombic actuators provide Lorentz torque which are produced as an interaction between the charges present in the Coulomb shells placed along the principal axes of inertia with that of the local orbital magnetic field. In the case of magneto-Coulombic actuators, the torque is constrained in a plane containing the local orbital magnetic field and angular velocity of the satellite which also results in an underactuation problem. However, the hybrid actuator formulation is capable of providing control torque along any arbitrary direction. Asymptotic stability of the proposed control algorithm is proved and numerical simulations elucidate the efficacy of proposed control.
3	12:10 - 12:30	**Gain-Scheduled Control for Active Suspension Using Estimated Parameters** T. Matsuura, M. Matsushita, and G. Chen (Nanzan Univ., Japan); I. Takami (Systems Approach Institute, Japan)	This paper proposes a method to improve ride comfort for a vehicle concerning an active suspension. The purpose of active suspension is to suppress the vibration of the vehicle body. The variation of two parameters; sprung mass and tire stiffness, deteriorate ride comfort because the vibration of the vehicle body depends on them. It is necessary to design a controller corresponding to the variations of these parameters. We apply a gain scheduled control for the sprung mass. The control is scheduled by the measurements of some parameters. We estimate the sprung mass using Square Root Unscented Kalman Filter to apply the gain scheduled control. On the other hand, robust control is applied for the tire stiffness. Then, we formulate the active suspension with uncertain parameters as a finite of linear matrix inequalities by using polytopic representation. The uncertainties are put into one matrix using descriptor representation to simply design the controller. We illustrate the effectiveness of the proposed method by simulation and evaluation based on International Organization of Standardization 2631-1.

Mechatronics 2: Design and Control			
No	**Time**	**Paper**	**Abstract**
1	14:00 - 14:20	**Robust Control of Infinite-dimensional Mechatronic Systems** A. Iftar (Eskisehir Technical Univ., Turkey)	Robust stabilizing controller design problem for infinite-dimensional mechatronic systems is considered. A controller design approach which uses a frequency-dependent robustness bound is proposed to solve this problem. Once the robustness bound is obtained, the proposed approach is completely based on the nominal model of the given system.
2	14:20 - 14:40	**Adaptive Control for Jib Crane System with Rope Hoisting and Uncertain Parameters** S. Ishikura and G. Chen (Nanzan Univ., Japan); I. Takami (Systems Approach Institute, Japan)	This paper proposes a robust control system which consists of a robust controller and Model Reference Adaptive Control law for an uncertain jib crane system with rope hoisting. In this study, decentralized control comprised of two independent controllers is utilized to control the jib crane. To suppress the influences of system uncertainties e.g., variations of the rope length, nonlinear friction and so on, we design the control system composed of a linear robust controller and an adaptive law for the positioning system of the trolley. We apply the linear robust controller for the variation of system characteristics caused by hoisting the rope. On the other hand, the adaptive law is designed to estimate nonlinear friction. The characteristic of this study is to cope with nonlinear friction by using the robust controller with the adaptive law. The adaptive law is utilized for the estimation and compensation of nonlinear friction. Besides, we approximate nonlinear friction by a nonlinear function in the adaptive law. We show the exponential stability for the system with the proposed method by using Linear Matrix Inequality. Finally, we verify the effectiveness of the adaptive law by contrasting the proposed method with the only robust controller in the simulation of load transferring.
3	14:40 - 15:00	**ARX/ARMAX Modeling and Fractional Order Control of Surface Roughness in Turning Nano-Composites** R. Sekhar (Symbiosis Institute of Tech., India); T. Singh (Thapar Institute of Eng. & Tech., India); P. Shah (Symbiosis International Univ., India);	Control of machining systems is important to ensure manufacturing quality. In this paper, multi input single output system of surface roughness generated during turning of Al/Mg/CNT composites was identified by ARX and ARMAX models of varying orders. The best of identified models were selected for control based on FIT, MSE, order, number of parameters and residuals. FPID controller was employed on the selected models to control output surface roughness. Of the three inputs, one was manipulated at a time keeping the other two constant at their mid levels based on experimental design. FPID parameter λ was also varied for improving controller performance. ARMAX model obtained better time domain characteristics as compared to ARX model. This result was especially evident for manipulated variables of feed rate and depth of cut, which effect surface roughness the most during machining.
4	15:00 - 15:20	**Closed Loop System Identification of a D.C. Motor Using Fractional Order Model** P. Shah (Symbiosis International Univ., India) and R. Sekhar (Symbiosis Institute of Tech., Pune, India)	Good mathematical models are vital for design of model based controllers and accurate system response predictions. Such mathematical models can be derived by employing either first principle method or empirical method. Empirical method involves model identification based on input and output data. This method is also known as system identification. Many real-time systems are inherently closed loop systems. Moreover, it is not possible to get data from an open loop system in process industry. In such cases, closed loop system identification is useful. In system identification, selection of model structure is critical. In this paper, a first order integer model and four different fractional models were identified for a D.C. motor in closed loop. Fractional order model parameters were optimized by minimization of sum of squared errors (SSE), using Genetic Algorithm. Results show that fractional order models fit better than first order integer model. Among the four fractional models identified, the fractional model with least parameters yielded best result.
5	15:20 - 15:40	**Simulation of a Sliding Mode Controller for a Uniaxial Seismic Shake Table** C.I.C. Crisostomo, R.V.C. Malalis, R.S. Saysay, and R.G. Baldovin (De La Salle Univ., Philippines	Damage to essential infrastructures has been the key reason why earthquakes are considered to be the deadliest natural hazard. Hence, it is necessary to properly simulate and test the rigidity of building designs against earthquake vibrations. Small-scale shake table tests have been developed to observe the performance of structure designs against dynamic loading that resemble a real earthquake. In a shake table, the controller serves as a key component that ensures proper movement of the loading plate to provide accurate earthquake simulation movement. In this paper, a sliding mode controller has been proposed and simulated for a uniaxial seismic shake table using MATLAB Simulink.

Mechatronics 3: Power & Renewable Energy			
No	**Time**	**Paper**	**Abstract**
1	16:10 - 16:30	**Comparative Study for PV Power Stabilization Technology Using Matlab Simulink** M. Kuncoro and I. Garniwa (Univ. of Indonesia); R. Darussalam (Indonesian Institute of Sciences, Indonesia)	Nowadays the global utilization of solar energy for electricity generation has greatly increased. But the amount is still very small of the existing potential. The classic issue in the utilization of solar energy is intermittent solar energy and power fluctuations. The power of the PV is not fixed, unpredictable and dependent on natural factors, namely irradiation, temperature and the influence of shadows. Several methods have been proposed to overcome intermittent energy and fluctuations in PV power including the Hybrid PV Generators, Power Curtailment, Geographical Dispersed, and Electrical Storage methods. Each method has characteristics in its application. Hybrid PV generators are relatively easy to apply but are expensive and cause greenhouse gases. Power Curtailment is easy to apply but inefficient because a lot of energy is wasted. Geographical Dispersed requires large land. Electrical storage requires a large energy storage capacity. To overcome this, a new method is proposed, namely, Dynamic Power Injection which is a combination of MPPT, Power Curtailment, and Electrical Storage. A comparative study with simulation using Simulink Matlab against 3 methods of PV power stabilization. The simulation results show that the DPI method is the most effective and efficient way to increase the stability of PV power.
2	16:30 - 16:50	**Power Electronics in the Engineering Field: A Perception Comparison Between Undergraduate & Graduate Students Using Fuzzy Logic Type 2 Signal Detection Theory** G. E. B. Reyes and P. Ponce (Tecnologico de Monterrey, Mexico); R. Ayyanar (Arizona State Univ., USA)	This paper proposes the implementation and analysis of a student survey to evaluate the perception of undergraduate and graduate engineering students have regarding the use of power electronics in the new electrical field. Also, a comparison between the undergraduate power electronics program of Tecnologico de Monterrey and the graduate program of Arizona State University is presented. The objective of this work is to use Fuzzy Logic Type 2 Signal Detection Theory to evaluate the results of the surveys and find the qualities of both educational models and propose a general educational methodology to standardize the general concepts required for future generations of engineers that intend to work in the electrical field. The results obtained demonstrate that both graduate and undergraduate students are sure that their power electronics programs are adequate to their specialization necessities, considering even the uncertainty levels when answering the perception survey
3	16:50 - 17:10	**Initial Concept for Increasing Polycrystalline Fixed Solar Panel Efficiency with Water Treatment** S. Taruna, L. Halim and B. Arthaya (Parahyangan Catholic University, Indonesia)	Fossil energy has an impact on environmental pollution, will be replaced by renewable energy. One of renewable energy is solar energy. Solar panel is a device that can convert sunlight into electricity. However, there is a factor such as temperature that can reduce the efficiency of solar panel. Therefore, this paper shows initial concept used to cool solar panel polycrystalline that have dimension 1480 mm x 680 mm x 35 mm with water treatment method that is to drain water on top of polycrystalline solar panel with water pump and put the solar panel on top of a water tank so that solar panel temperature dan ambient temperature below the solar panel are cooler. Efficiency improvement of polycrystalline solar panel occurs, while given water treatment method. However, the initial efficiency of solar panels is 11.9%. The time needed to decreasing the temperature the solar panel from 35.8 ˚C to 25.8 ˚C is 3.35 minutes and the solar panel cooling starts at 35.8 ˚C to 25.8 ˚C for 3.35 minutes with a water flow rate of 6 liters / min. Thus, the minimum water in a water bath is 20.1 liters. The water pump consumes 4.02 WattHour energy. So that the total solar energy starting at 08.00 AM - 01.00 PM after the pump is used is 420.18 WattHour from a total of 424.2 WattHour
4	17:10 - 17:30	**Arduino Uno-based Maximum Power Point Tracking for PV Module Using Perturb and Observe Algorithm** A. O. Batu, H. Soepardjo and P. Prajitno (Universitas Indonesia)	Using photovoltaic module, electrical energy obtained by converting energy from the irradiation of the sun. However, the disadvantages using photovoltaic module is when irradiation from the sun changes which moves the maximum power point in P-V curve resulting in output power obtained become not at its maximum power. The method to extract maximum power available from changing energy source in example solar photovoltaic module are known as Maximum Power Point Tracking (MPPT). One of MPPT techniques is called Perturb and Observe. Maximum power achieved when the derivative of power over the derivative of voltage results in zero. Arduino Uno used as microcontroller which process the readings from voltage and current sensor while also controlling DC-DC Booster which able to move the operating voltage of the system. Experimental results yield the output power from system greater than output power from photovoltaic module without using MPPT as result from the system working at operating voltage when the voltage of maximum power exists.
5	17:30 - 17:50	**Power Coefficient Performance of Savionus Wind Turbine Using CFD Analysis** M. Trisakti, L. Halim and B. Arthaya (Parahyangan Catholic University, Indonesia)	This paper aims to study the power coefficient of the Savionus wind turbine using Computational Fluid Dynamics (CFD) analysis. Power coefficient is one of the parameter from wind turbine to defined the ratio between available power from the wind and the extracted power from rotor. To analyze power coefficient, then 3D model of the Savionus wind turbine is needed. The 3D model included the rotor height and diameter. The height of the rotor in this research is 600mm and the diameter is 580mm. In this research, CFD is used to analyzed the behavior of Savionus wind turbine under the airfield conditions and to determine power coefficient of the wind turbine. The wind speed on the airfield is set to 5m/s with the angular velocity 5m/s. The value of power coefficient from the simulation is 0,301 and from the theoretical calculation is 0,268. The comparison power coefficient result between simulation and theoretical calculation has error value 0,033.

SYSTEMS SESSIONS

No.	Time	Session
1	11:30 - 12:30	Systems 1: Security
2	12:30 - 14:00	Lunch
3	14:00 - 15:40	Systems 2: Optimization
4	15:40 16:10	Coffee Break
5	16:10 - 17:50	Systems 3: Biomedic

Systems 1 : Security			
No	**Time**	**Paper**	**Abstract**
1	11:30 - 11:50	**Designing a Testbed to Assess Secure Control of Cyber-Physical Systems** E. Park (Univ. Southern Queensland, Australia); K. C. Chan (University of Southern Queensland & University of New South Wales, Australia)	The world today increasingly relies upon the usage of smart devices which have the capability to communicate with other systems and the cloud. Cyber-Physical Systems (CPS) are one such application of smart devices making use of network mediums for augmented communication capabilities. Problems and risks arise when the messages being sent via the network are not secure, as this would allow adversaries to manipulate and ultimately compromise the entire system. In the past, implementing security to these systems have been more reactive than proactive. This paper illustrates the design of a CPS testbed in which different security implementation methods can be tested upon and analyzed. The abstraction of the CPS testbed and an adversary model that shows where attacks may occur are then discussed.
2	11:50 - 12:10	**Security System ATM Machine with One-Time Passcode on M-Banking Application** R. Munadi and A. I. Irawan (Telkom University, Indonesia)	Automated Teller Machine (ATM) security system currently still uses magnetic cards and static PIN as its security system, which create many security holes. This security hole in many cases caused many bank customers to lose money mysteriously. In this paper a two-factor authentication system which use atm card and dynamic PIN is proposed to overcome this security hole. In this paper, a prototype of an ATM machine and m-banking application were built. The ATM machine prototype uses several components such as the Raspberry Pi 3B, smart card, smart card reader / writer, keypad number and LCD monitor. Dynamic PINs are generated using the CSPRNGSHA1-MWC random number generator. In developing prototypes, the framework that used in this study is based on mobile applications and cloud computing. To find out the quality of the prototype, we tested it qualitatively and quantitatively. Qualitatively we tested the prototype using a questionnaire using 165 sample respondents to provide an opinion about the safety and comfort of our prototype and quantitatively we measured the prototype to find out the level of randomness of the generated PIN and the QoS of the prototype that had been made
3	12:10 - 12:30	**Integration of Blockchains with Management Information Systems** K. C. Chan, X. Zhou and R. Gururajan (Univ. Southern Queensland, Australia); X. Zhou (Fujian Vocational College of Agriculture, Australia); M. Ally and M. Gardiner (Univ. Southern Queensland, Australia)	In the era of the fourth industrial revolution (Industry 4.0), many Management Information Systems (MIS) integrate real-time data collection and use technologies such as big data, machine learning, and cloud computing, to foster a wide range of creative innovations, business improvements, and new business models and processes. However, the integration of blockchain with MIS offers the blockchain trilemma of security, decentralisation and scalability. MIS are usually Web 2.0 clientserver applications that include the front end web systems and back end databases; while blockchain systems are Web 3.0 decentralised applications. MIS are usually private systems that a single party controls and manages; while blockchain systems are usually public, and any party can join and participate. This paper clarifies the key concepts and illustrates with figures, the implementation of public, private and consortium blockchains on the Ethereum platform. Ultimately, the paper presents a framework for building a private blockchain system on the public Ethereum blockchain. Then, integrating the Web 2.0 client-server applications that are commonly used in MIS with Web 3.0 decentralisedblockchain applications.

Systems 2: Optimization			
No	**Time**	**Paper**	**Abstract**
1	14:00 - 14:20	**Template-based Space-saving Approach for SMS Storage in A Server** S. Newaz (Bangladesh Univ. of Eng. &Tech.); A. H. Uddin (Khulna Univ., Bangladesh); A. B. M. Alim Al Islam (Bangladesh Univ. of Eng. &Tech., Bangladesh)	Nowadays, SMS based communication is common in almost every sectors. Private and government organizations deliver and receive millions of SMSs every year. This huge amount of SMSs can be used later in several useful ways. However, the storage space required for storing these huge amount SMSs creates so much complexity for the SMS service providing organizations that they cannot save the details of every SMS. Therefore, in this paper, we introduce a template-oriented SMS storage system based on a graph-theoretic approach, which reduces storage space requirements significantly. We achieve the storage space reduction through considering the fixed parts of SMSs as graph nodes and variable parts as graph edges. We perform experimentation on real SMS data collected from different telecom operators of Bangladesh. Our experimentation confirms that our proposed system substantially reduces the storage space requirement. To the best of our knowledge, we are the first to propose such a space-saving system for storing SMSs.
2	14:20 - 14:40	**Parking Space Optimization Using Simplex Method Linear Programming** C. I. Crisostomo and R. G. Baldovino (De La Salle University, Philippines)	The rise in private vehicles has led to the rise in the demand for parking, and this demand calls for the need of existing parking areas to be fully optimized in order to accommodate as much vehicles as possible. With the utilization of linear programming, a proposed optimization of the Enrique Razon Sports Center parking in DLSU, Manila is proposed. Since its current driveway is much wider than the minimum width required by the Building Code of the Philippines, it is narrowed down in order to make room for more parking slots. The Simplex Method was used in order to obtain the maximized parking area on each floor, which resulted in the addition of 36 slots per floor. This optimization will increase the building's parking capacity and will bring added convenience to the Lasallian academic community.
3	14:40 - 15:00	**Improving Temperature Sensor Accuracy in the IoT Trainer Kit by Linear Regression Method** M. Rahayu (Bandung State Polytechnic, Indonesia)	The rapid development of Internet of Things (IoT) makes people in higher education must train their students to be better prepared in advancing and implementing that topic. Therefore, to improve student comprehension, we need tools such as trainer kit as a learning media. The IoT Trainer Kit has been created in Bandung State Polytechnic called the I-Kit which has many features. Inputs include DHT 11 temperature, humidity sensors and RFID. The controller used is Arduino Nano. Output for features in the trainer kit will appear on the web page. This Kit also has several communication devices such as Bluetooth, LoRa, ESP 8266 and SIM 800. However, before using the I-Kit as a learning medium, we must make the features in this trainer kit precision first. But the training kit is also not necessarily reliable, it must be tested and improved for the performance of its features. In this paper, we have improved accuracy of the DHT 11 temperature sensor on the I-Kit. Improvement was carried out using the linear regression method, to find out the correlation between The temperature of the thermometer with the temperature read on the sensor in the trainer's kit. Then this regression equation is entered into the temperature program in Arduino. When comparison is made between error and deviation standard before and after doing regression, the error rate is decrease by 80.9 % from 7.3 become 1.39. The deviation standard which represents tolerance from sensor decrease 20% from 0.88 becomes 0.704.
4	15:00 - 15:20	**Performance of SC-FDMA for LTE Uplink Under Different Modulation Schemes** J. S. Roy (School of Electronics Engineering, KIIT University, India)	Single-carrier frequency division multiple access (SC-FDMA) is common choice for uplink of long term evolution (LTE) standard for broadband wireless communication. SC-FDMA is preferred for LTE uplink mainly due to its advantage of having low peak-to-average power ratio (PAPR) during signal transmission. The performance of SC-FDMA depends on modulation scheme used for it. In this paper performance of SC-FDMA for LTE uplink is compared on the basis of symbol error rate (SER) using different types of modulation schemes, like, binary phase shift keying (BPSK), quadrature phase shift keying (QPSK) and quadrature amplitude modulation (QAM). Also the performance of SC-FDMA is compared with orthogonal frequency division multiplexing (OFDM). In this paper, mainly variation of symbol error rate (SER) with signal-tonoise ratio (SNR) is investigated. It is found that by increasing spreading factor symbol error rate is reduced for SC-FDMA system and for spreading factor of 64 for SNR=20 dB, SER is of the order of 10-4. A comparison of SER for SCFDMA system with BPSK, QPSK, 16-QAM and 64-QAM shows that BPSK has lowest SER. When compared between localized and distributed mappings for SC-FDMA and OFDM, it is found that localized schemes have lower SER for both the cases than distributed scheme.
5	15:20 - 15:40	**Miniaturization of Circular Resonators Waveguide at SHF Frequency Using Floral Foam Electromagnetic Engineering** H. Ludiyati et al. (Politeknik Negeri Bandung, Indonesia)	In the commercial, telecommunications equipment is provided in a portable dimension. Some researchers have analyzed that the presence of high permittivity dielectric material in telecommunications equipment can reduce the dimensions of the device. The device that has been realized using dielectric material with smaller dimensions is a microstrip antenna. This research can be realized in other telecommunications devices such as cavity resonators by inserting dielectric material into the resonator. Dielectric material that can be used are FR4 epoxy, styrofoam and floral foam. On this final project, dielectric material used a floral foam because the latest research shows that floral foam can increase the permittivity higher than FR4 Epoxy and styrofoam. To increase the permittivity value, the electromagnetic properties of floral foam are disturbed by adding conductor wires according to the information on the distribution of the maximum electric field magnitude of a TM01 electromagnetic wave mode. The measurement results show that the conventional cavity resonator with 26 mm of radius and artificial cavity resonator with 17,8 mm of radius work at frequency of 5,2 GHz. It shows that the dielectric material floral foam has succeeded in miniaturizing the cavity resonator with a radius difference of 31,4%.

Systems 3: Biomedics			
No	**Time**	**Paper**	**Abstract**
1	16:10 - 16:30	**Analysis of RNA-Seq Data of 10000 Samples of Single-cell Transcriptomes** T. Afroze, A. Rahman, M. Sarkar, A. Sadique, J. Alam (NSU Genome Research Institute Dhaka, Bangladesh); S. Rahman (BUET Dhaka, Bangladesh) and M. Hossain (NSU Genome Research Institute Dhaka, Bangladesh)	Human pregnancies underlie many common pregnancy diseases for trophoblast-decidual interaction, such as pre-eclampsia, still birth. As uterine mucosa transforms into the decidua and fetal placenta implants there, many morphological changes occur due to immunological, metabolical changes. In this work, we analyzed single-cell RNA-seq data of pregnant women. The data was downloaded from the study of the University of Cambridge's Sarah Teichman Lab (http://data.teichmann.org &www.ebi.ac.uk) (Single-cell reconstruction of the early maternal-fetal interface in humans). We analyzed disease symptoms and investigated responsible genes by checking RNA-editing sites and gene functionality. The aim of this study is to identify editing sites, their impact on pregnancy complications and to make a profile for detecting disease criteria. The result shows the chromosome-wise distribution of RNA-editing sites which have a reflection of intra-chromosomal distribution. We found that the highest edited sites are in the regulatory region and also classified genes according to their functions and identified their role in pregnancy complications. Our result indicates that there are common RNA editing sites for a particular cell-like T-cell and CD-cell with probability more than 0.5.
2	16:30 - 16:50	**Brain Tumor Semi-Automatic Segmentation on MRI-T1 Weighted Image Using Active Contour Models** A. H. Thias, A. F. Al Mubarok, A. Handayani, D. Danudirdjo and T. E. Rajab (Institut Teknologi Bandung, Indonesia)	Brain tumor is a collection of abnormal growth in brain tissue. One of the methods to diagnose brain tumor is using magnetic resonance imaging (MRI) to produce images of brain tissue, on which the radiologist will perform manual segmentation of the tumor boundary. Manual segmentation poses a challenge in a large number of images. A Computer Aided Diagnosis (CAD) system can be designed to perform an automated segmentation of tumor boundary, thus providing more efficient and objective results. In this work, we compared and analyze the performance of snake active contour (SAC), morphological active contour without edge (MACWE), and morphological geodesic active contour (MGAC) segmentation algorithms on 3049 brain MRI T1-weighted images containing glioma, meningioma, or pituitary tumor. The performance of these algorithms quantified using the Jaccard Similarity Index (JSI) and the Hausdorff Distance (HD). The best segmentation results were obtained by the MGAC with the average JSI and HD of 71.18% and 4.04 pixels, respectively. The JSI of MGAC segmentation was highest for meningioma (77.94%) and lowest for glioma (66.31%) while a random shift in contour initialization affected the glioma and pituitary tumors more than the meningiomas, as shown by the respective post-shift JSI of 76.42%, 76.84%, and 85.98% accuracy for glioma, pituitary, and meningioma.
3	16:50 - 17:10	**Development of On-Demand Controller for Continuous Positive Airways Pressure** Y. Amrulloh (Univ. Islam Indonesia, Indonesia)	Continuous Positive Airway Pressure (CPAP) is one of the primary treatments for sleep apnea. In a conventional CPAP, the device produces a constant air pressure to maintain the opening of the respiratory tract. The common problem found in the conventional CPAP is discomfort due to long term air pressure during sleep. Further, in subjects who undergo training to strengthen upper airways muscles, the application of high air pressure during non-apnea period may reduce the muscular strength. In this work, we propose to develop an ondemand CPAP controller that follows the normal respiratory pressure during non-apnea event and produce a pre-set positive air pressure during the sleep apnea event. Not only improve the comfortability of the subjects, our method also useful for patients who plan to discontinue using CPAP in the future. Our proposed model was developed using LabView software. We simulated breathing signal to represent normal breathing and apnea condition. Then a proportional and integral control system was developed for regulating the air pressure. The results show that in 60 trials with several setting points, our model achieved the average rise time 0.75s, overshoot 3.79%, and settling time 1.72s. The total accuracy of the method was 100% in detection of sleep apnea events. Our method can be developed into a low-cost device for sleep apnea treatment in Indonesia.
4	17:10 - 17:30	**Modeling of Tumor Growth: An Incremental Development Framework** L. Iftekhar, T. Islam, M. S. Kamal and S. Amir (North South Univ., Bangladesh)	Cancer is a disease that is being extensively studied for half a century from numerous aspects and by researchers from varied fields including Medicine, Biology, Chemistry, Psychology, Engineering, Mathematics and more. A crucial base of these is the study of how tumors form, grow and become cancerous. The growth and spread of tumors, when charted, often follow the graphs of simple functions of time, and many mathematical models have been proposed to track these phenomena. This paper presents a short systematic description of the popular models in literature for a control engineering audience. The models are presented progressively with increasing complexity and a framework is developed to utilize this progression as a pedagogical tool for acquiring concepts of control systems. System modelling and analysis topics are mapped to the various models of tumor growth and a comparative analysis is presented through simulation results.
5	17:30 - 17:50		

SYSTEMS SESSIONS

No.	Time	Session
1	11:30 - 12:30	MoRSE 1: Simulator
2	12:30 - 14:00	Lunch
3	14:00 - 15:40	MoRSE 2: Design
4	15:40 16:10	Coffee Break
5	16:10 - 17:50	MoRSE 3: Implementation

MoRSE 1: Simulator			
No	**Time**	**Paper**	**Abstract**
1	11:30 - 11:50	**Game-Theoretic and Genetic-based Approach for Cooperative Mission-oriented Swarms of Drones** Nico Saputro (Parahyangan Catholic University, Indonesia)	The artificial intelligence applied to a drone has enabled a drone-swarm to operate autonomously as a group and unlocked many new potential applications that deal with more sophisticated tasks. In this paper, we present a game theory mechanism and nature-inspired algorithm that enable a fully autonomous drone-swarm to perform cooperative mission-oriented operations to some distinct targets. These operations require a small-team formation for each target with the potential overlap team member between teams and multiple task assignment and operations scheduling to ensure the mission success in a timely manner. The drone-swarm is modeled and simulated as a multi-agents system. A fully autonomous drone is represented as an intelligent agent with a certain dynamic risk tolerance level. An agent can decide based on the current risk tolerance level to participate in the auction-based team formation for a specific target while the genetic algorithm approach is used for the task assignment and operations scheduling. A multi-agent system simulator, which can be used to evaluate and analyze the proposed team formation, task assignment, and operation schedule; is built using Netlogo, a multi-agent programmable modeling environment. A case study and its simulation results are provided to demonstrate the potential use of the proposed approach.
2	11:50 - 12:10	**Cybersickness Evaluation While Using Driving Simulator in a Head-Mounted Display Environment** D.C.D. Suwarno; T. Wijayanto and F. Trapsilawati (Univ. Gadjah Mada, Indonesia)	This study aims to investigate the cybersickness severity in a driving simulator presented with two different displays: a head-mounted display and a three-monitor display. Twenty students participated in this study. They performed a set of driving task on a driving simulator. Half participants performed the task using the head-mounted display (HMD group), and the other half performed using the monitor display screen (MD group). Here, we found that using a head-mounted display to display the virtual environment of the driving simulator will cause cybersickness more severe than using the monitor display. Participants in the HMD group reported higher nausea, oculomotor, and disorientation problem after performing the driving simulation task. Of the three symptoms, the disorientation was reported to be the most severe symptom contribute to cybersickness occurrence when using head mounted display.
3	12:10 - 12:30	**VR Based Visualization of Robotic Workcells Using Cryengine** E.O. Karaoğlu and D. Tukel (Dogus Univ., Turkey); B. Arthaya (Parahyangan Catholic Univ., Indonesia)	Virtual reality technology has been traditionally associated with the gaming industry, it is being applied in various fields to manipulate physical surroundings such as medicine, military, production and manufacturing. Industrial virtual reality can be a powerful tool for technical people as human-machine interface and visualization tool. Digital twin of products, services and processes helps the control and monitoring of workspace. In our project, we design a digital twin of a robotic workcell using a game engine.

MoRSE 2: Design			
No	**Time**	**Paper**	**Abstract**
1	14:00 - 14:20	**Efficient Pavement Crack Area Classification Using Gaussian Mixture Model Based Features** S. Ogawa and K. Matsushima (National Inst. of Tech., Kurume College, Japan); O. Takahashi (Nagaoka Univ. of Tech., Japan)	Pavement cracks are caused by various factors such as aged deterioration, load and weather conditions, and so on. As these reduce the safety of road traffic, regular inspections are necessary. In recent years, various crack detection methods using pavement images have been proposed. However, those often have problems with accuracy and processing time. Therefore, in order to reduce the amount of calculation, we devised an efficient method to narrow down the area containing cracks in the pavement image. The method consists of crack feature extraction combining Gaussian Mixture Model and image filtering, and classification by Support Vector Machine. The experimental results show that our proposed method is the most efficient in accuracy and processing speed compared with the conventional methods.
2	14:20 - 14:40	**A Millimeter-Wave Phased Array for Communication and Sensing Systems** C. Huynh, J. Lee, J. Bae, D. Lee, M.-J. Hsiao and C. Nguyen (Texas A&M University, USA)	A 94-GHz 4x4 phased array frontend capable of two-dimensional scanning with orthogonal polarizations for wireless communication and radar systems has been designed. The phased array frontend resolves the RF signal leakage and isolation dilemma encountered in typical systems employing a single antenna for both transmission and reception, effectively maximizing the system's dynamic range and linearity operation as well as minimizing the noise figure. Simulations at 94 GHz show high performance for the phased array frontend. In the receive (RX) mode, it has noise figure of 8.5/8.4dB at the radiating element, RMS phase error of 2.38/2.36° and gain error of 1.22/1.27dB, and total array gain of 17/22.3dB for H/V polarization, respectively, and ultra-high isolations from TXAntenna (-200/-190dB), TX-RX (-106/-180dB) and V-H antenna ports (66/69dB). In the Transmit (TX) mode at 94 GHz, it achieves a radiated power of 7.8 dBm at the element antenna and RMS gain and phase errors of 1.28 dB and 2.19° at 94 GHz, respectively.
3	14:40 - 15:00	**Analysis of Power, Temperature, and Performance on Mobile Application Processor** D. H. Lee, H. H. Cho and O. H. Jeong (Sogang University, Korea)	Recent mobile devices have multiple cores and high operating frequencies. As a result, their performance has increased, along with their power consumption and temperature, which have become problems to solve. To understand how to operate a CPU efficiently while solving these problems, we study the relationship between power consumption, temperature, and performance as the number of operating cores and operating frequency increases. We use CPU power consumption that we measured, use steady-state temperature of the CPU calculated by Therminator and use DMIPS that is an index of CPU performance measured by Dhrystone. The experimental results show that the performance increases and temperature decreases as the number of operating cores increases for the same power consumption. In addition, for the same performance, power consumption and temperature decrease as the number of operating cores increases. Consequentially, the quad-core shows a 75.54% performance improvement and 36.04% reductions in temperature compared to the single-core for the same power consumption. In addition, when at the same performance, the quad-core has decreased power consumption and temperature compared to the single-core, 49.42% and 53.94%, respectively. Therefore, operating by increasing the number of cores in the multi-core application processor will effectively increase the performance and lower the power consumption and temperature.
4	15:00 - 15:20	**Devising A New Portable Electronic Firing System** M. Ali and A. B. M. Alim Al Islam (Bangladesh Univ. of Eng. and Tech., Bangladesh)	Traditional method of guarding by human beings (for example soldiers) is a laborious task, which can be leveraged through exploiting the technological revolution of electronics. Accordingly, in this paper, we present design and development of a new portable electronic firing system that can facilitate the task of guarding. Our system features remote control firing in addition to its portability. Moreover, it incorporates the notion of zeroing that is yet to be focused for electronic firing systems in the literature. Another aspect that is also yet to be focused in the literature in this regard is user-level testing. We perform user-level testing of our developed electronic firing system in testbed settings that adopt a toy pistol as the firing device. We compare performance of our developed system with that of professional human firers. Our experimental results demonstrate that performance of firing by our developed system is better than that of the professional firers. Nonetheless, we analyze how the performance of our developed system will be in real cases as per the correlations between the professional firers' performances in our testbed and in real cases.
5	15:20 - 15:40	**Design of Propeller Turbine for Micro-Hydro Electric Power Plant at Cikapundung River - Bandung** R. Sudiro; B. Arthaya; L. Halim (Parahyangan Catholic University, Indonesia)	Electricity has become a primary human need and its demand is increasing every year. while the majority of power plants use fossil energy with limited reserves which causes an increase in electricity prices. Therefore, we need an alternative energy source as a more economical power plant. One of the solutions is a micro hydro power plant that uses water energy as its power source. Propeller turbine types of micro-hydro-electric power plant is chosen based on the natural potential at Cikapundung river, which is the height difference water surface (h) of 2 m and the water flow rate (Q) of 0,01 - 0,11 m3/s. With its potential, the output result of propeller turbine can generate 637,24 Watt electrical power with efficiency up to 90,5%.

MoRSE 3: Implementation			
No	**Time**	**Paper**	**Abstract**
1	16:10 - 16:30	**Automatic Pavement Crack Detection Using Multi-Scale Image and Neighborhoods Information** T. Komori and K. Matsushima (National Inst. of Tech., Kurume College, Japan); Osamu Takahashi (Nagaoka Univ. of Tech., Japan)	Pavement cracks are dangerous because they can cause accidents such as tire punctures, slips, and collapses. Therefore, it is necessary to repair them properly. In recent years, various crack detection methods using pavement images have been proposed. However, in many cases, there are problems with accuracy and processing time. In this paper, we propose a new crack detection method using multi-scale image and neighborhood information. Experimental results show that the proposed method is superior to the most advanced crack detection methods in both accuracy and processing time.
2	16:30 - 16:50	**DenseNet with Spatial Pyramid Pooling for Industrial Oil Palm Plantation Detection** S. R. Abdani and M. A. Zulkifley (Univ. Kebangsaan Malaysia, Malaysia)	Palm oil is the most consumed vegetable oil with many proven benefits to human health. Apart from domestic usage, it has also been widely adopted as a source for biofuel, which produces less carbon footprint compared to the normal fuel. Because of its popularity, a lot of countries has systematically planted oil palm trees to make sure that it will be sustainable for the future generation. Rigorous monitoring of the land used for oil palm plantations is an important step in sustainable farming. Remote sensing approach through satellite imagery has been used to detect the industrial plantations, where their size can be inferred from the segmented regions. Therefore, a good monitoring system relies heavily on accurate detection of the oil palm trees from the satellite images. However, it is hard to detect the plantations because of non-uniformity in the age of oil palm trees, where a young plantation will have sparse canopy pattern, while a mature plantation will have dense canopy pattern. Besides that, any satellite image is prone to the problem of cloud occlusion and thus, raise the difficulty in detecting the plantations. This work presents an improved DenseNet with spatial pyramid pooling (SPP), which can detect the plantations across various scales so that plantation age is not a limiting factor. A set of concatenated features from three different maximum pooling kernels are used to replace the original global average pooling operation. The results show that the addition of SPP module has increased the detection accuracy by 1.78%. Besides that, the results also show that the shallowest DenseNet with 121 layers performs the best compared to the deeper DenseNet versions. The proposed algorithm can be extended to include semantic segmentation module so that the plantation size can be predicted instead of just the presence of oil palm trees.
3	16:50 - 17:10	**Crack Detection Using Spectral Clustering: Self-Tuning Considering Crack Feature and Connections** D. Shiotsuka and K. Matsushima (National Inst. of Tech., Kurume College, Japan); O. Takahashi (Nagaoka Univ. of Tech., Japan)	Cracks on the pavement road cause various traffic problems. Hence, we should repair them properly. Nowadays, there are a variety of crack detection method based on computer vision for operation efficiency. Spectral Clustering is one of them and effective. However, detection accuracy may decrease depending on the image because roads often have many bumps. In this paper, we cluster images having less noise into two clusters, while noisy images into three clusters. The number of clusters is determined automatically by considering the relationship between crack feature and the number of connections.
4	17:10 - 17:30	**Linear Wireless Sensor Networks for Cathodic Protection Monitoring of Pipelines** A. Kara and M. A. Imran (Atilim Univ., Turkey); K. Karadag (Kortek Corrosion Technologies, Turkey)	This paper presents design considerations and implementation of linear wireless sensor networks (LWSNs) to be used in cathodic protection (CP) monitoring of oil and natural gas pipelines. Firstly, the paper overviews the CP monitoring system of pipelines. Then, it presents the proposed design of LWSN along with some implementation details by providing high-level design illustrations and system parameters. Moreover, some hardware and software design issues and challenges are addressed briefly. LWSN based CP monitoring system is designed for the use in high rise mountains along with deep valleys, and some other extreme or unattended locations where communication infrastructure is unavailable, or there exists limited or interrupted access to the infrastructure.
5	17:30 - 17:50	**Energy-based Modeling and Swing Up Control Synthesis of an Inverted Pendulum System** J. Candra, T.A. Tamba and A. Sadiyoko (Parahyangan Catholic Univ., Indonesia)	The inverted pendulum system (IPS) is one of benchmark systems that is often used to demonstrate the dynamics and behaviors of nonlinear practical system. This paper discusses an energy-based modeling and control framework for the analysis and control synthesis of an IPS. The IVP model is first derived using the Euler-Lagrange dynamic modeling framework. The controller design for the IPS is also proposed to ensure the stability of the pendulum rod into the equilibrium point. Simulation results are presented to stimulate important aspects of the IPS.