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Thursday, October 12, 13:15 - 15:15

IT1: Information Technology 1

Room: Grand Ballroom B

Chairs: Yajima Kuniaki (General Engineering & National Institute of Technology Sendai College, Japan), Naras Kwanthong (Rajamangala University of Technology Srivijaya, Trang Campus, Thailand)

Development of Student-Centred Language Learning Environment 1

Jarmo Seppälä (Aalto University & Metropolia University of Applied Sciences, Finland); Yajima Kuniaki (General Engineering & National Institute of Technology Sendai College, Japan)

Student-centred learning is considered one of the most significant pedagogical point of views. Active student participation and connecting learning processes to real world situations are one of the defining properties of the approach. A student-centred learning environment offers students the tools for content production and management with interactive and communal elements, altogether producing a personalized learning experience. Participatory and socially connected Web, or "Web 2.0" has brought elements of social media and open content into the field of learning, enabling the evolvement of student-centred web-based learning platforms. The purpose of this study was to develop a participatory, web-based language learning platform for Sendai National College of Technology. The application is aimed for the exchange students of the aforementioned school and is meant to facilitate students' language learning and to endorse a self-driven way of learning.

A Proposal of Global Engineering PBL Education Using by Developed Sequence Control Kit 7

Yajima Kuniaki (General Engineering & National Institute of Technology Sendai College, Japan); Nitta Akihiro (NITSendai Collge, Japan); Takeichi Yoshihiro (National Institute of Technology Tsuruoka College, Japan); Noppadol Maneerat (King Mongkut's Institute of Technology Ladkrabang, Thailand); Jun Sato (National Institute of Technology Tsuruoka College, Japan)

In recent years, a learning method called problem-solving learning (PBL), which is expected to acquire "various facilitation" through learning, attracts attention. In this research, we aim to construct a learning environment that supports "training human resources with various facilitation skills". Therefore, we developed sequence control PBL learning kit which can carry out 1 Day PBL with overseas students and evaluate and improve the usefulness of PBL learning kit by actually implementing 1 Day PBL overseas we done.

Integrating MicroPython-based Educational Mobile Robot with Wireless Network 13

Matenat Khamphroo and Natavut Kwankeo (Kasetsart University, Thailand); Kamol Kaemarungsi (National Electronics and Computer Technology Center, Thailand); Kazuhiko Fukawa (Tokyo Institute of Technology, Japan)

This paper proposes a prototype of educational mobile robotic platform based on MicroPython library system and Thread wireless network which enables robot controlling with Python language and communication over a wireless network. This prototype robot utilizes a modular design which is based on a simple block snapping without any wiring using a magnetic pogo pin connector that uses magnetic force to snap the connection. The robot contains a brain module, which is the main processor of the system. Other modules are simple sensors. As mentioned above all of the modules are equipped with EFR32 Mighty Gecko, that makes each individual module to support wireless communication and makes this robot differences from others educational mobile robotic platforms. Moreover, this robotic platform supports a visual programming environment called Blockly, which is very simple and similar to an intuitive jigsaw puzzle. Both Python and Blockly are simple coding tools for first-time learners who are interested in programming learning.

Integrated E-project Collaborative Management System Empirical Study for Problem-Based Learning 19

Kemachart Kemavuthanon (Mae fah luang University & Mae fah luang University, Thailand)

Traditional way of teaching is teacher-centered, which encourage the learning environment that the student will only recognize, memorize and learn the content of the class. This is a one-way communication

teaching from lecturer to students. Therefore, this way of learning limits students' solving problem skills and their abilities to learn by themselves. This will lead to difficulty situation when students have to manage and solve real problems. This method of learning also obstructs students to develop teamwork skills. Thus this research will explore teaching process by using the project-based management system to develop a team management program. Also, 'Collaborative Management' system will use for tracking student's learning behaviors and to support instructional learning by using 'Problem Based Learning (PBL)'. The results of this study show factors effecting teamwork efficiency and indicate skills that students need to study effectively based on the problem-based learning framework (PBL) as a guideline for developing effective skills in effective learning environment.

Profiling and Clustering Methods for Transaction Profiling in BRT Transaction 24

Mardhani Riasegiawan (Universitas Gadjah Mada, Indonesia)

This paper works on fraud identification using transaction profiling in Bus Rapid Transit transaction. The research has purpose to deliver profiling information for fraud identification baseline. The data used by the research reach 22GB for 2 years transaction, which has 165 million records. The data process using MapReduce environment that placed in the 9 nodes Hadoop Cluster. The approach has implemented with two-way methods, there is value and amount based profiling. The profiling has been implemented for generating the profile of card, time, gate, and prepaid transaction. The research has strengthening the data process by defined the data transformation into common format, data mapping, selecting the attributes, and generate the value and amount. The works has shown that audit trail profile has resulted by profiling and clustering process from BRT transactions.

The Wireless Sensor Network Monitoring of Sea Level and Wind Speed 30

Naras Kwanthong, Nikom Onsri, Supawat Inkerd and Narit Klompong (Rajamangala University of Technology Srivijaya, Trang Campus, Thailand)

This paper describes about the measurement of sea level using ultrasonic sensor with PVC pipe and wind speed using anemometer for physical oceanography to design the coastal erosion prevention methods. The sensor system installs in the sea and send data to database server on shore via wireless network communication. The controller system using Arduino UNO R3 and Raspberry Pi for data collection and connect to network via Outdoor Access Point. The experimental installs sensor system at light beacon in the sea. The accuracy of sea level about ± 0.02 meters and accuracy of wind speed about ± 1.08 m/s.

SIG1: Signal Processing & Machine Intelligence 1

Room: Madalena

Chair: Sirion Vittayakorn (King Mongkut's Institute of Technology Ladkrabang, Thailand)

Three-Stages Hard Exudates Segmentation in Retinal Images 34

Worapan Kusakunniran (Faculty of ICT, Mahidol University, Thailand); Qiang Wu (University of Technology, Sydney, Australia); Panrasee Rittipravat (Mahidol University, Thailand); Jian Zhang (University of Technology, Sydney, USA)

This paper proposes a three-stages method of hard exudate segmentation in retinal images. The first stage is the pre-processing. The color transfer is applied to make all retinal images to have the same color characteristics, based on statistical analysis. Then, only a yellow channel of each image is used in the further analysis. The second stage is the blob initialization. The blob detection based on color, size, and shape including circularity and convexity is used to identify initial pixels of hard exudates. The detected blobs must not be inside the optic disk. The third stage is the segmentation. The graph cut is iteratively applied on partitions of the image. The fine-tune segmentation in sub-images is necessary because the portion of hard exudates is significantly less than the portion of non-hard exudates. The proposed method is evaluated using the two well-known datasets, namely e_optha and DIARETDB1, in both aspects of pixel-level and image-level. Based on the comprehensive comparisons with the existing works, the proposed method is shown to be very promising. In the image-level, it achieves 96% sensitivity and 94% specificity for the e_optha dataset, and 96% sensitivity and 98% specificity for the DIARETDB1 dataset.

Fall Detection Using Gaussian Mixture Model and Principle Component Analysis 40

Arisa Poonsri and Werapon Chiracharit (King Mongkut's University of Technology Thonburi, Thailand)

Fall accident whose rates increase exponentially is the major risk for the elderly, especially those living alone. Therefore, a fall accident detection system, which can automatically detect the fall accident and call for help, is very important for elderly. This method is proposed to extract human from a video camera using a mixture of Gaussian combined with average filter models. The algorithm extracts six postures of human physically movements include lying, sitting, standing, getting up, walking, and falling from unique features such as Inter-frames Information, Shape Description is shown by silhouette Aspect Ratio and Orientation of principal component analysis, etc. This programs could be automatically alarmed when the fall is detected. This method provides good results up to 86.21% on the 58 videos from the Le2i dataset.

Analysis of Margin Sharpness for Breast Nodule Classification on Ultrasound

Images 44

Hanung Adi Nugroho (Universitas Gadjah Mada, Indonesia); Yuli Triyani (Universitas Gadjah Mada & Politeknik Caltex Riau, Indonesia); Made Rahmawaty (Universitas Gadjah Mada & Politeknik Caltex Riau, Indonesia); Igi Ardiyanto (Universitas Gadjah Mada & Faculty of Engineering, Indonesia)

Breast cancer is the most commonly diagnosed cancer with the highest prevalence, incidence, and mortality for females in Indonesia and worldwide. Ultrasound is a recommended modality for breast cancer. The margin of breast nodule is one of breast cancer malignancy characteristics based on BIRADS. Meanwhile in ultrasound images, the possibility of a false positive result is quite high. Computer Aided Diagnosis (CAD) provides a second opinion in the interpretation of ultrasound results thus increasing the diagnosis confidence. This research proposed a CAD-based method for classifying breast nodule in ultrasound image based on margin characteristic. The method consists of adaptive median filter for marker removal, pre-processing with normalization and SRAD filter, segmentation methods of neutrosophic and watershed, features extraction and MLP as a classifier. The proposed features include 10 features based on texture, geometry and margin sharpness analysis. This research uses 102 images consisting of 57 not circumscribed nodules and 45 circumscribed nodules. The performance of proposed method achieved the accuracy of 95.10%, sensitivity of 93.33%, specificity of 96.49%, PPV of 95.45%, NPV of 94.83%, kappa of 0.9004, and area under curve (AUC) of 0.989.

Identification of Thai Characters and Numbers on Plate Number 49

Kaset Sirisantisamrid (King Mongkut 's Institute of Technology Ladkrabang, Thailand)

This paper proposes a method of Thai characters and numeral identification on plate number. The proposed method consists of license plate detection and identification of characters and numbers. In the license plate detection, the vertical edges, the vertical projection, and some operations of morphology are used to searching for license plate location. Once plate location is known, the identification of characters and numbers starts from inversion of binary image, character and number segmentation, normalization, computation of the horizontal and vertical DCT coefficients. Finally, the impulse response of FIR system of character and number are determined using the horizontal and vertical DCT coefficients as input and output of FIR system. The unknown characters or numbers on the plate number can be identified by comparison of their impulse response with the impulse responses of known characters and numbers in database, if the sum square error of them is smallest. On experiments, it found that the correct detection of license plate is about 95.52% and the accuracy of characters and numeral identification is about 81.25%.

Automatic Labeling for News Article Classification Based on Paragraph Vector 55

Taishi Saito and Osamu Uchida (Tokai University, Japan)

Getting useful information from the Internet plays an important role. A news site is one of Internet services often used for obtaining information on the Internet. The news site has advantages such that information update is fast and there are abundant kinds of information, and in recent years there are sites that collaborate with multiple newspaper companies and post bulk content. However, as there are a lot of articles, there are problems that it is difficult to find the articles we would like to read. Therefore, how to classify and present articles is an important issue. In this study, we consider the category classification of documents using distributed representation of sentences. Specifically, we propose a method to classify articles by extracting words with similar meanings from sentence vectors of each category and assigning them as labels.

Facial Expression Recognition Using Local Gabor Filters and PCA plus LDA 59

Sirion Vittayakorn (King Mongkut's Institute of Technology Ladkrabang, Thailand); Tanapol Pumlumchiak (King Mongkut's Institute of Technology Ladkrabang, Thailand)

A simple smile can indicate our approval, happiness or positive thoughts, while a scowl might signal displeasure or anger. Understanding facial expressions and their meanings are crucial not only in our daily life communication, but also in many applications. For example, in marketing, the customers' facial expressions indicate their response towards a product. In artificial intelligence (AI), robots can use human facial expressions as a cue for understanding their emotion in order to respond appropriately. This paper proposes a method for recognizing human facial expressions from images using local Gabor filter, Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA). The system starts by applying the face detection algorithm to detect the face from an image. From the face, the system extracts the Gabor filter responses and maps these responses into the novel feature subspace using the joined framework of PCA and LDA. Note that, in our framework, the principle component removal is also integrated into the jointed framework. Based on the weighted neighbor approach, the system finally classifies human expressions into 4 different classes: anger, surprise, happiness and neutral. The results demonstrate that our approach significantly outperforms the baselines.

POW1: Power Systems 1

Room: Marco Polo

Chair: Warongkidh Ganchanasopa (Assumption University of Thailand & Electrical and Electronics Engineering, Thailand)

Indicator-Based Multi-Objective Chemical Reaction Optimization for Combined Heat and Power Optimum Power Flow with Thermodynamic Model 65

Priambudi Pujiatma (Universitas Gadjah Mada, Indonesia); Sasongko Pramono Hadi (Gadjah Mada University, Indonesia); Sarjiya Sarjiya and Tri Agung Rohmat (Universitas Gadjah Mada, Indonesia)

Chemical reaction optimization is a recently developed heuristic optimization technique. This research aims to utilize Indicator-Based Chemical Reaction Optimization (IBCRO) to solve multi-objective combined heat & power (CHP) optimization, which considers cost, steam production and power system loss. CHP system will be modeled using thermodynamic equations of gas turbine and Heat Recovery Steam Generators (HRSG). The performance will be compared with other algorithms: goal attainment, NSGA II, MOPSO and PESA. The result shows that IB-CRO can compete with other popular algorithms, proven by high average satisfactory degree values and coverage metrics.

A Novel Approach for Electromechanical Mode Estimation Based on PMU 71

Sergei Dekhtiar (Ural Federal University, Russia); Pavel Chusovitin (Ural Federal University & System Operator of United Power System, Russia); Andrey Pazderin (Ural Federal University, Russia)

This paper describes a new electromechanical mode estimation algorithm based on phasor measurement units (PMU) data obtained under ringdown condition. The main feature of the algorithm is that oscillation parameters aren't directly estimated but equivalent dynamic power system model is identified as a whole. Furthermore, the model is based on physical concepts underlying electromechanical transient processes in power system. Proposed algorithm is more accurate compared to main algorithms which are used for solving this problem. Besides, the algorithm allows to identify not only frequency and damping of electromechanical modes but also mode shape: amplitude, phase. The proposed algorithm along with existing methods are tested using simulated data from simple three-nodes power system model.

Voltage Stability Analysis Using Quadratic Objective Function Taking into Account Inequality Constraints 77

Grigoriy Shabalin (Ural Federal University, Russia); Pavel Chusovitin (Ural Federal University & System Operator of United Power System, Russia); Pavel Bannykh (Ural Federal University, Russia); Eduard Balakh (Ural Federal University & Ural Institute of Electrical and Power Engineering, Russia); Andrey Pazderin (Ural Federal University, Russia)

The author group proposes algorithm based on the analysis of the objective function consisting of the squared residual sum of node voltage equations to evaluate the closest maximum loading condition. The paper presents the development of research connected with consideration of inequality constraints, namely generators reactive power ranges. These constraints are taken into account by the usage of modified objective function supplemented by penalty components. Test calculations were made on the basis the simplest models and of 7-node power system. The proposed objective function and algorithm of the closest maximum loading condition calculation allows to identify power system security margin with set accuracy.

The Usage of Parallel Calculations in State Estimation Algorithms 83

Olga Malozemova and Ilya Polyakov (Ural Federal University, Russia); Pavel Chusovitin (Ural Federal University & System Operator of United Power System, Russia); Andrey Pazderin (Ural Federal University, Russia)

An increasing calculation speed is one of the highest priorities in developing power system state estimation (SE) algorithms. Modern power systems are continuously growing and different types of new measurements are appearing in networks which impact on a practical implementation of SE. The expanding size and growing complexity of the SE task lead to increasing computation burden. The paper proposes parallel execution approaches of mathematical operations, which used in different stages of SE algorithms. Also, the new matrix storing format suited for parallel manipulations is suggested. The format allows adding new elements to the matrix in any sequence without reallocating memory and performing fast multiplication of two sparse matrices. Their implementation can significantly shorten computation time. Also, it allows to use resources of modern computers in a greater extent. Different approaches for SE are widely used today. Each of them has some features that must be taken into account in practical implementation. The application of parallel calculations to the SE problem in different statements is analyzed in this paper. The elapsed time for parallel executing of mathematical operations in comparison with their sequential realization is provided.

Combined Cycle Power Plant Control During Frequency Excursions 88

Olga Malozemova (Ural Federal University, Russia); Pavel Chusovitin (Ural Federal University & System Operator of United Power System, Russia); Andrey Pazderin (Ural Federal University, Russia)

Combined cycle power plants (CCPPs) have unique frequency response compared with conventional steam turbine power plants, because gas turbine power output is determined not only by speed but also temperature controller. In the paper, special attention will be devoted to CCPP operation under low frequency conditions. In this mode operation of CCPP controllers can result in frequency collapse. But it is possible to escape such bad consequences by means of proposed active power boosting, which should be introduced at the first moment of islanding.

An Exercise Bikes Assisted Main Energy Source in DC Distributed Power System 93

Warongkidh Ganchanasopa (Assumption University of Thailand & Electrical and Electronics Engineering, Thailand)

The DC distributed power system for a house will facilitate the implementation of the small electric power sources from various renewable energies with less complexity connection and high efficiency of power sending. From these benefits, a human power generation based on exercise bike becomes feasible renewable energy. An electric energy is produced and sends to a DC distributed power system of the house only pedaling period. The voltage level of human power generated is maintained equal to a voltage level of the DC distributed power system. The retarding torque level setting by a cyclist is a value of a generator current that produces and sends to the DC distributed power system. From the experiment of results, they can send the electrical power to the appliances with the efficiency more than 99% and also assisted partial energy supplying in the main energy source such as 125W with a set of exercise bike unit and 252W with 2 sets.

NET1: Communication & Network Technologies 1

Room: Santiago

Chairs: I Wayan Mustika (Universitas Gadjah Mada, Indonesia), Lapas Pradittasnee (King Mongkut's Institute of Technology Ladkrabang, Thailand)

Interference Suppression Methods with Adaptive Threshold in Internet of Things (IoT) Systems 98

Natthanan Promsuk (Asian Institute of Technology, Thailand); Attaphongse Taparugssanagorn (Wireless Innovations and Security Laboratory, NECTEC & Asian Institute of Technology, Thailand); Johanna Vartiainen (Centre for Wireless Communications, University of Oulu, Finland)

The explosive growth in home, wearable and wireless devices has not been matched by a growth in radio spectrum bands to accommodate them. The inter-networking of all of these devices, called "the internet of things (IoT)" is expected to have tens of billions of devices, mostly wireless, definitely incurring a coexistence or interference problem. The ubiquitous industrial, scientific and medical (ISM) radio band at 2.4GHz, in particular, one of the candidate band for IoT is heavily oversubscribed due to its unlicensed nature and could become all but unusable for priority systems in a densely populated area in the future at the present rate of growth of 2.4GHz transmitters and networks. In our study, the communications of the "last 100 meters" of an IoT network, i.e., from devices to an access point (AP) are considered. The interference suppression algorithms using the probability of false alarm based methods, the Neyman-Pearson (NP) criterion and the localization algorithm based on double-thresholding (LAD) are applied to enhance the transmission bit error rate (BER) performances in various scenarios. Besides the traditional fixed threshold approach, an adaptive threshold approaches are proposed to enhance the performances in frequency selective fading channels. The simulation results show that the proposed methods excellently work even in an IoT network, which contains a large number of devices.

Infotainment Data Dissemination Mechanism Using RSU Cloud Based for Vehicular Networks 104

Vatin Jaiboon (Prince of Songkla University, Phuket Campus, Thailand); Jirawat Thaenthong (Prince of Songkhla University, Phuket Campus & Faculty of Technology and Environment, Thailand)

In the future, vehicular networks are implemented on Vehicular-to-Vehicular (V2V) and Vehicular-to-Infrastructure (V2I) Communication system. The broadcast technique is a public data dissemination used for safety and emergency information. However, the amount of the vehicle, the distance between the vehicle, and the movement behavior of the vehicle on the highway affect to throughput and delivery delay. The data dissemination of V2V is the short time communication. Road Side Units are used to spread the data efficiently to the distant vehicles. The delay and throughput are the main issues of the

representative network. This paper proposes the technique of RSU Cloud which has the ability of cloud computing to solve the limitation of the traditional RSU for the efficiency of distributed Infotainment message.

Two Dimensional Angle of Arrival Estimation Using Minimum Sparse Ruler Based Rectangular Array of Antennas 110

Hasbi Nur Prasetyo Wisudawan (Universitas Gadjah Mada, Indonesia); Risanuri Hidayat (Gadjah Mada University (UGM), Indonesia); Dyonisius Dony Ariananda (Universitas Gadjah Mada, Indonesia)

One important application in the field of adaptive antenna array processing used in recent wireless communications systems, such as cognitive radio applications, is the direction of arrival (DoA) estimation. The existing works suggest that the $N_x \times N_y$ two dimensional (2-D) antenna array is almost surely able to recover up to $\lceil N_x/2 \rceil \lceil N_y/2 \rceil$ two dimensional (2-D) DoA. In this paper, a new 2-D (azimuth and elevation) DoA estimation method using a minimum sparse ruler based rectangular array of antenna is evaluated. The minimal sparse ruler is used to determine which antennas that have to be deactivated and which antennas that should be remain active. Therefore, it is possible to deactivate some antennas in the uniform rectangular array (URA) leading to a sparse rectangular array (SpRA). While minimizing the reduction in the quality of the resulting DoA estimation with SpRA, the selection and averaging procedure are adopted to tackle these elements. This approach is possible for uncorrelated sources as the covariance matrix of the impinging signals on the URA contains redundant elements. The selection and averaging procedures are adopted to tackle these elements. These steps are followed by the execution of the MUSIC algorithm to compute the 2-D DoA estimates. The simulation study shows that it is possible to employ only 25-antennas in SpRA in order to estimate the azimuth (ϕ) and the elevation (θ) angles of up to 19 sources. The combinations of (ϕ) and (θ) is drawn from the range of $0^\circ \leq \phi \leq 180^\circ$ and $0^\circ \leq \theta \leq 90^\circ$. The separation in azimuth and elevation angles between sources is at least 10° .

Cell and RBs Selection Scheme for Power Consumption Reduction in Femtocell Networks Using Discrete Bacterial Foraging Optimization 116

I Wayan Mustika (Universitas Gadjah Mada, Indonesia); Sahirul Alam (UGM, Indonesia); Selo Sulistyo (Gadjah Mada University, Indonesia)

Cell and resource blocks (RBs) selection scheme is deemed important especially in a dense deployed femtocell area. An appropriate scheme can select cell and RBs for the femtocell user equipment (FUE) to reduce the inflicted interference to achieve a higher throughput. In this paper, cell and RBs selection scheme to reduce the power consumption of femtocell networks is proposed using Discrete Bacterial Foraging Optimization (DBFO). The proposed scheme can select femtocell base station (FBS) and the combination of RBs, which use the lower power consumption but satisfy the minimum throughput required by the FUE.

Improving Performance of Route Maintenance Processes in RPL Protocol 122

Lapas Pradittasnee (King Mongkut's Institute of Technology Ladkrabang, Thailand)

Currently, there is a rapid increase in the implementations of Internet of Thing (IoT) systems in many areas such as smart building, and smart cities. This type of network has different requirements than other types of networks. It needs to effectively work with unreliable wireless channel condition. IETF proposed IPv6 Routing Protocol for Low-Power and Lossy Networks (RPL) for addressing lossy environment problem. However, many important mechanisms of RPL protocol are underspecified. In this paper, we examine the performance of the route maintenance processes that are provided in RPL protocol (the combination of Neighbor Unreachability Detection Mechanism (NUD), Objective Function Zero (OF0) and The Minimum Rank with Hysteresis Objective Function (MRHOF)). Both practical and simulation experiments are conducted. The results from the practical experiments shows that the performance in term of Packet Reception Ratio (PRR) from the combination between NUD and MRHOF is better than the combination between NUD and OF0. Moreover, the simulation experiments are also conducted to explore the best approach to improve the route maintenance processes by modifying two input parameters (ReachableTime and MAX_LINK_METRIC). The results from the simulation experiments indicate that when the data rate is high enough, there is no need to modify the input parameters. However, when the data rate is low, modifying the value of MAX_LINK_METRIC can significantly improve the performance of the route maintenance processes but the careful consideration is required because it has high possibility to affect other mechanisms in RPL protocol.

CON1: Control Systems 1

Room: Vera Cruz

Chair: Altug Iftar (Anadolu University, Turkey)

Simulation of Standing Upright Control of an Inverted Pendulum Using Inertia Rotor and the Swing Type Inverted Pendulum for Engineering Education 128

Junichi Sugaya (National Institute of Technology Sendai College, Japan); Toshiyuki

Kanmachi (National Institute of Technology Ishikawa College, Japan); Yuzuru Ohba (National Institute of Technology, Sendai College, Japan)

These days, higher educational institutions in Japan are facing various problems. For example, as a result of the decreasing number of science or technology students, there will be fewer researchers or engineers of the next generation in those fields, which may undermine the foundation of manufacturing in Japan. That is typical consideration. There are various measures, such as visiting lectures to tackle this problem, but a control engineering area is the same situation in the field of engineering. We need new experimental teaching materials which are easy to understand and can be used in demonstration experiments for students and in open classes for elementary and junior high school students. Especially, inverted pendulums are useful teaching materials and are often used in classes of colleges and NITs. There is a type of inverted pendulum called inertia rotor type. It is a type of inverted pendulum which can be stood upright by the reaction force generated through adding torque to the power point. In this research, we aim to manufacture an inverted pendulum with a purpose of making students to learn control engineering using inertia rotor type inverted pendulum. First, as a procedure of stabilization control design, to model the inertia rotor type inverted pendulum, we measured physical parameters in each part of the inverted pendulum and derived a motion equation and an equation of state. Then we conducted PID control and optimal regular control as control methods to make the pendulum stand upright in a vertical state. In each case, we conduct a control experiment. We also design and manufacture a swing type inverted pendulum with this inertia rotor, and introduce the process from the swing control to the standing position control.

Identification of Medical Surgical Product and Object Distinction Using Image Processing 134

Satoshi Anai, Mika Iwasaki, Keisuke Hano and Shigeru Kuchii (National Institute of Technology, Kitakyushu College, Japan)

In medical field, forming surgical invoice is a very burdensome task. Additionally, manual counting makes a lot of incomplete billing due to human error. Therefore, the automation system counting and recording has a strong demand. Automatic Injection Information Reader had been developed to make invoice automatically and it was introduced into large size hospitals. The current situation, however, is that the device has not been introduced into mid-size and smaller hospitals because of the large production cost and size. In this study, the system for identification of medical surgical product and substance distinction was developed with fewer components. It enabled to identify the medical surgical product which previous machine could not recognize.

Implementation of Fuzzy Control for a Nonlinear System - Conical Level Process 138

I Thirunavukkarasu (Manipal Institute of Technology, India); E Sarath Yadav and Ashutha K (MIT, Manipal University, India); Shreesha Chokkadi (MIT Manipal, India)

Fuzzy logic is the trending control strategy and ideal in its performance to the real world of control. It has been implemented in most of the control fields because of its expertise in fault tolerance, knowledge representation, nonlinearity, uncertainty, real time operation etc. In this paper mamdani type of fuzzy controller is considered for controlling nonlinear conical tank process. The identification of conical tank system is performed by two point method and fuzzy controller is implemented. The results of fuzzy controller is compared with AMIGO (Approximate M constrained Integral Gain Optimization) and conventional controllers for evaluating its performance indices like IAE, ITAE, ITSE and ISE using simulation and real time response. It is also observed that the fuzzy controllers performs better than that of AMIGO and conventional controller.

Design of Virtual Process Control Laboratory (VPCL) Using First Principle Method and Interactive PID Control Toolkit Using Labview 142

S Meenatchi Sundaram (Manipal University, India)

First principle method of modelling is relatively easy to implement and analyze a process because of its simple equations. If the process is properly modelled, the model can be used effectively to understand the process behavior. In this paper, it is aimed to design a virtual level process control system to understand the working of the process with PID control. Interactive Graphical User Interface (GUI) is developed using Labview. This GUI can be used as a training toolkit to understand the effect of PID action in a level process system. The toolkit made in the form of an .exe file so as to make it platform independent. The GUI has added features than a real-time single loop PID level process control system. User can perform experiments to understand the features such as Auto / Manual operations, Direct / Reverse settings, Constant / Non-Constant outflow & PV, dead time, anti-reset windup, bump less transfer and load disturbances. The simulated results are compared with a real-time level control system with Yokogawa PID controller and the results are found to be closely matching.

Controller Design Using Extension for Neutral Distributed-time-delay Systems 147

Altug Iftar (Anadolu University, Turkey)

Extension principle is first defined for neutral distributed-time-delay systems. Necessary and sufficient conditions for one such system being an extension of the other are then presented. Contractibility of controllers for such systems is then discussed. It is shown that, any controller designed for the expanded system can be contracted for implementation on the original system, if the expanded system is an

extension of the original system. Stability and good performance are then considered. It is shown that, provided that the expanded system is an extension of the original system, the contracted controller achieves stability and good performance for the original system if the controller designed for the expanded system achieves stability and good performance for the expanded system.

A Study of Determining an Adaptive Control Input Without Using a Parallel Feedforward Compensator 153

Ryo Tanaka, Tetsunori Koga and Kazuki Ikeda (Kurume College, Japan)

This article describes an approach to determine a modified adaptive control input which realizes an almost strictly positive real (ASPR) plant without a parallel feedforward compensator (PFC). In a simple adaptive control (SAC) theory, several output feedback based control techniques can be applied to the plant satisfying ASPR characteristics. However, real plants do not often satisfy this characteristics. To solve this problem, several PFC design methods have been proposed so far. Most PFC design parameters are generally adjusted by acquiring an empirical knowledge of designers. This article focuses on this situation. If a relative degree of the plant is two, ASPR plants can be designed by modifying an adaptive control input. We perform the effectiveness of the proposed method by some numerical simulations.

Thursday, October 12, 15:30 - 16:50

IT2: Information Technology 2

Room: Grand Ballroom B

Chairs: Chalita Srinuan (Faculty of Business Administration and Management, KMITL, Thailand), Boonprasert Surakratanasakul (King Mongkut's Institute of Technology Ladkrabang, Thailand)

Mobile Expert Systems for Bamboo Identification Using Rule Based Reasoning 159

Endina Putri Purwandari, Eldorado Arifin, Ariefa Yani, Endang Winarni and Feri

Noperman (University of Bengkulu, Indonesia)

Indonesia is a rich country in the diversity of bamboo. The condition make difficult to identification process. The type of bamboo contained in Indonesia is estimated at about 159 species out of the total 1250 species of bamboo around the world. The bamboo identification method usually takes a long time, is relatively expensive, complicated, and requires information from a bamboo expert. By transferring the knowledge of bamboo experts in recognizing the characteristics of bamboo such as roots, shoots, stems, branches, and leaves, identification can be done without having to bring an expert directly. The data feature of the mobile expert system for the identification of the diversity of bamboo species is divided into 6 morphologies, 31 characteristics and 188 attributes characteristic as inputs. This system is built with a rule based reasoning method that is modified with greedy algorithm to compare the difference of bamboo species weight. The experiments were performed with 143 bamboo test cases have shown 100% high accuracy rate for the same system input 100%. Furthermore, the accuracy rate reaches 100% for 50% input data equal to the knowledge base and only 50% answer filled, so the user does not need to answer the whole question to get accurate identification result. This results shown that the mobile expert system for bamboo identification with rule based reasoning generated results more reliable than human expert

Development of an IoT Device for Monitoring Electrical Energy Consumption 165

Siriwat Wasoontarajaroen, Khanchai Pawasarn and Vitthaya Chamnanphai

(Rajamangala University of Technology Isan, Khonkaen Campus, Thailand)

An energy monitoring device integrating with the concept of the Internet of Things allows their measurement data can be monitored and retrieved at any locations where internet is available. This paper presents an IoT device that was developed for monitoring electrical energy consumption in a building. It was a low-cost IoT device consisting of three available off-the-shelf modules including PZEM-004t electrical energy sensors, an Arduino Nano Mini microcontroller and an ESP8266 Serial-to-WiFi board. The IoT device was tested by conducting electrical energy measurement for a week. The results of the test confirmed that the device was functioning well which could be able to collect electrical energy data for supporting efficient energy management.

Shifting Thai Mobile User Behavior and Its Impact on Mobile Regulation 169

Chalita Srinuan (Faculty of Business Administration and Management, KMITL, Thailand)

This study investigated the determinants of mobile-only user subscribers in the Thai mobile communications market. The survey data in 2014 together with a probit model were employed for analysis. Results showed that subscriber characteristics, including gender, government officer, private officer, Internet application, area of living, and smart phone ownership, can explain a significant behavior

of becoming mobile-only user of Thai mobile subscribers. The subscribers in rural area are subjected to more rely on mobile service. Findings also showed that the subscribers who are heavily user on Internet application will not rely only on mobile service. They will use other services as a complimentary service. Hence, the telecom regulator should consider implementing a quality of service regulation. This regulation would provide an opportunity for subscriber in rural area could access to better mobile service. Importantly, the spectrum allocation policy is necessary due to the high demand of mobile only user. This will benefit for both users in urban and rural area.

Lightweight CommonKADS in Knowledge Intensive Organization 175

Boonprasert Surakratanasakul (King Mongkut's Institute of Technology Ladkrabang, Thailand)

One of challenges in knowledge engineering is analysis and organizes knowledge with appropriate methodology. CommonKADS is a de-facto technique in knowledge intensive methodology. It provides several models to explain organizational knowledge both in context and concept. Because of it offers for large scale of knowledge based system, so it complicates and confuses for naïve developer and knowledge engineer. For these reasons, this paper presents the lightweight of CommonKADS methodology. It aims to reduce process and improve method for easier learning by sense of organizational environment and with simplify user interface on web application. The experiment results from expert and beginner users show 85.7% can reduce processes in CommonKADS method and 57.1% satisfy and prefer this model for develop knowledge management system in an organization.

SIG2: Signal Processing & Machine Intelligence 2

Room: Madalena

Chairs: Hanung Adi Nugroho (Universitas Gadjah Mada, Indonesia), Kitsuchart Pasupa (King Mongkut's Institute of Technology Ladkrabang, Thailand)

Vehicle Classification in Congested Traffic Based on 3D Point Cloud Using SVM and KNN 180

Porn-anan Raktrakulthum (King Mongkut's University of Technology North Bangkok, Thailand)

The vehicle classification in congested traffic is a big challenge due to the difficulty to segment packs of different vehicles that stand still next to each other or travel at a very low speed. In this work, a low-cost vision system was designed and built to acquire image and to generate 3D point cloud to be used as input for the classification process. The vehicle classification uses machine learning K-Nearest Neighbor and Support Vector Machine with radial basis function kernel to classify two types of vehicle which are car and motorcycle based on 3D point cloud. The processing of the training data and test data can be divided into filtering, segmentation, tracking, and feature extraction, respectively. The extracted feature vectors are then used for both KNN and SVM classifiers. The results show that the proposed preforms well even in high congested traffic with a mix of both vehicle's type. This can be seen from the TPR for car classification from both KNN and SVM which is relatively high (KNN=95.8%, and SVM=95.8%) compared to other existing systems. In case of motorcycle classification the SVM classifier performs better compared to KNN in all three different traffic conditions.

Neutrosophic and Fuzzy C-Means Clustering for Breast Ultrasound Image Segmentation 186

Hanung Adi Nugroho (Universitas Gadjah Mada, Indonesia); Made Rahmawaty (Universitas Gadjah Mada & Politeknik Caltex Riau, Indonesia); Yuli Triyani (Universitas Gadjah Mada & Politeknik Caltex Riau, Indonesia); Igi Ardiyanto (Universitas Gadjah Mada & Faculty of Engineering, Indonesia)

Breast ultrasound image segmentation is one of the most difficult tasks due to its speckle noise, poor quality and location of the breast nodule. In this research, we proposed normalization algorithm to enhance image contrast in order to be segmented using neutrosophic and fuzzy c-means clustering. At first, the input image is filtered using speckle reduction anisotropic diffusion (SRAD) to reduce speckle noise and normalized to increase the contrast. Secondly, the normalized image is transferred to neutrosophic domain with three membership subset T, I and F to define the nodule area. Finally, the fuzzy c-mean method is used to segment the nodule area from the background. To evaluate and compare the performance of the proposed method, this research uses several measurements, namely Area Error Metric and Boundary Error Metric. The result shows that the proposed method is able to segment the breast ultrasound images effectively and accurately.

Segmentation of Optic Disc and Optic Cup in Colour Fundus Images Based on Morphological Reconstruction 191

Hanung Adi Nugroho, KZ Widhia Oktoeberza, Astrid Erasari, Augustine Herin Hutami and Cerwyn Cahyono (Universitas Gadjah Mada, Indonesia)

Glaucoma disease is one of the retinal abnormalities caused by size changing of optic disc and optic cup. The disease commonly diagnosed by quantifying vertical cup-to-disc (CDR) ratio. Therefore, this study proposes two schemes for segmenting optic disc and cup based on morphological reconstruction. Retinal vessel removal is considered during the process. The proposed schemes are evaluated on 50 colour fundus images collected from Drishti-GS dataset. The final segmentation results are compared to the available ground truth image. Segmentation of optic disc achieves the level of accuracy, sensitivity and specificity at 96.3%, 83.12% and 99.37%, respectively. The evaluation for optic cup segmentation obtains the accuracy of 99.13%, sensitivity of 80.68% and specificity of 99.53%. These results denote that the proposed schemes have a potential to be implemented as part of developing computerised glaucoma diagnosis systems.

Comparison of Vowel Feature Extraction on Time and Frequency Domain 196

Risanuri Hidayat (Gadjah Mada University (UGM), Indonesia); Deni Yulian (Departement of Electrical Engineering and Information Technology, Indonesia); Agus Bejo and Sujoko Sumaryono (Universitas Gadjah Mada, Indonesia)

Vowel recognition is the most important part of the speech recognition process. Most spoken speeches must contain vowels to be sounded. It needs a method that can separate a vowel with another. The methods of the feature extraction on time domain, frequency, cepstrum, and fourier are several basic methods that can be used. This paper compares features of the strengths of the feature of zero crossing rate, energy, spectral centroid, spectral spread, spectral entropy, harmonic ratio, fundamental frequency, cepstrum, and fourier to separate and recognize vowels of a, i, u, e, and o. The results show that the spectral spread feature that is one of the features in the frequency domain has the most accurate ability to recognize vowels tested compared to other features.

POW2: Power Systems 2

Room: Marco Polo

Chair: Arit Thammano (King Mongkut's Institute of Technology Ladkrabang, Thailand)

Maximum Utilization of DC Link Voltage in Grid Connected Hybrid Modular Multilevel Converter 200

Ambati Dinesh Kumar, Bikram Das, Prabir Ranjan Kasari and Abanishwar Chakraborti (NIT AGARTALA, India)

This paper presents a five level hybrid modular multilevel converter that consists of full-bridge sub modules & half-bridge sub modules with a ratio of 1:2. compared to conventional half bridge based modular multilevel converter. Hybrid modular multilevel converter can provide maximum utilization of available DC bus voltage, by which transformer less operation can be obtained. Phase-disposition pulse width modulation technique has been utilized for generating the pulses required for the converter. Finally, grid connection of the hybrid modular multilevel converter using vector control scheme has been implemented. Capacitor voltage balancing scheme has also been performed in this system. Simulation results have been presented here for validation of the complete system.

Optimal Allocation of Distributed Generation with FACTS Controller for Electrical Power Loss Reduction Using Genetic Algorithm 205

Sattawat Burana, Panida Thararak, Peerapol Jirapong and Kannathat Mansuwan (Chiangmai University, Thailand)

Distributed generation (DG) and flexible alternating current transmission systems (FACTS) can be used to enhance power generation and increase the efficiency of distribution systems. However, the installation of DG units with FACTS controllers at inappropriate allocations can result in negative impacts. In this paper, a new DG with FACTS allocation planning tool is developed for determining the optimal location and sizing of DG with FACTS to reduce power losses. The optimal power flow (OPF) with DG and FACTS is formulated as a minimization problem of system power losses subjected to system constraints such as voltage limits, line loading limits, generation limits, and the Provincial Electricity Authority (PEA) grid code. DG and FACTS used in this experiment are synchronous generator and static var compensator (SVC), respectively. Genetic algorithm (GA) implemented by a m-file script in MATLAB is used for the optimization technique. Consequently, evaluation of load flow solutions and objective functions in each generation of GA are determined using DIgSILENT Programming Language (DPL) script in DIgSILENT software. In this approach, MATLAB and DIgSILENT are employed and linked together in a genuine automatic data exchange procedure. An existing 22 kV distribution system from PEA of Thailand is used as a case study. The practical system data from a geographic information system (GIS) database are imported for the planning tool using DIgSILENT-GIS-SCADA (DGS) file format. The obtained simulation results show that the optimal location and sizing of DG with FACTS using the proposed tool results in system power loss reduction and voltage profile and line loading improvement, both of which lead to a higher level of system efficiency.

Defining the Damping Properties of Synchronous Generator Using Disturbance Measurements 211

Dmitry Bliznyuk and Aleksander Berdin (Ural Federal University, Russia); Pavel Kovalenko (Ural Federal University named after the first President of Russia B. N. Yeltsin, Russia); Andrey Gerasimov (JSC «STC UPS», Russia); Sergei Dekhtiar (Ural Federal University, Russia)

At present time complex generating unit models with a great number of parameters are implemented for the emergency control in power systems. Identification of these parameters is a challenging problem. State-of-the-industry measurement devices allow calculating electrical parameters during electromechanical disturbances. That is why one can use simplified generating unit models, parameters of which can be calculated using field measurements. In particular, generating units damping properties might be estimated. The proposed method involves the synchronous machine damping power estimation by means of the measurements approximation during dynamic disturbances. This value allows determining the generating unit capability to damp power system oscillations. The method was examined in MATLAB Simulink and by means of JSC "STC UPS" physical electrodynamic simulator. One can apply obtained results in the power system emergency control and in a wide variety of problems related to dynamic transients calculation and analysis.

Optimal Location and Sizing for PV System and Battery Energy Storage System Using ABC Algorithm Considering Voltage Deviation and Time of Use Rate 216

Arnuphap Meechaka (King Mongkut's University of Technology Thonburi, Thailand); Anawach Sangswang (King Mongkut's University of Tech. Thonburi, Thailand); Krissanapong Kirtikara (CSSC KMUTT, Thailand); Dhirayut Chenvidhya (King Mongkut's University of Technology Thonburi (KMUTT), Thailand)

This paper presents the optimal location and sizing for photovoltaic (PV) and battery energy storage (BESS) with PV 220 kWp on King Mongkut's University of Technology Thonburi, Bangkhunthian Campus (KMUTT BKT) 13 bus system. By using Artificial Bee Colony Algorithm (ABC) to find the optimal PV and battery size considering Time of use Rate (TOU) and using Time Sweep Mode in DigSILENT Power factory to get the optimal location focus on voltage deviation of the system by defining scenario that may happen to the system in the future. The PV installation on the limited rooftop area of the building and Net Present Value NPV are considered for optimal sizing. The results show that the system with optimal location and sizing of PV and battery energy storage lead to system voltage difference from 85.64% to 4.13%, efficient energy usage, save energy cost 23.74% per year and reduce power transmission line loss from utility grid to KMUTT BKT.

IT3: Information Technology 3

Room: Santiago

Chairs: Lukito Edi Nugroho (Universitas Gadjah Mada, Indonesia), Bundit Thanasopon (King Mongkut's Institute of Technology Ladkrabang, Thailand)

Enabling Fine Granularity of Difficulty Ranking Measure for Automatic Quiz Generation 222

Sasitorn Nuthong (Prince of Songkla University, Thailand)

This Automatic Quiz Generation system is utterly handy for reducing teachers' workloads in quiz creation. Nevertheless, by exploiting a coarse-granular concern inside difficulty ranking mechanism, only a few number of automatic-generated quizzes can be obtained. In order to increase the number of usable quizzes, we suggest how a 5-level difficulty ranking score using a hybrid similarity measurement approach together with property filtering of the key data can be potential for serving this propose. Based on experiment results, our proposed similarity measure outperforms three other candidates. Enabling users with finer options of making sensible quiz generation. Hence, this mechanism can be regarded as a synergistic technology for improving teachers' quality of life for the future.

Knowledge Management System for Supporting Organizational Management and Sustainable Development: A Case Study of a Research Group in a University 228

Soontarin Nupap (Mae Fah Luang University, Thailand)

Knowledge management system (KMS) plays a crucial role as a knowledge repository to support organizational management and sustainable development. Based on the previous study which demonstrated the success of balanced scorecard (BSC) implementation for quality assurance in educational management, this paper aims to propose a framework for the same case study which is a research group within a department in a university by implementing KMS based on BSC notion in order to improve the knowledge sharing and learning environment for sustainable development. It reveals the proposed methodology in which the KMS initially implemented for improvement in the corporation sector

accelerates educational management and supports knowledge sharing and learning environment for long-term improvement.

Extraction and Evaluation of Popular Online Trends: A Case of Pantip.com 233

Bundit Thanasopon, Nattawut Sumret and Jirawin Buranapanitkij (King Mongkut's Institute of Technology Ladkrabang, Thailand); Ponrudee Netisopakul (King Mongkut's Institute of Technology Ladkrabang & Faculty of Information Technology, Thailand)

Popular online trends detection from crowd becomes more and more essential for both trend followers and online sellers. However, huge amount of online posts, both text and images, has prevented trends detection to be manually processed. This article, focusing on text mining, aims to automatically extract popular online trends. A case study is performed on one of the most popular discussion forum websites in Thailand - i.e., Pantip.com. The approach involves employing several unsupervised text mining techniques, namely, TF-IDF and HTML scores, and supervised learning sentiment classification, to extract key topics and assess sentiment results, respectively. Also, we conducted an experiment on the performance of sentiment classification and found that support vector machine (SVM) outperformed other learning techniques. In addition, the authors developed a web-application incorporating the proposed approach. The application collects data from Pantip.com, identifies key concepts of posts and calculates the popularity of each key concept based on statistics and sentiment results.

Development of Monitoring System for Smart Farming Using Progressive Web App 238

Lukito Edi Nugroho, I Wayan Mustika and Ridi Ferdiana (Universitas Gadjah Mada, Indonesia)

Indonesia is one of countries well-known as the biggest palm oil producers in the world. In 2015, this country succeeded to produce 32.5 million tons of palm oil, and used 26.4 million of it to export to other countries. The quality of Indonesia's palm oil production has become the reason why Indonesia becomes the famous exporter in a global market. For this reason, many Indonesian palm oil companies are trying to improve their quality through smart farming. One of the ways to improve is by using technology such as Internet of Things (IoT). In order to have the actual and real-time condition of the land, using the IoT concept by connecting some sensors. A previous research has accomplished to create some Application Programming Interfaces (API), which can be used to support the use of technology. However, these APIs have not been integrated to a User Interface (UI), as it can only be used by developers or programmers. These APIs have not been able to be used as a monitoring information system for palm oil plantation, which can be understood by the employees. Based on those problems, this research attempts to develop a monitoring information system, which will be integrated with the APIs from the previous research by using the Progressive Web App (PWA) approach. So, this monitoring information system can be accessed by the employees, either by using smartphone or by using desktop. Even, it can work similar with a native application.

CON2: Control Systems 2

Room: Vera Cruz

Chairs: Cyril Joseph (Manipal University & Manipal University, India), Pastraporn Thipayasothorn (King Mongkut's Institute of Technology Ladkrabang, Thailand)

Automated Fertigation System for Efficient Utilization of Fertilizer and Water 243

Cyril Joseph (Manipal University & Manipal University, India); Indiran Thirunavuakkarasu, Aadesh Bhaskar and Anish Penujuru (Manipal University, India)

Fertigation is the process of delivering plants nutrients along with water to produce a quality crop with higher yields. Employing an automated fertigation system can help farmers by significantly improving water and nutrient usage. The objective is to automatically maintain the moisture level in the soil and to mix different nutrients to obtain the required NPK ratio and give it to plants along with irrigation. The project is carried out in two parts. One is maintaining the optimum level of moisture in the soil. We use a soil moisture sensor which senses the moisture content in the soil. The sensor output is given to the controller, which decides if more water needs to be pumped or not. Then we move on to control the fertilizer mixing and delivery part. The user will input the amount of N, P and K needed in Kg. The user will also input the concentrations of NPK fertilizer solutions used. Taking all these parameters into account, the system will prepare a fertilizer mixture that contains the required amount of nutrients needed by the plant. It will then deliver the mixture along with irrigation water. The preparation of fertilizer mixture will be done with specific intervals of time which will be decided by the user. The system is connected to internet by using Wi-Fi and the user can enter the parameters in a mobile application which will transmit the data to the system over internet.

The Control Speed of DC Motor with Adaptive Compensator Add Integrate 249

Napassadol Singhata (Valaya Alongkorn Rajabhat University under the Royal Patronage, Thailand)

This paper presents the control of DC motor speed with adaptive compensator by using a gradient method. It controls power from disturbance to maintain the DC motor speed. The error of steady state system can be reduced by increasing integrated gain. This method was used to compare with the PI method. Experimental results are studied to verify the validity of the two methods. According to the results of using gradient method, it was found that the adaptive compensator responding to the disturbance resulted in efficiently keeping the continuity in DC motor speed. The results also indicate that the gradient method caused the temporary delay in DC motor speed when compared to PI method. In this study, gradient method in controlling DC motor more effective than using PI method.

Control System Technology of Higher Educational Community Traffic 255

Pastraporn Thipayasothorn and Amornchai Chaichana (King Mongkut's Institute of Technology Ladkrabang, Thailand)

The traffic network designed for the communities plan around higher education service areas in Bangkok and vicinity aimed to 1) study the traffic flow in the communities plan around the higher education service areas in Bangkok and vicinity, 2) study the appropriate information used to plan the traffic routes for the particular community's plan, and 3) provide control system of guideline for information needed for the traffic routes planning for the certain community's plan. The data was collected from 400 samples who were regular commuters in the certain area around the higher education service areas in Bangkok and vicinity through sets of questionnaires. Then, the data was analyzed based on the research methodology. According to the result, the researcher found that the city commuting network affecting the accessibility of each area should provide sufficient convenience for the commuting demand and it should be able to connect to other networks as well. Moreover, the traffic of the communities around the higher education service areas in Bangkok and vicinity must be easily understood, accessible, and each route must be used equally.

Design of LQR Controller for Ballbot and Hardware Implementation 259

Edwin Mocherla, Winston Netto and Sherine Jesna VA (Manipal Institute of Technology, Manipal University, India)

A Ballbot is a single spherical wheeled robot with single point of contact with ground. This makes the system statically unstable. It attains stability only with the help of a sophisticated controller. The controller is a computer algorithm that reads/senses various physical parameters of the robot and generates a computed control signal. LQR controllers for each plane of instability are designed and then tuned from simulation results and was implemented on hardware and validated. Ballbot structure is designed using Solidworks software and the hardware model is fabricated.

Friday, October 13

Friday, October 13, 11:15 - 12:15

IT4: Information Technology 4

Room: Grand Ballroom B

Chairs: Munesh Chandra Trivedi (ABES Engineering College Ghaziabad, India), Olarn Wongwirat (King Mongkut's Institute of Technology Ladkrabang, Thailand)

Industrial Wireless Sensor Selection Method by Using Decision Tree 265

Saksiri Meesawad (KMITL, Thailand); Olarn Wongwirat (King Mongkut's Institute of Technology Ladkrabang, Thailand)

Abstract—Recently, an industrial wireless sensor (IWS) is widely used by many industries. There are various industries trying to apply qualified IWS products in competitive market for gaining advantage. The method in selection IWS includes not only the cost, but also several factors, e.g., data rate, output power, operating voltage, current transmitting, current receiving, operate temperature, brand and so on. These factors is difficult to decision making by engineers or project managers. In this paper, we propose the method for selection IWS by using data mining techniques of decision tree. The proposed method is suitable for the problems that involve selection simultaneously, as in the IWS selection problem. The IWS factors used for decision attribute are defined in this work, as well as the model of training set preferences. The classification definition and algorithms of decision tree technique are also derived in the process to acquire the result, including the cross validation check for the result obtained. The result

expressed that the decision tree provides the correct decision result. It is rationality and feasibility for selection the qualified IWS products.

Metamorphic Cryptography Considering Concept of XOR and Chaotic Sequence Using Video as Medium 271

Namrata Singh (AKTU, India); Munesh Chandra Trivedi (ABES Engineering College Ghaziabad, India); Virendra Kumar Yadav (ABES Engineering College, India); Vikash Singh (I G National Tribal University Amarkantak, MP, India)

Society increasing dependency on modern digital world allows more creativity in today's world. Increasing connectivity motivates cyber criminals to discover new ways to gain access to sensitive information for which they are not authorized to do so. Several researches have been done in past and is still going on. To protect the sensitive information during communication, many researcher favors either cryptography or steganography. A group of researcher now a days also favors the concept of metamorphic cryptography. Several algorithms have been proposed in past to perform steganography and cryptography. But LSB approach is most frequent and popular technique followed by researchers because it simply inserts bits of message in to LSB of video frames. Presented paper contains concept of an efficient algorithm using LSB approach but keeping in mind how to create less distortion and also creating chaotic sequence for high randomness and encryption effect.

Interactive Public Display Using Mobile Web Client 277

Patchara Pattanakimhun (King Mongkut's Institute of Technology Ladkrabang, Bangkok, Thailand); Nopporn Chotikakamthorn (King Mongkut's Institute of Technology Ladkrabang, Bangkok, Thailand); Winyu Chinthammit (Human Interface Technology Laboratory Australia, University of Tasmania, Australia)

Large public displays are widely used in public spaces for serving information. Most of them lack user-content interaction due partly to the fact that a touch screen is not suitable. With nearly universal adoption of mobile smartphone devices worldwide, its use as a tool for interacting with a public display is a viable option. Lack of standard interaction methods, protocols, and wide-spread used mobile applications for this purpose is a problem that prevents its adoption. In this paper, we address these problems by proposing a method for using a mobile phone device as a tool for interaction with a public display system. The method is based on a standard web client, pre-installed on all smartphone devices, thus avoiding the problem as mentioned. Standard mobile gestures were employed for ease of use. The problem of establishing a connection and getting control of the public display is addressed. We present results of user evaluation on our proposed method.

SIG3: Signal Processing & Machine Intelligence 3

Room: Madalena

Chair: Ukrit Watchareeruetai (International College, King Mongkut's Institute of Technology Ladkrabang, Thailand)

Detecting Cluster Numbers Based on Density Changes Using Density-Index Enhanced Scale-invariant Density-Based Clustering Initialization Algorithm 283

Onapa Limwattanapibool (Khon Kaen University & Faculty of Science, Thailand); Somjit Arch-Int (Khon Kaen University, Thailand)

Despite high accuracy, K-means relies mainly on the determination of the suitable number of clusters. To cope with, it is hypothesized that in a dataset region with high density tends to be a cluster. The present study is based on Scale-invariant density-based clustering initialization, in which a cluster numbers is derived from density change analysis or density distribution analysis. However, the density calculation under this approach is based on the number and volume of data, which may result in inaccuracy for cluster detection. Thus, the objective of this study was to improve the performance of Scale-invariant density-based clustering initialization to detect the appropriate cluster numbers and initial cluster centers. We proposed a density calculation based on data distance. The density value obtained from the calculation was used as a condition of data division and data merging for cluster detection. According to the experiment, compared to the Scale invariant density-based clustering initialization, the proposed method could detect the cluster numbers and initial cluster centers more equal or closer to the actual number of clusters. In addition, the level of accuracy in clustering was higher than its counterpart.

A Review of Optimization Method in Face Recognition: Comparison Deep Learning and Non-Deep Learning Methods 288

Sulis Setiowati (University of Gadjah Mada, Indonesia); Zulfanahri Zulfanahri and Eka Frannita (Universitas Gadjah Mada, Indonesia); Igi Ardiyanto (Universitas Gadjah Mada & Faculty of Engineering, Indonesia)

Currently, face recognition system is growing sustainably on a larger scope. A few years ago, face

recognition was used as a personal identification with a limited scope, now this technology has grown in the field of security, in terms of preventing fraudsters, criminals, and terrorists. In addition, face recognition is also used in detecting how tired a driver is, reducing the occurrence of road accidents, as well as in marketing, advertising, health, and others. Many methods are developed to give the best accuracy in face recognition. Deep learning approach becomes a trend in this field because of stunning results, and fast computation. However, the problem about accuracy, complexity, and scalability becomes a challenge in face recognition. This paper focuses on recognizing the importance of this technology, how to achieve high accuracy with low complexity. Deep learning and non-deep learning methods are discussed and compared to analyze their advantages and disadvantages. From critical analysis using experiment with YALE dataset, non-deep learning algorithm can reach up to 90.6% for low-high complexity and 94.67% in deep learning method for low-high complexity. Optimization deep learning, SVM and Genetic Algorithm is proposed to overcome the problem about low accuracy and scalability.

Detection of Fibrosis in Liver Biopsy Images Using Multi-Objective Genetic Programming 294

Purit Thong-on (King Mongkut's Institute of Technology Ladkrabang, Thailand);
Ukrit Watchareeruetai (International College, King Mongkut's Institute of Technology Ladkrabang, Thailand)

This paper proposes an automatic construction of feature extractor for liver fibrosis detection using a multi-objective genetic programming approach in which a constructed feature extractor was measured in different aspects in which becomes the objectives of the evolutionary run. The result of the evolutionary run is a set of solutions with different strengths and weaknesses. A solution from each experiment is selected and compared with a benchmark handcraft method in by each experiment and top-five manners. One of the best results obtained has 2.09 fibrosis estimation error which is less than the benchmark method with 2.63 fibrosis estimation error.

ELEC1: Electronics, Circuits, and Systems 1

Room: Marco Polo

Chairs: Saowalak Saengkae (Rajamangala University of Technology Krungthep, Thailand),
Ruslee Sutthaweekul (Newcastle University, United Kingdom (Great Britain))

Implementation of Wireless Instrument for Solar Energy System 300

Saowalak Saengkae, Putthiphong Kirdpipat and Saichol Chudjuarjeen (Rajamangala University of Technology Krungthep, Thailand)

Solar cells are an alternative energy that is easily accessible to many households. The enhancement of solar cell research is widespread, but energy monitoring is time consuming. In order to reduce the workload and increase the ability of researchers, solar cell system measuring based on the microcontroller application. Applying 2.4 GHz wireless module to transmit and receive data to a computer. Implementing Graphic User Interface (GUI) using Delphi program for recording the data in database and display them on the graphs. As the results, we measure DC voltage, DC current and AC voltage by comparing our instrument with digital multimeter. We observe that there are some errors in terms of percentage such as 0.25 percent of DC voltage, 0.34 percent of DC current and 1.8 percent of AC voltage respectively. Our instrument can also send all voltages via wireless communication at transmission range are 7 meters. The average of light intensity which provides the maximum voltage (20V) of solar energy is 15000-45000 lux in the morning and afternoon respectively. This application may apply to the other applications in the solar energy systems.

Three-Input Single-Output Current-Mode Universal Filter Using Single CCCTA 304

Jakrawat Budboonchu (King Mongkut's Institute of Technology Ladkrabang (KMITL), Thailand); Worapong Tangsirat (King Mongkut's Institute of Technology Ladkrabang (KMITL) & Faculty of Engineering, Thailand)

The circuit topology for the realization of a low-component count current-mode universal biquadratic filter with three inputs and single outputs (TISO) is described. The described structure employs a single current-controlled conveyor transconductance amplifier (CCCTA), and only two grounded capacitors, without needing any external passive resistors. By properly selecting the relevant input signal, the circuit is capable of generating the five standard biquadratic filtering functions, i.e. lowpass, bandpass, highpass, bandstop and allpass current responses. The proposed filter can also be tuned electronically by external bias currents of the CCCTA. The circuit is analyzed for the non-idealities of the used CCCTA and possesses attractive low sensitivity performance. Simulation results are found to be in good agreement with the theoretical analysis.

Study of Microwave Responses on Layered Woven CFRP Composites 308

Ruslee Sutthaweekul (Newcastle University, United Kingdom (Great Britain)); Adi Mahmud Jaya Marindra (Newcastle University, United Kingdom (Great Britain) &

Kalimantan Institute of Technology, Indonesia); Guiyun Tian (Newcastle University, United Kingdom (Great Britain))

Woven carbon fibre reinforced polymer (CFRP) have been widely used in airline industry. The main challenge of microwave inspection on woven CFRPs is the complex electromagnetic responses related to their layered-woven structures and associated defect (e.g., impact damage). This work focuses on simulation study of microwave responses for woven CFRPs based on microwave open-ended waveguide (OEWE) system in K-band. Simulation studies of woven composites with different weaving structures are carried out through structural parameters including width, gap between fibres, ply thickness and number of plies. The simulation results suggest that gap and ply thickness significantly affect frequency shift in the response, whereas woven texture and number of plies are related to occurrences of multiple resonances/ripples. In experiment, we examine microwave responses of a 12-layers, 5HS woven composite in areas of with and without impact damage. The initial experimental results show good agreement with the simulation. The understanding of microwave responses related to woven CFRP structures is the foundation for future development of defect characterisation technique and inverse problem solving on woven composites.

SIG4: Signal Processing & Machine Intelligence 4

Room: Santiago

Chairs: Peter Drotar (Technical University of Kosice, Slovakia), Duangjai Jitkongchuen (Dhurakij Pundit University, Thailand)

Automatic Voltage Regulator Using PID Controller Based on Particle Swarm Optimization 313

Rapeepong Rattanawaorahirunkul and Jitsaran Seekuka (Kasetsart University, Thailand)

This paper presents the optimal PID controller design for Automatic Voltage Regulator (AVR) system. The AVR system is complex and sensitive to noise and disturbance inputs. PID controllers are popular controllers in the design and control of general systems. However, designing optimal PID controllers for complex systems with uncertainty disturbance effect is also an interesting issue for many researchers. In this research, Particle Swarm Optimization (PSO) is used to calculate the optimum PID gain for AVR system. This paper compares the results of system control by using Mean Square Error (MSE), Mean Absolute Error (MAE), and Maximum Absolute Error (MaxAE). From the simulation result, we found that, the PID controller design base on PSO technique has more efficiency in improving the output response of the AVR system under random disturbance effect.

The Improved Ensemble Classification Technique Using Wolf Algorithm 317

Duangjai Jitkongchuen and Worapat Paireekreng (Dhurakij Pundit University, Thailand)

the rise of data mining leads to the data-oriented society and focusing on data analytics. Several classification techniques have been investigated to find the optimized model for data prediction. This includes the enhancing the performance of the model. Grey Wolf Optimizer is the one of novel approach to solve NP-hard problems. However, the algorithm address the general situation. To solve the customized situation, the adapted algorithm needs to be explored. This research proposes the Ensemble Featured-Wolf (EF-Wolf) algorithm which includes the feature selection stage and implements ensemble technique to optimize the function selection problem in classification. The number of the packs of the wolf can help to select the most optimized functions to selection the most relevant features in the dataset. In addition, the packs ensemble of the relevant features can determine the feature selection of the dataset. The experiment shows the comparison among classification techniques with binary and multiclass datasets. The results show that EF-Wolf 5-pack mostly performs better results in terms of accuracy rate compared to other techniques.

Heterogeneous Ensemble Feature Selection Based on Weighted Borda Count 322

Peter Drotar, Juraj Gazda and Matej Gazda (Technical University of Kosice, Slovakia)

Feature selection is important step in many data mining applications. Reduction of data dimensionality through feature selection reduces computational time and complexity and provide better interpretability. Besides well established feature selection approaches such as filter, wrapper and embedded approach recently emerged novel methodology: ensemble feature selection. This approach utilize diversity to select final feature selection subset. In this paper we proposed four novel heterogeneous ensemble methods using eight basal feature selection methods in first stage and modified Borda count voting schemes in the second stage. The proposed methods were evaluated on four artificial datasets achieving significantly higher index of success than conventional feature selection techniques.

NET2: Communication & Network Technologies 2

Room: Vera Cruz

Chair: Lapas Pradittasnee (King Mongkut's Institute of Technology Ladkrabang, Thailand)

Design of Textile Capsule-Shaped Patch Antenna for WBAN Applications 326

Charinsak Saetiaiw (Rajamangala University of Technology Isan, Khonkaen Campus, Thailand)

This paper presents the design of the Capsule-shaped patch antenna on fabric substrate for WBAN applications at 2.45GHz ISM band. The antenna uses Pure Copper Polyester Taffeta Fabric as a conductive substrate for ground and radiator layers, and denim as dielectric substrate. Normally, a basic rectangular antenna has a narrow bandwidth. This paper proposes the new design combining a rectangular shape with a half circular shape at both end, called the Capsule-shaped antenna was proposed. The other purpose of this research is to design the antenna that can be directly installed on cloth for a WBAN small sensor. The parameters used for the analysis rely on resonance frequency. The operation frequency can be analyzed based on the reflection coefficients; it is obtained from simulation results. The antenna prototypes have been built and measured. The impedance bandwidth of prototype antenna at 10 dB with a value of 11.95% compared with 7.34% of the simulation, centered at 2.45GHz. It was found that the antenna gain from simulation and measurement was 5.63dB and 3.53dB, respectively. Finally, the radiation pattern of Capsule-shaped antenna was verified by the measurement results.

Proposal of Channel Estimation Scheme for Practical V-BLAST MIMO-OFDM System 330

Tanairat Mata (Rajamangala University of Technology Krungthep, Thailand);
Nakarin Inkamchua (King Mongkut's Institute of Technology Ladkrabang, Thailand); Anan Sopin (Rajamangala University of Technology Krungthep, Thailand); Pisit Boonsrimuang (King Mongkut's Institute of Technology Ladkrabang, Thailand)

In wireless communication, multiple input and multiple output technique is often applied with orthogonal frequency division multiplexing (MIMO-OFDM) because of its many advantages such as spectral efficiency, link reliability, diversity gain and so on. In the practical MIMO-OFDM system, it has a signal aliasing problem due to the mismatch of sampling from adding zero padding at both front and rear of data transmission in each OFDM symbol. To solve this problem, the channel estimation by using the new comb-type pilot symbol arrangement scheme is proposed for the practical MIMO-OFDM system. From the computer results, it can be shown that the proposed channel estimation scheme can perform higher system performances than the conventional scheme in the practical V-BLAST MIMO-OFDM system.

Elephant Flow Detection and Delay-Aware Flow Rerouting in Software-Defined Network 335

Hnin Thiri Zaw (University of Computer Studies, Yangon); Aung Htein Maw (University of Information Technology, Myanmar)

Long-lived large flows (or) elephant flows (such as VM migration and backup data transfer) carry a large amount of data and consume a lot of network resources. Normal flows (or) mice flows (such as web searching) carry a small amount of data and consume a few network resources. The long existence of elephant flow makes the network throughput degradation and delays to other traffic flow in the network by utilizing more bandwidth and buffers. Therefore, differentiating elephant and mice flows play as an important function to optimize network performance. This paper presents a traffic rerouting solution with the combination of elephant flow detection and multipath routing in software-defined networking (SDN). This solution provides network performance improvement and efficient resource utilization by rerouting the elephant flow to the least delay path among available paths. The proposed method is implemented by using ONOS controller and Mininet emulator. The experimental results show that 44.11%-58.76% throughput improvement and 36.46%-47.44% flow completion time (FCT) reduction for elephant flows as compared with the reactive forwarding application of ONOS controller.

Friday, October 13, 13:15 - 15:15

IT5: Information Technology 5

Room: Grand Ballroom B

Chairs: Adhitya Bhawiyuga (University of Brawijaya, Indonesia), Marissa Chantamas (Assumption University, Thailand)

Interactive Interface Design for Learning Numeracy and Calculation for Children with Autism 341

Afshara Tashnim, Samiha Nowshin, Fatema Akter and Amit Kumar Das (East West University, Bangladesh)

Nowadays education with technology is highly preferable for children as children are way more engrossed to gadgets. The use of devices, in educational sectors, is rising day by day. Children with autism are one of the most benefited parts in this area. If the gadget is a touchscreen assistive tool, then the interest of an autistic child is increased. Devising and designing an interactive interface system for autism children with the help of participatory interface design process that has been guided with autistic children before and encouraged us to develop the touchscreen assistive learning numeracy and calculation system, named Play and Learn Number(PLaN). The application mainly focused on teaching numeracy and calculation cause without having a basic idea on numeracy and calculation regular life is hard to move on. We also focused on user interface design with some latest approaches like dot matching and puzzling which will be applied in the application. The PLaN application is also usable for teachers and parents to train and educate the autism children; it will also help to grow their interest in learning as several reinforcements are included in it. It is assumed that after establishing of this application, the autistic child will be able to learn more than before. This application will also help the children to memorize and recognize the numbers with or without sequence through the animated pictures and interactive learning application. Finally, this paper described the user interface design process broadly for forming PLaN to teach basic numeracy and calculations to children with autism.

A Publish Subscribe Based Middleware for Enabling Real Time Web Access on Constrained Device 347

Adhitya Bhawiyuga (University of Brawijaya, Indonesia); Dany P Kartikasari and Eko Sakti Pramukantoro (Brawijaya University, Indonesia)

In IoT world, web platform can be one of the promising interoperability enabler platform due to its massive success in current internet era. In order to integrate the web and IoT, a middleware with efficient communication architecture is required. In this paper, we designed and implemented publish subscribe based middleware for enabling real time web access on constrained device. The proposed system consists of three components : the sensor-actuator equipped device and its web based client counterpart acting as both publisher/subscriber, and MQTT broker. In order to send its sensing data to user, each device periodically publish a message with specific topic. In another side, user subscribe to that topic for getting the latest data from a device. The similar natures are applied for communication in reverse direction i.e. the user giving command to device. For enabling web access to the system, web based client utilize MQTT through websocket protocol to communicate with broker while the device utilize MQTT on top of pure TCP/IP stack to reduce the communication overhead. From the functional and performance testing we conclude that the proposed system is able to bridge the communication between web based client to the device with reasonable performance.

University-Industry Collaboration for Game Curriculum: The Open Innovation Model 352

Tanat Jiravansirikul and Tuang Dheandhanoo (DIDTC Thammasat, Thailand); Marissa Chantamas (Assumption University, Thailand)

University-industry (U-I) linkages have been around for quite sometime now. However, the studies applying directly to the gaming curriculum are still limited. This study proposes the use of the open innovation model to develop the gaming curriculum as one of the contributions of this research. The findings suggest that university-industry collaborations need to be distinctive in catering to the demands of the industry to be successful. The program was developed with collaboration between a Thai university and leading gaming institution from the US. Based on the research four inter-related programs were created under two programs supported by multiple companies in the industry serving different functions. In addition the research also identified that an additional player, the government should be added thus transforming the U-I linkage to triple helix model.

A Conceptual Framework for Better Understanding of Factors Influencing Accessibility to a Website and Its Acceptance by University Students with Visual Impairments 356

Phatthanan Sirikitsathian (King Mongkut's Institute of Technology Ladkrabang, Thailand); Singha Chaveesuk (King Mongkut's Institute of Technology Ladkrabang, Thailand); Chanboon Sathitwiriawong (King Mongkut's Institute of Technology Ladkrabang, Thailand)

Information and communication technology have been developed and widely used nowadays. A good website should be readily accessible to every group of users. General users or users with disability should be able to access and understand the messages in a website equally well. However at the present, many people with visual impairment cannot access a website readily: they cannot search for information, in particular. Specifically, some university students in Thailand have problems accessing a website and understanding its content due to the website was developed by developers and associated personnel that lacked the knowledge and understanding of the principles that affect universal website accessibility and

acceptance. This study, therefore, propose a conceptual framework based on the UTAUT theory of website acceptance. In addition to the main variables in the original theory which are applicable only to general users, two more main variables were included in this framework: perceived convenience and perceived reliability. Two new moderators were added to it as well: web accessibility and vision impairment level. These extra variables and moderators were added in order to incorporate users' intention to use a website and their usage behavior in this framework. This framework would be of value to developers and associated personnel to help them understand the valid website design requirements for university students with visual impairment.

Friday, October 13, 13:15 - 15:35

SIG5: Signal Processing & Machine Intelligence 5

Room: Madalena

Chairs: Kousuke Matsushima (National Institute of Technology, Kurume College, Japan),
Ajchara Phu-ang (Chandrakasem Rajabhat University, Thailand)

Segmentation of Coring Images Using Fully Convolutional Neural Networks 361

Szilard Fazekas, Stephen Obrochta, Tatsuhiko Sato and Akihiro Yamamura (Akita University, Japan)

As a first step in building a toolkit for the computer analysis of images of sea floor sediment cores, we introduce a technique to automate a time consuming manual phase of said analysis. The retrieved cores contain artifacts, e.g., induced by the extraction itself, the removal of which improves the efficiency of environmental reconstruction. From a computer vision perspective, the task of identifying those artifacts is an image segmentation problem. The method we describe as a solution uses the recently introduced fully convolutional neural networks (FCN), which have been shown to be very efficient in segmenting images.

Road Deformation Detection Based Sensor Fusion 366

Katsuto Yamaki and Kousuke Matsushima (National Institute of Technology, Kurume College, Japan); Osamu Takahashi (Nagaoka University of Technology, Japan)

The state of asphalt pavement gradually becomes worse because of daily traffic, weather, and temperature. Then it emerges as pavement deformations. For preventing human damages by them, we need to detect existing underground cavity. Consequently, location estimation of the efficiency is an important factor for maintaining the road safety. The purpose of the present study is to develop Asphalt Pavement Deformation Monitoring System (APDMS). The APDMS automatically detects the deformation of asphalt pavement using computer vision, laser range finder, and inertial measurement sensor. Laser range finder is used to collect height data of pavement surface more accurately. Then vision sensor is used to acquire a state of asphalt pavement. Experimental results show that pavement deformations can be detected correctly with the sensor fusion method.

Image-based Pavement Crack Detection by Percolation Theory 372

Yasuhiro Kawasaki and Kousuke Matsushima (National Institute of Technology, Kurume College, Japan); Tadashi Sho (Toyohashi University of Technology, Japan)

Asphalt pavement performance may deteriorate so rapidly because the desired service level of local governments is reduced. Thus, there are a lot of road damages like cracks, potholes, and ruts on some pavements. If they remain in the condition of being inconvenient, road-traffic accidents such as vehicle crash and fall of motorcycle would be occurred. Moreover, if they get worse further, there are possibilities that the pavement safety performance cannot be maintained and the structures may collapse. Hence, it is necessary to diagnose the pavements for safety and to carry out proper maintenance on a regular basis. In the present study we present the approach for highly accurate crack detection based percolation theory. The shadow reduction approach is used to detect cracks more accurately. Experimental results show that many kinds of cracks can be detected correctly and fast with the adaptive search window method.

The Flower Pollination Algorithm with Disparity Count Process for Scheduling Problem 378

Ajchara Phu-ang (Chandrakasem Rajabhat University, Thailand)

The flexible job shop scheduling is the problem that found in the manufacturing industry and challenge for many researchers interested in this field. This paper proposed new algorithm for solving the flexible job shop scheduling problem (FJSP). The proposed algorithm is based on the flower pollination algorithm with a new concept called disparity count process. The performance of the proposed algorithm is compared

with the other state-of-the-art metaheuristic algorithm. The results are evaluated in terms of the average percentage deviation from the lower bound. The experimental shown that the proposed algorithm found the number of best answer more than others algorithm.

Multiple Steps Time Series Prediction by A Novel Recurrent Kernel Extreme Learning Machine Approach 383

Zongying Liu, Chu Kiong Loo and Naoki Masuyama (University of Malaya, Malaysia); Kitsuchart Pasupa (King Mongkut's Institute of Technology Ladkrabang, Thailand)

This paper proposes a novel recurrent multi-steps-prediction model called Recurrent Kernel Extreme Learning Machine (RKELM). This model combines the strengths of recurrent multi-steps-prediction and Extreme Learning Machine (ELM) to unleash the limitation of prediction horizon. The kernel matrix is applied to replace the hidden layer mapping of ELM in order to solve the lack of predicting deterministic and parameter dependency. In the experiment, we apply two synthetic benchmark data sets and two real-world time series data sets including Malaysia palm oil price, ozone concentration of Toronto to evaluate RKELM and compare its performance against Recurrent Support Vector Regression (RSVR) and Recurrent Extreme Learning Machine (RELM). The experimental results show that RKELM has superior abilities in the different predicting horizons and stronger predicting deterministic than others.

A Framework for Origin-Destination Estimation Using License Plate Recognition for Thai Rural Traffic 387

Kitipong Praphananurak (Ministry of Transport, Thailand); Winai Sanghitkul (MAA Consultants Co., Ltd, Thailand); Voraniti Chovichien (Asian Engineering Consultants Corp. Ltd., Thailand); Pakorn Watanachaturaporn (King Mongkut's Institute of Technology Ladkrabang & Faculty of Engineering, Thailand)

Origin-Destination (OD) estimation is a crucial parameter for planning city transportation network. Classical methods for collecting the OD information including individual interviewing or using pressurized tube counting equipment; such example methods are limited by the number of people involved during observation and interview, traffic delay, budget, and short observation period. Accuracy from human observation and short observation period are doubtfully accurate. Using image processing technology, the OD estimation can be performed for longer period by analyzing vehicle movement from recorded or online closed-circuit television recordings. Moreover, an individual average speed for each vehicle or type of vehicle are obtainable from identify the license plate number. This paper proposes of a methodology for applying a license plate recognition technology for OD estimation for Thai rural traffic. The proposed methodology obtains trustable estimation for each individual vehicle. The results can be verified later by human or other methods from recorded video. Therefore, higher accurate and trustable estimation is obtained and make available for later usage.

Intravascular Ultrasound Image Recovery and Segmentation Based on Circular Analysis 392

Anusorn Wong-od (Burapha University & Informatics, Thailand); Annupan Rodtook (Ramkhamheang University, Thailand); Suwanna Rasmequan and Krisana Chinnasarn (Burapha University, Thailand)

This paper presents an novel approach to segment Lumen and Media-Adventitia boundaries and repair corrupted pixels of incomplete Intravascular Ultrasound Image. The proposed algorithm based on circle analysis is employed to estimate Lumen and Media-Adventitia boundaries and the algorithm based on diffusion is implemented to recover corrupted pixel. The proposed method has been tested on the standard dataset provided by expertise of Computer Vision Center, Universitat de Barcelona, Barcelona, ESP. The experiment demonstrates that the proposed method provides good accuracy results for a set of incomplete Intravascular Ultrasound Image.

Friday, October 13, 13:15 - 15:15

POW3: Power Systems 3

Room: Santiago

Chair: Sarjiya Sarjiya (Gadjah Mada University, Indonesia)

The Development of Wind Energy Resources as Wind Turbine Grid Tied Using SCIG in Bantul South Java Island 398

Danang Wijaya (UGM, Indonesia)

The development of wind energy resources as grid tied wind turbine in Indonesia is presented. There are

35 locations that are feasible to develop as wind farm which have wind speed higher than 5 m/s and wind power density above 150 W/m² at 50 m elevation. To investigate the impact of wind farm grid tied to the existing power system, a simulation study of 50 MW SCIG was done in Bantul which is located in south Java Island. Simulation results show that wind turbine generation provided a good influence to increase the bus voltage and power loss reduction in existing electric power system. With the capacity factor of 30%, annual energy production is about 32,734.02 MWh.

Customer Load Monitoring and Intelligent Control Device 404

Dmitry Bliznyuk, Pavel Bannykh, Vladislav Samoylenko and Andrey Pazderin (Ural Federal University, Russia); Pavel Kovalenko (Ural Federal University named after the first President of Russia B. N. Yeltsin, Russia)

To date there are a variety of systems and services worldwide providing the demand-side management functionality. They are applied for reducing electricity losses, increasing consumption efficiency and reducing customers' electricity costs. However, none of them are capable of reasonably-efficient operation within Russian energy market environment. The hardware-software integrated solution was developed for performing demand-side management and providing the information on electricity consumption. The developed solution provides "smart home" functionality with industrial-level stability, reliability and service life. The device enables developing the recommendation for choosing the optimal price category based on the energy consumption statistics. Moreover, it allows to optimize the customers operational cycle within current price category. The introduction of demand-side management systems is beneficial both for the customers and for the grid companies.

A Novel Modeling Approach of SVC for Three-phase Transient Stability Simulator 409

Pavel Bannykh (Ural Federal University, Russia); Pavel Chusovitin (Ural Federal University & System Operator of United Power System, Russia); Andrey Pazderin (Ural Federal University, Russia)

Transient stability analysis requires an appropriate models of FACTS devices. This paper describes a new Static VAR Compensator (SVC) model for transient stability simulator. The main attention is paid to the model of such an integral part of the SVC as a thyristor-controlled reactor (TCR). In the standard model, the influence of PLL is neglected for transient stability analysis. It is shown that the value of the phase-to-phase susceptance differs from that given by the control system for unbalanced disturbances. These effects are associated with a firing pulses error that is due to the PLL response to the phase-to-phase voltage change. The proposed model allows to take into account these effects. In addition, it is shown that these phenomena can be reproduced only in a three-phase transient stability simulator. Validation of the model was done by comparing simulated results with an accurate electromagnetic transients program (EMTP) model.

Parallel Operation Synchronous and Induction Generator on Microgrid Testbed 415

F. Danang Wijaya, L. Gajayana and H. Wijaya (Universitas Gadjah Mada, Indonesia)

Parallel operation between two generators was an important case to take a caution to increase the capacity of generated power. Because in this case, there will change system variable such as frequency and voltage. In order to comprehend this parallel operation, several tests were performed on the synchronous generator and induction generator in a microgrid testbed. The test was done by loading the system with maintain system voltage and frequency at the level of ± 380 VL-L (-10%, + 5%) and ± 50 Hz ($\pm 1\%$). The test results indicate that synchronous and induction generator can act as voltage and frequency stabilizers. In the system, synchronous generators can work as active and reactive power supplier, while induction generators can only work as active power supplier.

Substation Expansion Planning in Kulon Progo Region Using Imperialist Competitive Algorithm 420

Sarjiya Sarjiya (Gadjah Mada University, Indonesia); Beny Pardede (Gadjah Mada University & Chevron Pasific Indonesia, Indonesia)

The objective of substation expansion planning (SEP) is to prepare the capacity of a substation in order to supply the load growth in the future. The planning is conducted also to minimize the investment and operation cost of the substation, by finding its optimal location, capacity, and construction time. This paper proposes SEP using an imperialist competitive algorithm (ICA) and geographical information system (GIS). The type of planning is one stage, with 10 years period time (long-term). Two alternatives of SEP, which are the expansion of existing substation and the construction of a new substation in the new location are analyzed and compared. The alternative with a lower cost without breaking the constraints is taken. The effect of ICA parameters is also tested to find the best optimum value and the fastest execution time. Finally, the comparison between ICA and Genetic Algorithm (GA) is done to prove the effectiveness of the method in the SEP

Iterative Decremental Step-Size Scanning-based MPPT Algorithms for Photovoltaic Systems 425

Faizal Samman (University of Hasanuddin, Indonesia); Syafaruddin Syafaruddin (Universitas Hasanuddin Makassar, Indonesia); Abd. Azis Rahmansyah (Politeknik Bosowa Makassar, Indonesia)

Iterative decremented step-size scanning-based maximum power point tracking (MPPT) algorithms are presented in this paper. The change of partial shading conditions is a main problem in photovoltaic systems. Power curves of the systems will contain some local maximum power points, beside a global one, and also change depending on environmental climates, which affect the partial shading conditions. Three iterative scanning-based MPPT algorithms are proposed to solve the problem, i.e. decremented window scanning, peak bracketing (PB) method and PB with initial scanning. A photovoltaic system coupled with a DC/DC converter is modeled in SPICE for verification and simulation purposes. The simulation results have presented that, for some cases, those MPPT algorithms can find out the global maximum power points of the considered photovoltaic system. They also required relatively small number perturb-and-observe steps to reach global maximum power points.