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Saturday, May 19, 09:00 - 09:20

Opening Remarks

Room: Conference Hall

Saturday, May 19, 09:20 - 10:20

Keynote Speech I C.-C. Jay Kuo

Room: Conference Hall
Chair: Robert Chen-Hao Chang (National Chung Hsing University & National Chi Nan University, Taiwan)

Saturday, May 19, 10:20 - 10:40

Coffee Break (Break Area)

Saturday, May 19, 10:40 - 12:00

Panel Discussion

Room: Conference Hall
Chair: Wen-Chung Kao (National Taiwan Normal University, Taiwan)

Saturday, May 19, 12:00 - 13:00

Lunch (Lunch Area)

Saturday, May 19, 13:00 - 14:30

Poster Session A

Room: Corridor at 1st Floor
Chairs: Hai Wu Lee (Huaiyin Institute of Technology, P.R. China), Tin-Yu Wu (National Ilan University, Taiwan)

Anti-Jamming CRN Transmission Stackelberg Game under Cumulative Interference Constraint *1*
Bin Gao and Li Zhao (Southeast University, P.R. China); Peng Lan (Shandong Agricultural University, P.R. China); Fenggang Sun (PLA University of Science and Technology & Shandong Agricultural University, P.R. China); Zhanke Yu and Xiumei Pang (PLA Army Engineering University, P.R. China)
The power allocation of a secondary user (SU) in a cognitive radio network (CRN) contending with a smart jammer (JA) is formulated as a zero-sum game, in which the SU as the leader first chooses the transmit power while JA as the follower selects jamming power to interrupt the transmission of the SU. The impact of the cumulative interference constraint for ensuring PU's quality of service (QoS) is investigated. A Stackelberg equilibrium of the anti-jamming CRN game is derived and the conditions assuring its existence are provided.

Projective Weight-based Unsupervised Laplacian Graph Learning for Person Re-identification *3*
Bin Gao and Li Zhao (Southeast University, P.R. China); Peng Lan (Shandong Agricultural University, P.R. China); Fenggang Sun (PLA University of Science and Technology & Shandong Agricultural University, P.R. China); Zhanke Yu and Xiumei Pang (PLA Army Engineering University, P.R. China)
For unsupervised person re-identification, traditional Laplacian regularisation based dictionary learning methods encounter the fixed weight problem and thus impair the match rate. To address this limitation, we develop a novel unsupervised dictionary learning approach to learn a discriminative representation. The proposed approach takes the efficiency of l2 graph regularization with a closed-form solution into account. Our approaches achieve very promising results on the challenging VIPeR dataset.

App Supported Demonstration Design on Reuse of Areca Catechu Tree *5*
Fang Lin Chao and Yu Chueh Wong (Chaoyang University of Technology, Taiwan)
When Areca catechu is chopped down and left in the wild and became an extra burden to the local environment. Reuse opportunities collected and App built to enhance the designer's awareness and extend possible utilization. Sets of LED are controlled by the app, others sets of switches are placed on samples of areca tree. Virtual information and the physical specimen can be linked through the bidirectional interaction as a triggered message is sent between the app and LED indicator. From the preliminary survey, we found the combination of physical and virtual display performs better than normal information search.

Pilot Contamination Reduction in Massive MIMO System 41

Yifeng Zhao and Zeyu Lin (Xiamen University, P.R. China); Liu Kai (University of Xiamen, P.R. China); Changzheng Zhang (Senior, P.R. China); Lianfen Huang (XiaMen University, P.R. China)

This paper proposed two efficient pilot contamination reduction schemes based on the TDD massive MIMO system model: the directional pilot scheme and the multi-cell processing (MCP) scheme. Closed expressions of the user throughput are also derived. According to the simulation results obtained, we can know that the capability of the massive MIMO system can be significantly improved and the robustness is also achieved through the proposed scheme. Due to a lack of good strategies for pilot contamination reduction, the proposed schemes in this paper provide some new solutions for this problem with strong innovation.

Ray Tracing Based Marine Broadband Mobile Wireless Channel Modeling 43

Zhibin Gao (Xiamen University Xiamen, P.R. China); Siqiang Ke and Canbin Chen (Xiamen University, P.R. China); Lianfen Huang (XiaMen University, P.R. China)

This paper proposed an improved spatial partitioning ray tracing algorithm to modeling the marine broadband mobile wireless channel. In this paper, a communication scene between a unmanned aerial vehicle (UAV) and a boat is simulated, then, the marine wireless channel is studied.

Session A1: Computer Communications and Signal Processing for Next Generation Media-I

Room: Conference Hall

Chairs: Pingguo Huang (Seijoh University, Japan), Yutaka Ishibashi (Nagoya Institute of Technology, Japan)

13:00 ***Audiovisual and Haptic Interactive IP Communications over Wireless LANs and their QoE 45***

Tatsuya Domae and Toshiro Nunome (Nagoya Institute of Technology, Japan)

This paper assesses QoE of audiovisual and haptic interactive communications over wireless LANs. We evaluate the effect of two intra-stream synchronization control methods: the media adaptive buffering that sets appropriate playout buffering time for each media and the conventional buffering that sets the same playout buffering time for all the three media. We deal with three network configurations that differ access lines to our campus network; the configurations include wireless LAN access. Then, we assess QoE of the intra-stream synchronization control methods. As a result, even in the case of wireless LAN access, we find that the media adaptive buffering achieves higher QoE than the conventional buffering.

13:15 ***Cloud-Base Defense against DRDoS Attacks 47***

Hiroshi Fujinoki (Southern Illinois University Edwardsville, USA)

In this paper, we present our new approach for protecting production servers from distributed reflector denial of service attacks, while the volume of their attacking traffic has been exponentially increasing. We apply a cloud to effectively sieving out the reflectors of the attacking traffic. We assessed the convergence delay for sieving using simulations. Our simulation results indicated that the proposed protection method promising, showing the approach is scalable in both attacking traffic volume and attacker ratio.

13:30 ***Effect of Estimation Error in Node-Clustering with V2X Communications for Crash Warning Applications 49***

Takeshi Hirai and Tutomu Murase (Nagoya University, Japan)

In crash warning application (CWA) using V2X (Vehicle-to-Everything), we have already proposed the Node-Clustering communication method to accommodate more communication nodes. In this method, a cluster-head node estimates other nodes' status information, and transmits all cluster-members information; then, if a node (cluster-member) knows that the estimated information is not correct, the node transmits an updated message. As the estimation is less accurate, the correction messages are more transmitted. This may cause severer congestion in a wireless channel, therefore, we evaluate the impact of the estimation error for the maximum numbers of accommodated nodes which have to meet the requirements of CWA such as 10 information frames per second.

13:45 ***Learnable Image Encryption 51***

Masayuki Tanaka (National Institute of Advanced Industrial Science and Technology, Japan)

The network-based machine learning algorithm is very powerful tools. However, it requires huge training dataset. Researchers often meet privacy issues when they collect image dataset especially for surveillance applications. A learnable image encryption scheme is introduced. The key idea of this scheme is to encrypt images, so that human cannot understand images but the network can be train with encrypted images. This scheme allows us to train the network without the privacy issues. In this paper, a simple learnable image encryption algorithm is proposed. Then, the proposed algorithm is validated with cifar dataset.

14:00 ***A Performance Evaluation of General Traffic Systems by Machine Learning 53***

Suguru Nii and Takashi Okuda (Aichi Prefectural University, Japan)

When we design the Internet of Things (IoT) systems, it is important to evaluate general traffic systems. However, in general traffic systems, the exact solution is not available. Alternatively, we can evaluate it with simulation. However, simulation spends much time. In this paper, we propose evaluate general traffic systems by machine learning.

14:15 ***Issues of Network Reliability Design toward IoT Society 55***

Hitoshi Watanabe (Tokyo University of Science & Faculty of Engineering, Japan); Pingguo Huang (Seijoh University, Japan); Yutaka Ishibashi (Nagoya Institute of Technology, Japan)

Telecommunication networks with high reliability and high performance are indispensable for realizing the Iot society. The authors have been engaged in the research and development of reliability design of telephone network (PSTN), which is one of nationwide backbone network. This paper summarizes the methodology of reliability design of PSTN and points out the future issues of network reliability design toward IoT society.

Session A2: Wearable Technology on the Health and Medical Electronics

Room: 101

Chair: Jian-Chiun Liou (Taipei Medical University, Taiwan)

13:00 ***An FPGA-based Transceiver for Human Body Channel Communication using Walsh Codes 57***

Ching-Che Chung, Ru-Hua Chang and Ming-Hsuan Li (National Chung Cheng University, Taiwan)

In this paper, a body channel communication (BCC) transceiver with Walsh codes modulation is presented. In the transmitter part, data are encoded in Walsh code format, and the chosen Walsh codes restrict the maximum consecutive identical digit (CID) to increase the data transitions. In the receiver part, we use an analog front-end (AFE) circuit board to amplify the attenuated signal from the transmitter and restore the signal to the digital waveform. After the 8x oversampling sampler and vote integrator recovery the clock and data, the Walsh code demodulator demodulates the original data. The proposed BCC transceiver has higher data reliability because of the orthogonal characteristic of Walsh codes. Moreover, the proposed Walsh code concatenated method strengthens the jitter tolerance and improve the code rate. The proposed BCC transceiver was verified on a field-programmable gate array (FPGA) board. The chip rate of the proposed transceiver ranges from 1.56 Mcps to 12.5 Mcps. Also, the bit error rate is < 10^-8 and < 10^-5 at 6.25 Mcps and 12.5 Mcps, respectively.

13:15 ***Instantaneous Heart Rate Variability(HRV) Signal Cloud Portable Flat Panel Observation*** ***59***

Jian-Chiun Liou (Taipei Medical University, Taiwan)

This study is an instantaneous heart rate variability (HRV) signal cloud portable flat panel observation. HRV applications reflect the heart and cardiovascular disease. Patients with essential hypertension and myocardial infarction, vagal decay are reflected in the heart rate variability. Heart rate variability is also used as a predictor. Neurology, heart rate variability can reflect a variety of central nervous autonomic disorders. Such as Parkinson's disease, chronic alcoholism, limb paralysis and so on. Cardiomyopathy caused by diabetes mellitus and diabetes mellitus will reduce heart rate variability. The decrease in heart rate variability is before the onset of clinical conditions.

13:30 ***An Investigation of the ECG and PPG Signal Acquisition Analysis System*** ***61***

Jian-Chiun Liou (Taipei Medical University, Taiwan)

The study is focus in investigation of the ECG and PPG signal acquisition analysis system. This is based on ECG signal and PPG signal as input. It records the blood flow produced by the subject. Heart rate variability compared to the same posture. It attempts to find out the correlation between the PPG signal and the ECG signal and analyze it.

13:45 ***Design and Development of Portable Spirometer*** ***63***

M. Udin Harun Al Rasyid (Politeknik Elektronika Negeri Surabaya (PENS), Indonesia); Kemalasari M Syah (Indonesia, Indonesia); Muhammad Sulistiyo (Politeknik Elektronika Negeri Surabaya (PENS), Indonesia); Sritrusta Sukaridhoto (Politeknik Elektronika Negeri Surabaya, Indonesia)

Spirometer as main device to perfom spirometry test is needed to make clinical diagnosis of Chronic Obstructive Pulmonary Disease (COPD), a limitation airflow disease. Spirometer will produce Forced Vital Capacity (FVC), maximum volume of air that can be exhaled during a forced maneuver and produce Forced Expired Volume in one second (FEV1), volume expired in the first second of maximal expiration after a maximal inspiration as the main factor to diagnosis COPD. Spirometry test generally performed at a health clinic or medical offices but nowdays home spirometry with portable devices is slowly gaining acceptance. But current portable home based spirometers have no coaching, feedback, or quality control mechanisms from physicians to ensure acceptable measurements. This study creates android messaging, javafx desktop and website based information system integrated to portable spirometer made from MPX5100DP sensor to calculate the pressure during FVC, and Arduino nano to keep track and maintaince spirometry test.

14:00 ***A High-Speed High-Voltage Bipolar Pulser for Medical Ultrasonic Imaging Applications*** ***65***

Yen-Chung Huang, Kuo-Tso Chen and Kuan-Yi Lu (Industrial Technology Research Institute, Taiwan); Jian-Chiun Liou (Taipei Medical University, Taiwan); Guo-Zua Wu (ITRI, Taiwan)

This study proposes a high-speed high-voltage pulser for ultrasonic imaging applications. The proposed pulser employs high-speed level shifters and a high-voltage push-pull output stage that can produce 200 Vpp (±100V) output pulses with rising and falling times of 18.2 ns and 18 ns, respectively, under a 1-KOhm resistance parallel with a 220-pF capacitance load. The transmitted signal shows about -40 dBc second harmonic signal distortion (HD2). The measured results indicate the designed pulser can be employed for medical imaging with low second harmonic sideband signals.

14:15 ***A Wearable Photoplethysmographic System Realization with Efficient Motion Artifact Reduction Method Based on Recursive Least Squares Adaptive Filtering Algorithm*** ***67***

I-Wei Chen, Chih-Chin Wu and Wai-Chi Fang (National Chiao Tung University, Taiwan)

The appearances of Motion Artifacts (MAs) in the photoplethysmographic (PPG) signals is one of the major obstacles to improve the accuracy and the stability of the signals analysis. In this paper, we present an effective and adaptive method based on DC Remover method and Recursive Least Squares (RLS) adaptive filter for reducing MAs disturbances from PPG signals. The results achieved by the presented methodology show a high correlation coefficient between Electrocardiography derived heart rate and PPG-derived heart rate (R=0.8054), moreover, the accuracy of heart rate monitoring was improved. The proposed system was implemented in hardware design for wearable and home-care applications.

Session A3: Bioelectronics and Biosignal Procession for Wearable Device Application

Room: 102

Chair: Liang-Hung Wang (Fuzhou University, P.R. China)

13:00 ***Blunted cardiac response to sleep apnea A Marker of Depression after Acute Myocardial Infarction*** ***69***

Junichiro Hayano (Nagoya City University Graduate School of Medical Sciences, Japan); Yutaka Yoshida (Nagoya City University Graduate School of Design and Architecture, Japan); Robert Carney (Washington University School of Medicine, USA); James Blumenthal (Duke University Medical Center, USA); Emi Yuda (Nagoya City University & Graduate School of Medical Sciences, Japan)

While depression is often overlooked in patients after acute myocardial infarction (AMI), it is an important risk of death among these patients. We examined if heart rate variability (HRV) particularly those related to sleep apnea can be a maker of depression after AMI. According to the prognosis of depression, 707 post-AMI patients were divided into 349 never, 138 remitting, 25 newly onset, and 195 persistent depression. Regardless of future prognosis, currently depressed patients had higher heart rate, lower HRV, and blunted cyclic variation of heart rate to sleep apnea during the night.

13:15 ***Relationship between subjective assessment of sleep quality and heart rate variability during sleep*** ***71***

Emi Yuda (Nagoya City University & Graduate School of Medical Sciences, Japan); Yutaka Yoshida (Nagoya City University Graduate School of Design and Architecture, Japan); Junichiro Hayano (Nagoya City University Graduate School of Medical Sciences, Japan)

Assessment of autonomic function during sleep is gathering attention as an indicator of sleep quality that is closer to subjective assessment than that from polysomnography or actigraphy. This study examined the relationships between subjective sleep quality assessment and heart rate variability (HRV) indices, particularly those derived from a new sleep index (Hsi) that we have recently developed to detect non-REM sleep. We studied 18 sets of nighttime ECGs and the responses to sleep inventory questionnaires obtained from 5 male workers. We observed that subjective quality was associated with sleep latency estimated by Hsi and with the length of time in bed excluding the period of non-REM sleep in these subjects.

13:30 ***Using an Adaptive Filter to Remove ECG Motion Artifact Interference*** *73*

Liang-Hung Wang, Li-Ming Bai, Ming-Hui Fan and Chen-hui Feng (Fuzhou University, P.R. China)

Motion artifact removal is one of the most important issues in portable ECG (electrocardiogram) monitoring. Motion artifacts are usually accompanied by significant baseline drift. Adaptive filtering has been used to filter motion artifacts and baseline drift. The 3-axis acceleration signal is selected as the noise reference signal. Results show that motion artifacts and baseline drift have been removed in filtered ECG, and the QRS complex of the filtered ECG has clearly appeared.

13:45 ***Ergonomic and Human-Centered Design of Wearable Gaming Controller Using Eye Movements and Facial Expressions*** *75*

Ker-Jiun Wang (University of Pittsburgh, USA); Anna Zhang (Horace Greeley High School, USA); Kaiwen You, Fangyi Chen, Quanbo Liu, Yu Liu, Zaiwang Li and Hsiao-Wei Tung (University of Pittsburgh, USA); Zhi-Hong Mao (University of Pittsburg, USA)

The future technologies should center around the human beings. How to let human interact with various state-of-the-art technologies in a straightforward and intuitive way is a grand challenge. Currently human uses hands to interact with the world, however, there are so many scenarios that human is not able to use his hands to control multiple devices/equipment at the same time, for instance, while the hands are busy at carrying stuffs, driving or riding a bicycle. Oftentimes, people do not want to use voice command either. But humans are really good at multi-model interactions using body languages, eye and facial gestures to communicate with each other. It provides a good hint to use eye movements and facial expressions as a compensation to other existing interaction interface. In this research project, we aim to build a wearable device that is extremely compact, non-obtrusive, which can be worn comfortably for long hours to identify eye movements and facial expressions. We develop our product - EXGbuds to evaluate this idea in controlling the games in an engaging way.

Session A4: QoS/QoE-Related Technologies for Future Communication Systems

Room: 203-1

Chairs: Ryogo Kubo (Keio University, Japan), Takahiro Matsuda (Tokyo Metropolitan University, Japan)

13:00 ***Active Queue Management Supporting TCP Flows Using Dynamically Controlled Target Queue Length*** *77*

Ryosuke Hotchi and Ryogo Kubo (Keio University, Japan)

Active queue management (AQM) is a congestion control scheme for transmission control protocol (TCP) flows. However, the appropriate adjustment of a target queue length has not been studied and discussed for proportional-integral-derivative (PID)-based AQM controllers. This paper proposes an AQM technique using a PID-based controller and an algorithm that dynamically controls the target queue length in order to more efficiently utilize the buffer capacity of the bottleneck router. Simulation results show that the proposed AQM using a dynamically controlled target queue length outperforms the conventional AQM using a constant target queue length in terms of buffer utilization efficiency.

13:15 ***Throughput Control Method between Different TCP variants based on SP-MAC over WLAN*** *79*

Ryo Tsurumi, Mayu Morita, Chisa Takano and Hiroyasu Obata (Hiroshima City University, Japan); Kenji Ishida (Hiroshima City University & Graduate School of Information Sciences, Japan)

We have proposed the Media Access Control method based on the Synchronization Phenomena of coupled oscillators (SP-MAC) to improve a total throughput of wireless terminals connected to a Access Point. SP-MAC can avoid the collision of data frames that occur by applying Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) based on IEEE 802.11 in Wireless local area networks (WLAN). Furthermore, a new throughput guarantee control method based on SP-MAC has been proposed. This method enable each terminal not only to avoid the collision of frames but also to obtain the requested throughput by adjusting the parameters of SPMAC. In this paper, we propose a new throughput control method that realizes the fairness among groups of terminals that use the different TCP versions, by taking the advantage of our method that is able to change acquired throughput by adjusting parameters. Moreover, we confirm the effectiveness of the proposed method by the simulation evaluation.

13:30 ***Control Vector Selection with Delay Estimation in Wireless Networked Control Systems*** *81*

Keisuke Nakashima (Osaka University, Japan); Takahiro Matsuda (Tokyo Metropolitan University, Japan); Masaaki Nagahara (The University of Kitakyushu, Japan); Tetsuya Takine (Osaka University, Japan)

In a sampled-data wireless networked control system, bursty packet losses and random delays could cause unstable behavior of controlled objects. In order to compensate these network-induced effects, we extend a packetized predictive control method, where multiple future control vectors are generated from estimated states of controlled objects and they are packed into a single packet transmitted over the wireless network. In the extended method, more control vectors are generated than in the conventional method, so that the controller should select effective control vectors among the set of those control vectors so as to be packed into a single packet. We thus consider a control vector selection scheme, where control vectors in each packet are selected based on the estimated average round-trip delays on the wireless network.

13:45 ***LEACH Partition Topology for Wireless Sensor Network*** *83*

M. Udin Harun Al Rasyid (Politeknik Elektronika Negeri Surabaya (PENS), Indonesia); Bih-Hwang Lee (National Taiwan University of Science and Technology, Taiwan); Iwan Syarif (Politeknik Elektronika Negeri Surabaya (PENS), Indonesia); Mokhammad Muqoffi Arkham (Politeknik Elektronika Negeri Surabaya, Indonesia)

LEACH has major issues regarding the number of clusters formed. The fluctuation significantly number of clusters in each round destabilizes the wireless sensor network (WSN) architecture. In order to produce a better lifetime on the architecture of WSN, LEACH partition topology (LEACH-PT) is proposed in this paper. In LEACH-PT, cluster head (CH) selection is chosen by the base station (BS). It can guarantee the number of clusters formed is fixed on each round. In addition, this action will also minimize the burden of energy consumption at each node, resulting network lifetime better than LEACH. In addition, the distribution node is done evenly to the specific provisions than the existing random topology on LEACH. It is also a major focus on the LEACH-PT algorithm. The result of the simulation using network simulator 2 shows that LEACH-PT has significant better performance in term of nodes lifetime than that of LEACH.

14:00 ***Behavior Analysis of Flooding Attacks in Sparse Mobile Ad-Hoc Networks*** *85*

Takuya Idezuka, Tomotaka Kimura and Masahiro Muraguchi (Tokyo University of Science, Japan)

In recent years, many store-carry-forward routing schemes have been proposed for sparse mobile ad-hoc networks, which is the most representative networks in delay/disconnected tolerant network environments. In general, store-carry-forward routing schemes are designed under the assumption that all nodes in the network are good and cooperative. Therefore, they are highly vulnerable to malicious attacks. To eliminate these vulnerabilities, we need to clarify the characteristics of such malicious attacks. In this paper, we focus on analyzing the behavior of flooding attacks in which malicious nodes generate unnecessary messages to exhaust network resources. Through simulation experiments, we reveal how flooding attacks affect the system performance.

Session A5: Trend of Smart Computing and Internet of Things Technology for the Next Generation Internet

Room: 203-2

Chair: Yen-Lin Chen (National Taipei University of Technology, Taiwan)

13:00 ***Advances in Web of Things for IoT Interoperability*** ***87***

Soumya Kanti Datta (EURECOM); Christian Bonnet (Institut Eurecom, France)

It is widely acknowledged that the current Internet of Things (IoT) ecosystem is highly fragmented. The Web of Things (WoT) aims to counter the fragmentation using the principles of Web, standardized metadata and APIs. This paper describes the recent advances in W3C WoT including its architecture and building blocks. We also highlight an experiment using WoT Thing Description that help achieve interoperability between two IoT systems.

13:15 ***Validating Halstead Metrics for Scratch Program using Process Data*** ***89***

Zhong Chang (Beijing University of Posts and Telecommunications, P.R. China); RongGang Song (Yiwu Research Institute of Education Science, P.R. China); Yan Sun (Beijing University of Posts and Telecommunications, P.R. China)

What will happen when traditional software complexity measures meet latest visual programming language? Are they still valid? In this paper, in order to validate classic Halstead Metrics for Scratch programming language, which is the most used language in K-12 education, we collect process data by modifying the Scratch platform. The results show a positive, significant and strong correlation between process data and Halstead Metrics, could be considered as a validation of Halstead Metrics for Scratch Program.

13:30 ***Study on the Tutorial Efforts to Scratch Learning*** ***91***

Shuo Kong (Beijing University of Posts and Telecommunications, P.R. China); An Hua (Yiwu Niansanli Second Primary School, P.R. China); Hong Luo (Beijing University of Posts and Telecommunications, P.R. China)

Tutorial is an important tool for programming teaching. In this paper, we design a moderate learning tutorial based on the Scratch programming platform. In addition, we tested our proposed lessons in both real classes of primary school grade 6. Then, we utilized process data and submitted projects of students during the tutorial of study to analyze the teaching effectiveness of tutorial and discover the relationships between learning process and final score. Experimental results and performance analysis show that effective learning in the learning process has a significant impact on the final score and different modules have different effective learning times.

13:45 ***Analysis of Scratch Project with Process Data*** ***93***

Wang XiaoLei (BUPT, P.R. China); XinMin Huang (Yiwu Research Institute of Education Science, P.R. China); Yan Chang (BUPT, P.R. China); Hong Luo (Beijing University of Posts and Telecommunications, P.R. China)

Scratch is a visual programming language which has been widely used in the K-12 education. The data generated during the process of student programming can truly reflect behaviors of students during their creation. Analysis of these process data can help us understand the thinking process of students thus does further researches on the students' logical thinking ability. To this end, this paper first designs a novel method of collecting process data using Scratch platform. Then a data analysis method for the complicated process data is proposed. Finally, by comparing with the static data, we verify the correctness of the process data and make analysis from the boys and girls.

14:00 ***A GPS-Based Wander Management System for the Elderly*** ***95***

Wen-Yu Chiu, Kuang-Nan Huan, Ying-Chieh Huang, Chi-Kai Huang and Hsin-Te Wu (National Penghu University of Science and Technology, Taiwan)

The proportion of elderly population in Taiwan has been on the rise, as ageing society becomes a major issue. According to Taiwan's Ministry of the Interior, in 2016, the average life expectancy was 76.8 years for males and 83.4 years for females, showing a gradual annual rise, which when coupled with decrease in birth rate led to continuous increase in ageing. Prolonged life has resulted in escalated incident rate; usually, in an ageing society, the two main physiological problems that the elderly face are dementia and need for other people's concern. This study employs webpage-obtained GPS (Global Positioning System) records as the main analysis method by utilizing GPS records to analyze and examine elderly behavior so as to understand the elderly's movement positioning. We can also use the GPS records to examine data and determine a movement range; further analysis allows us to categorize movements as either usual or unusual activities in order to explore user behavior. Our system analyzes early behavior to further understand the elderly's message behavior and motivation and then issue warning or response.

14:15 ***Home Security System for Seniors*** ***97***

Tsai-i Cheng, Ping-He Tsai, Yu-Chieh Hsiao, Tang-Wei Li and Hsin-Te Wu (National Penghu University of Science and Technology, Taiwan)

Today's society is battling issues of ageing and low birth rate. As many seniors spend the day alone at home or live alone altogether and since many suffer from chronic disease, a home security system is essential in monitoring a senior's condition at home to further analyze their behavior at home. This study applies beacon technology to conduct analysis on the amount of time a senior spends in a certain home area in order to assess whether they are in dangerous condition. In case of danger, the system can immediately notify family members to come to aid. This project utilizes beacons' low power consumption feature to reduce frequency in battery changes to avoid seniors' adaptation issues with information technology. Moreover, beacons and beacon receivers are affordable to family of all ranges.

Session A6: Advanced Computing Systems for Consumer Electronics

Room: 204-1

Chair: Masaru Fukushi (Graduate School of Sciences and Technology for Innovation, Yamaguchi University, Japan)

13:00 ***Preliminary Experiments on Fault-Tolerance of a Small Convolutional Neural Network*** ***99***

Haruhiko Kaneko (Tokyo Institute of Technology, Japan)

Fault-tolerance is an important property of safety critical systems, and there exist many established fault-tolerant technologies for conventional computing devices. As preliminary for fault-tolerant design of complex neural networks, this paper presents some simulation results of fault-tolerance of a small convolutional neural network for digit classification, and we show relations between error probability of synaptic weights and classification accuracy.

13:15 ***Measurements of critical charge around rising edge of clock signal*** ***101***

Nao Horita (Chiba University, Japan)

This paper analyzed the critical charges of a master-slave D-FF when a soft error occurred around a rising edge of a clock signal. We measured

the critical charge around a rising edge of clock signal, and then compared that when CLK is stable. This analysis showed that single events can bring about an upset even when the master latch is in a transparent state (i.e. CLK=0) around rising edge of clock signal while event do not incur an upset when the master latch is stably in a transparent state. Furthermore for CLK=0 there is a period in which the critical charge is lower than that for CLK=1. In our simulation, the period occurred 0.1ns prior to the clock edge.

13:30 ***A New Image Correction Method for the Moving-Object Recognition of Low-Illuminance Video-Images*** ***103***

Yasuyuki Miura, Weijie Zhou and Hiroki Toyoda (Shonan Institute of Technology, Japan)

In this research, we propose a new image correction method for low-illuminance video images. In previous research, we proposed the preprocessing of moving-object detection by combination of gamma correction and a denoising filter. In this paper, we propose the new correction method by combining two gamma functions. From the experimental results, most "low-illuminance images with low light" obtained the best peak signal-to-noise ratio (PSNR) through use of the proposed method.

13:45 ***The Study on Adaptive Routing Algorithm of 2-D Torus Network with Fault Tolerance*** ***105***

Tsukasa-Pierre Nakao, Yasuyuki Miura and Naohisa Fukase (Shonan Institute of Technology, Japan)

As an application of the turn model in a two-dimensional torus network, we propose a north-south first (NSF) algorithm. Until now, evaluations focusing on fault tolerance were inadequate because we focused on proposing a routing algorithm aimed at avoiding congestion. In this paper, we propose NFS-IP, which is a new routing algorithm with improved fault tolerance, along with an evaluation of the conventional NFS algorithm.

14:00 ***Comparative Evaluation of Multicore Dataflow DSPs with Different Arithmetic Units*** ***107***

Kenji Ichijo (Hirosaki University, Japan)

DSPs and accelerators using FPGA technology and dataflow approach offer the potential for high performance in many applications including IoT-connected consumer electronics and so on. A dataflow approach provides the potential for exploiting parallelism inherent in programs. In our laboratory, we have developed a ring interconnected multicore dataflow DSP called LSC-Based DSP. In this work, we design five different kinds of arithmetic units including adder-subtractor, multiplier and divider. We implement LSC-Based DSPs with five different arithmetic units on an FPGA and evaluate them by comparison with both the logic resource usage and the execution time.

14:15 ***Research for High Speed Image Processing Programming Method on Combined Environment of CUDA and OpenCV*** ***109***

Satomi Kameyama and Yasuyuki Miura (Shonan Institute of Technology, Japan)

When the OpenCV GPU method and the existing CUDA kernel function are mixed, memory copying occurs frequently between the main memory and the GPU device memory. In order to solve this problem, we tried to reduce the effort of programmer and reduce memory copies by using modules for implementing GPU in OpenCV environment. As the experimental result of the proposed method, it turned out that the predetermined processing can be handled without a serious influence to the whole system.

14:30 ***A Fault-Tolerant Routing Method for 2D-Mesh Network-on-Chips Based on the Passage of Fault Blocks*** ***111***

Yota Kurokawa (Yamaguchi University, Japan); Masaru Fukushi (Graduate School of Sciences and Technology for Innovation, Yamaguchi University, Japan)

Toward the realization of dependable high-end consumer electronics products, this paper proposes a fault-tolerant routing method for 2D mesh Network-on-Chips (NoCs). Unlike the conventional fault-tolerant routing methods which always detour faulty nodes, the proposed method is based on a new concept; packets can pass through faulty nodes. For the method, we enhance the common NoC architecture and add switches and links around the each node. Simulation result shows that the proposed method reduces average communication latency by about 75.9%, compared with the conventional method.

Session A7: Recent Advances in Intelligent Systems and Signal Processing

Room: 312-1

Chairs: Shih-Shinh Huang (National Kaohsiung First University of Science and Technology, Taiwan), Chien-Cheng Tseng (National Kaohsiung First University of Science and Technology, Taiwan)

13:00 ***Adaptive Graph Filter Based on LMS Algorithm*** ***113***

Chien-Cheng Tseng (National Kaohsiung First University of Science and Technology, Taiwan); Su-Ling Lee (Chang-Jung Christian University, Taiwan)

In this paper, an adaptive graph filter based on least mean squared (LMS) algorithm is presented. First, the basics of graph filter are briefly reviewed. Then, conventional LMS algorithm is extended to the graph LMS algorithm to update the graph filter coefficients. Finally, numerical examples of adaptive graph filters for identifying and tracking unknown graph system is demonstrated to show the effectiveness of the proposed algorithm.

13:15 ***Digital Image Sharpening Using Integral Image Representation and Laplacian Operator*** ***115***

Su-Ling Lee (Chang-Jung Christian University, Taiwan); Chien-Cheng Tseng (National Kaohsiung First University of Science and Technology, Taiwan)

In this paper, an image sharpening method using integral image representation and Laplacian operator is presented. First, a parallel algorithm is proposed to compute the integral image of the original image. Then, the integral image is used to compute the Laplacian image by subtracting the center pixel from its surround average in a rectangular window. This method can achieve a constant number of operations per rectangle. Next, the sharpened image is obtained by adding the Laplacian image to the original image. Finally, one numerical example is demonstrated to show the effectiveness of the proposed image sharpening approach.

13:30 ***Automatic Detections of Nipple and Pectoralis Major in Mammographic Images*** ***117***

Yi-Chong Zeng (Institute for Information Industry, Taiwan)

After diagnosing, doctors record diagnostic results as structure data. For example, they record mass position by referring to relative positions of another object not coordinate. Those objects include tissues of breast and areas of human body. This paper presents schemes to detect nipple and pectoralis major. For nipple detection, we consider cases of visible and invisible nipples. Our scheme computes curvature of edge between breast and background, and then finds convex area or largest curvature, which is considered as nipple. In mediolateral oblique (MLO) view image, edge appears between pectoralis major and non-muscle. For pectoralis major detection, the proposed scheme applies Smith-Waterman algorithm to scoring matrix referred to MLO image. Finally, boundary of pectoralis major is defined as path with minimum score. The experiment results demonstrate that the proposed scheme has good performances in nipple and pectoralis major detections.

13:45 ***Weighted HOG for Thermal Pedestrian Detection*** ***119***

Yi-Hao Li (National Kaohsiung University of Science and Techology, Taiwan); Shih-Shinh Huang (National

Kaohsiung First University of Science and Technology, Taiwan); Ching-Hu Lu (National Taiwan University of Science and Technology, Taiwan); Feng-Chia Chang (National Chung-Shan Institute of Science and Technology, Taiwan)

Pedestrian detection is an important topic in many applications. For the purpose of applications used around the clock, the work for detecting pedestrian based on thermal sensors has attracted significant attentions. Based on the observation that the histograms of four cells in HOG descriptor over the pedestrian contour are significantly different, this study proposes a new feature called weighted HOG (WHOG) that weights the traditional HOG by the difference pattern of the histograms of cells. In the experiment, four videos are used to validate the proposed WHOG and the results demonstrate that WHOG outperforms HOG in all cases.

14:00 ***Generalized Jacket Transform with Arbitrary Integer Entries*** ***121***

Shiang-Chih Hua and Jian-Jiun Ding (National Taiwan University, Taiwan)

The Jacket transform has generalized the Walsh transform. In this paper, we further generalize the Jacket transform. We find that, even if the entry is not 2^k, if some constraint is satisfied, the transform is still reversible and the inverse transform entries can be implemented using finite number of bits.

Session A8: Advances in Video Processing for Emerging Multimedia Applications

Room: 313-1

Chairs: Po-Chyi Su (National Central University, Taiwan), Tsung-Han Tsai (National Central University, Taiwan)

13:00 ***Fast Binary Tree Partition Decision in H.266/FVC Intra Coding*** ***123***

Ting-Lan Lin (Chung Yuan Christian University, Taiwan); Hui-Yu Jiang, Jing-Ya Huang and Pao-Chi Chang (National Central University, Taiwan)

The Joint Video Exploration Team (JVET) has established the latest video compression standard, Future Video Coding (FVC). However, quadtree plus binary tree (QTBT) based coding unit (CU) structure increases noticeable computational complexity in FVC intra coding. In this paper, a fast intra CU binary tree partition decision algorithm based on spatial features is proposed. The proposed method compared to JEM5.0 can save 23% encoding time with only 0.55% BDBR increment.

13:15 ***3D Around View System with Ground Estimation*** ***125***

Tien-Ying Kuo, Yu-Jen Wei, Yi-Jun Cheng and Feng-Shih Cheng (National Taipei University of Technology, Taiwan)

In this paper, a 3D around view system with ground information is proposed to assist vehicle driving. The main objective of this work is to infer the ground information using fisheye cameras to improve 3D model construction, so that drivers can observe more accurately from any angles around vehicles.

13:30 ***A Multi-Operator Retargeting Scheme for Compressed Videos*** ***127***

Dai-Yan Wei, Yung-Chieh Chou and Po-Chyi Su (National Central University, Taiwan)

This research presents a multi-operator retargeting scheme, in which content-based cropping, seam carving/insertion and scaling are applied sequentially to adjust the video frames to the target resolution. Assuming that the video to be processed is encoded with H.264/AVC, compressed-domain data in the bitstream are utilized to classify video shots into different types for further processing. SLIC superpixels are formed to identify boundaries of objects and a saliency map will determine the visual significance of frame areas for appropriate cropping. A motion feature map is constructed to locate moving objects or contents so that possible distortions on them can be avoided. For static scenes, a local-significance-aware seam carving scheme based on one-dimensional gradients is applied. A SSIM-based blur detection method is also developed to extract sharp foreground objects. The experimental results show that the proposed method performs well in various kinds of video shots.

13:45 ***Implementation of Real-time Connected Component Labeling using FPGA*** ***129***

Tsung-Han Tsai, Yuan-Chen Ho and Chi-En Tsai (National Central University, Taiwan)

Connected Component Labeling (CCL) is one of the important process in the field of image processing. It can detect connected component in binary image and label them. This paper proposes a real-time single-scan CCL architecture and implementation in field-programmable gate array (FPGA) platform. This implementation has been completed on Xilinx Vertex-5 FPGA device and just used with the internal memory for storing component size and position rather than saving a whole image. It has been working at 60Hz for video of 640x480. The architecture runs in real-time while having reasonably low resource utilization, making integration with other real-time algorithms feasible.

Saturday, May 19, 14:30 - 15:30

Keynote II, Pau-Choo (Julia) Chung

Room: Conference Hall

Chair: Yu-Cheng Fan (National Taipei University of Technology, Taiwan)

Saturday, May 19, 15:30 - 15:50

Coffee Break (Break Area)

Saturday, May 19, 15:50 - 17:40

Session B1: Computer Communications and Signal Processing for Next Generation Media-II

Room: Conference Hall

Chairs: Pingguo Huang (Seijoh University, Japan), Yutaka Ishibashi (Nagoya Institute of Technology, Japan)

15:50 ***Experiment of Handwritten Tele-communication System between Hawaii and Toyohashi*** ***131***
Takanori Miyoshi (Toyohashi University of Technology, Japan); Shogo Hamada (Toyohashi Universigy of Technology, Japan)
This paper describes the tele-control system for Deaf-Blind people. Our proposed tele-control system consists of the client devices, the motion server, and the Internet connection. The client device transmits the operator's force to the motion server, the motion server calculates the device motion, and the client device positions itself to the commanded position. The stability of this system is proved in the international experiment between Hawaii and Toyohashi.

16:05 ***QoE Assessment of Adaptive Viscoelasticity Control in Remote Control System with Haptic and Visual Senses*** ***133***
Takuya Abe (Nagoya Institute of Technology & Ishibashi lab., Japan); Yusuke Komatsu (Nagoya Institute of Technology, Japan); Hitoshi Ohnishi (The Open University of Japan, Japan); Yutaka Ishibashi (Nagoya Institute of Technology, Japan)
We propose adaptive viscoelasticity control which dynamically changes the elasticity and viscosity coefficients according to the network delay and the moving speed of a haptic interface device. We also investigate how large range the optimum viscosity coefficient has. We further obtain an equation that derives the optimum viscosity coefficient from the network delay and the moving speed by multiple regression analysis. Then, we examine the effectiveness of the control by QoE (Quality of Experience) assessment.

16:20 ***Noncontact Estimation of Qualitative Flow Velocity in Nasal Breathing by using Far Infrared Imaging*** ***135***
Dai Hanawa (Nagoya City University, Japan); Kimio Oguchi (Seikei University, Japan)
In order to realize non-contact measurement of human breathing, we propose a method for nasal cavity detection in far infrared (FIR) images. Nasal cavities on FIR image are detected based on temperature variation in each pixel. Experimental result showed that proposed method can almost accurately detect nasal cavity on far infrared images.

16:35 ***The Study of Using Arduino to Control Aircraft Combined with Obstacle Avoidance Warning Function*** ***137***
Hai Wu Lee, Xian-Zhi Chen and Xiao-Hao Tan (Huaiyin Institute of Technology, P.R. China)
With the rapid development of UAV technology, more and more sophisticated and simple unmanned aerial vehicles have been brought to market. For the general public however the issue of greatest concern has always been security. At present, it is a key issue for UAV development to realize air safety flight, and the obstacle avoidance function plays a key role in this issue. This thesis adopted the Arduino UNO, rotary ultrasonic, three color light and buzzer as performance of obstacle avoidance warning system, and through the WIFI to send warning signals to the mobile phone APP to remind staff operating in advance to avoid an obstruction on the flight path, greatly reduce various kind of harm for error, etc.

16:50 ***A Study of WIFI Control Wheeled Robot System with Ultrasonic Obstacle Avoidance*** ***139***
Hai Wu Lee, Jin-Yu Chen and Zi-Chen Fang (Huaiyin Institute of Technology, P.R. China)
With the progress of science and technology, wheeled robots have been widely used in various fields to help people complete tasks. However, when performing a task, the robot and the object could be damaged if the robot collides with the object due to negligence of the operator. Therefore, the safety issue is the most important consideration. This paper presents a multi-function system, including Arduino controller, rotary ultrasonic obstacle avoidance and WIFI control system. Red warning led and buzzers on the fuselage will alert operators in time of danger and feedback warning information to the phone. The system is proved to be feasible by experiment.

Session B2: Advanced Cryptography and Its Applications

Room: 101
Chair: Yasuyuki Nogami (Okayama University, Japan)

15:50 ***New Operation and Problems on Elliptic curve and Their Application*** ***141***
Masaaki Shirase (Future University Hakodate, Japan)
In this paper, a new operation Me(P,Q) or P oplus Q and the Me-scalar multiplication P_{n,Z} with auxiliary Z are defined for P,Q,Z in E(F_p) and n in N, where E is an elliptic curve over F_p. Although (E(F_p),oplus) does not form a group, it is shown that the Me-scalar multiplication has properties suitable for constructing cryptosystems such as (P_{n,Z})_{m,Z}=(P_{m,Z})_{n,Z}. Next, MeDLP and MeCDH, which are the Me-scalar multiplication version of ECDLP and ECCDH, are defined. Last, under the assumption that MeCDH is hard, cryptosystems using Me-scalar multiplication are proposed.

16:05 ***Efficient Parallel Simeck Encryption with GPGPU and OpenCL*** ***143***
Taehwan Park (Pusan National University, Korea); Hwajeong Seo (Hansung University, Korea); Yasuyuki Nogami and Md. Al-Amin Khandaker (Okayama University, Japan); Ho Won Kim (Pusan National University, Korea)
Simeck family block cipher was proposed in CHES 2015. It is a kind of lightweight block cipher provide various block and key size. In this paper, we present performance of Simeck parallel implementation with GPGPU by using OpenCL.

16:20 ***A consideration of an efficient arithmetic over the extension field of degree 3 for elliptic curve pairing cryptography*** ***145***
Xin Li, Yuta Kodera, Yoshinori Uetake, Takuya Kusaka and Yasuyuki Nogami (Okayama University, Japan)
Recently, pairing-based cryptography has received much attention since it has many innovative applications. Usually pairing requires pairing-friendly elliptic curves defined over the extension field i.e. ??18 and ??24. The efficiency of pairing depends on the efficient arithmetic in extension field. Therefore, we aim to reduce the number of ?? multiplications and additions for multiplication, squaring over ??3, where ??3 is the base field of ??18 during sextic twist. This paper presents new algorithms based on cyclic vector multiplication algorithm and then evaluates the calculation costs compared with Karatsuba-based method.

16:35 ***Evaluating the Maximum Order Complexity of a Uniformly distributed Sequence over Odd Characteristic*** ***147***
Yuta Kodera and Takuya Kusaka (Okayama University, Japan); Takeru Miyazaki (The University of Kitakyushu, Japan); Yasuyuki Nogami (Okayama University, Japan); Satoshi Uehara (The University of Kitakyushu, Japan); Robert H Morelos-Zaragoza (San Jose State University, USA)
This paper focuses on the Maximum Order Complexity of a pseudorandom sequence for security applications called NTU sequence. It shows tha maximum feature on the nonlinear property and several properties have been theoretically proven. However, the NTU sequence requires a uniformization technique to overcome the drawback on its bits distribution. The technique has already proposed but the non-liear feature

still has not investigated. Therefore, this paper evaluates the affects on the non-linear feature of the original NTU sequence by using Maximum Order Complexity.

16:50 ***Randomness of Binary Sequences with Long Period by Combining m-Sequence and Knuth's Quadratic Congruential Sequence*** ***149***

Kohei Kawase (Kitakyusyu, Japan); Takeru Miyazaki (The University of Kitakyushu, Japan); Shunsuke Araki (Kyushu Institute of Technology, Japan); Satoshi Uehara (The University of Kitakyushu, Japan); Yasuyuki Nogami (Okayama University, Japan)

Cryptography is one of the most important elements on the information security. In this paper, we propose a construction method of a long-period binary sequence with good randomness for use in cryptography. We generate the sequence by combining two types of binary sequences; one is the m-sequence and the other is a quadratic congruential sequence proposed by Knuth. It is well known that the m-sequence has good statistical properties, and Knuth's method can generate a long period sequence. However, both of these sequences cannot pass the almost NIST statistical tests by stand-alone. We derive a binary sequence combining these two sequences. In addition; we also consider the reasons why the proposed sequence has good randomness properties.

17:05 ***A Construction Method of a Binary Sequence Using a Logistic Map over Fp for IoT Device*** ***151***

Nagano Takato (The Univ. of Kitakyushu, Japan); Takeru Miyazaki and Satoshi Uehara (The University of Kitakyushu, Japan); Yasuyuki Nogami (Okayama University, Japan)

With the spread of IoT, it is necessary to implement of encryption and decryption in order to secure the security of information handled by each device. In this paper, we studied about generating a sequence having random number property with microcomputer. It is short available bit length. So we generated two binary sequences from two random number sequences of 16 bits or less. After generated two binary sequence, we tried interleaving and using gray code. And we discussed about how to generate a Sq and random number property.

17:20 ***A new Construction of Secret Sharing Scheme using the primitive polynomial over Galois fields*** ***153***

Yuji Suga (Internet Initiative Japan Inc., Japan)

Fast (k, n)-threshold secret sharing schemes with XOR operations have proposed. Their methods are ideal that share size is equal to the size of the data to be distributed with the benefits that can be handled very fast for using the only XOR operations at distribution and reconstruction processes. After that, alternative methods in WAIS2013 and NBiS2013 have proposed, first method leads to general constructions of (2,n_p+1)-threshold secret sharing schemes where n_p is a prime. The later proposal realizes (2,m(m+1)/2)-threshold secret sharing schemes for small positive integer m. In this paper, we use m-dimensional vector spaces over Z_2 on having bases that meet certain conditions in order to construct proposed methods proposed in NBiS2013 that has some errors of construction. So we corrects faults in NBiS2013 paper and also proposes an accurate construction by using Galois field GF(2^m) that elements are represented in the ring F_p[X]/f(X) where f(X) is a primitive polynomial, these functionalities lead to general constructions of (2,2^m)-threshold secret sharing schemes for all integers m.

Session B3: The Trend of Smart Vehicles, Technologies and Applications

Room: 102

Chair: Yao-Tung Tsou (Feng Chia University, Taiwan)

15:50 ***Performance Evaluation of Proactive and Reactive Routing Protocols in Mobile Ad Hoc Networks*** ***155***

Manyi Qian and Xin Huang (BJTU, P.R. China); Dan Tao (Beijing Jiaotong University, P.R. China)

Mobile Ad hoc networks (MANETs) perform the difficult task of multi-hop communication in an environment with mobile nodes and changing network topology. As one of the most fundamental problems, routing protocols have been accumulated for MANETs, and which can be divided into two types: proactive and reactive ones. In this paper, we analyze and compare typical proactive (i.e. DSDV) and reactive (i.e. AODV and DSR) routing protocols by using NS2 simulations and give detailed performance evaluations with different performance metrics.

16:05 ***Android based Vehicle Anti-theft Alarm and Tracking System in Hand-held Communication Terminal*** ***157***

Manyi Qian, Hailin Gao and Weihong Liu (BJTU, P.R. China)

With the rapid development of China's automobile industry, the number of cars is increasing rapidly. Automobile has developed into an important means of transportation for people. However, while people are enjoying the convenience and speed brought by the vehicle travel, the theft of vehicles is causing more and more concern. Owing to the importance of vehicles safety, how to prevent vehicles from being stolen is becoming a hot topic in the field of artificial intelligence. In this paper, a vehicle anti-theft alarm and tracking system based on Android operating system in hand-held communication terminal is designed and developed. By using the built-in sensors of the terminal based on Android Operating System (OS), such as a smart phone, the abnormal information of a vehicle will be sent to the owner's smart phone through communication network. In this way, the long-distance remote alarm can be realized. In addition, the usage of the positioning function of GPS or communication base station makes vehicle location tracking into possible. Finally, a demo system is performed and it can effectively perform vehicle anti-theft alarm and tracking.

16:20 ***STT-MRAM Application on IoT Data Privacy Protection System*** ***159***

Yao-Tung Tsou, Hung-Ju Lai, Ren-Yu Huang and Jun-Ying Huang (Feng Chia University, Taiwan)

One of the major problem of Internet of Things (IoT) is that the limitation of the currently available technology cannot simultaneously provided the solution of lower power consumption, higher intelligence, higher security and non-volatile which are critical for IoT designing. Spin torque transfer magnetic random access memory (STT-MRAM) based on magnetic tunneling junction (MTJ), in addition to a high endurance, can also use as embedded non-volatile memory. Compared to all the existing technologies and components, STT-MRAM is more suitable for the IoT objects. Except to provide a better security of network hardware and information security STT-MRAM can also always in non-power standby mode. All IoT objects always maintain the "Instant On" state and thus battery life becomes extremely long. This paper focuses on the development of the STT-MRAM application on IoT data privacy protection. We design a STT-MRAM control circuit and use it to improve the efficiency of operation of IoT data privacy protection.

16:35 ***Compressive Beamforming for Underwater Acoustic Source direction-of-arrival Estimation*** ***161***

Haiyan Song and Jin-Ping Qin (Heilongjiang Institute of Technology, P.R. China); Chang-Yi Yang (National Penghu University of Science and Technology, Taiwan); Ming Diao (Harbin Engineering University, P.R. China)

The Direction-of-Arrival (DOA) estimation under noisy conditions, coherent sources and few snapshots is a challenging problem especially in forward-looking sonar. Compressive beamforming can achieve spatial sparsity, thus improve spatial resolution, by imposing penalties based on the L1-norm, and has recently become an exciting field that has attracted considerable attention in signal processing. In this work, we investigate the principle of compressive beamforming in detail and further extend this technique to the underwater acoustic DOA estimation case, exactly to say, apply compressive beamforming for effective DOA estimation in Forward-Looking Sonar scenario. Numerical tests and experimental data from the Forward-Looking Sonar Experiment (FLS-Ex) demonstrate the high-resolution capabilities of compressive beamforming.

16:50 ***Vector-sensor array DOA estimation using spatial time-frequency distributions*** *163*

Haiyan Song (Heilongjiang Institute of Technology, P.R. China); Chang-Yi Yang (National Penghu University of Science and Technology, Taiwan); Jin-Ping Qin (Heilongjiang Institute of Technology, P.R. China); Ming Diao (Harbin Engineering University, P.R. China)

By making use of the extra particle velocity information, an array of vector sensors can achieve better Direction-of-arrival (DOA) estimation performance than a conventional array of pressure sensors. In this paper, we develop a new approach which exploits the inherent time-frequency-space characteristics of the underlying vector-sensor array signal to achieve better DOA estimation performance even in a noisy and coherent environment with few snapshots. Computer simulations with several frequently encountered scenarios, such as a single source and multiple closely spaced coherent sources, indicate the superior DOA estimation resolution of our proposed approach as compared with existing techniques.

17:05 ***Performance Evaluation of Surrounding Image Display in Smart Glasses using Image Overlay Method*** *165*

Chia-Yuan Lin and Jim-Min Lin (Feng Chia University, Taiwan); Chih-Ming Lin, Hsien-Chiu Jao and Lan-Lin Chuang (Hua-chuang Automobile Information Technical Center Company, Taiwan); Tin-Yu Wu (National Ilan University, Taiwan); Ming-Fong Tsai (National United University, Taiwan)

In order to overcome the problem of blind spots, this paper proposed to install multiple cameras on cars in an annular way and display the transmitted captured road images on smart glasses so that the driver can access images taken from blind angles without needing to check the rear mirror. Moreover, this paper proposed an image overlay method for overlaying images taken from multiple visual blind angles, allowing the driver to read images to improve driving convenience and safety.

Session B4: QoS/QoE-Related Technologies for Future Communication Circuits and Systems

Room: 203-1

Chairs: Ryogo Kubo (Keio University, Japan), Takahiro Matsuda (Tokyo Metropolitan University, Japan)

15:50 ***A Study of User Selection Method for Access Control Scheme on Multi-Beam Massive MIMO System*** *167*

Yoshiaki Morino, Takefumi Hiraguri and Hideaki Yoshino (Nippon Institute of Technology, Japan); Kentaro Nishimori (Niigata University, Japan)

In the physical (PHY) layer, wireless communication system can be performed high-speed communication and simultaneously communication with many terminals by techniques such as multi user-multiple input multiple output (MU-MIMO) and massive MIMO transmission. On the other hand, the transmission efficiency decreases by large overhead of access control such as channel state information (CSI) feedback for channel estimation. In related work, multi-beam massive MIMO transmission eliminating CSI feedback has been proposing to solve this issue. In this paper, we proposed an access control scheme for multi-beam massive MIMO transmission called overhead less access control scheme and we studied user selection method for fairness of terminals. Then, we confirmed the effectiveness of user selection in the proposed access control scheme used computer simulations.

16:05 ***An M-CORD architecture for Multi-Access Edge Computing: A review*** *169*

Kathiravan Srinivasan (Vellore Institute of Technology, India); Nitesh Kumar Agrawal (VIT University & National Ilan University, India); Aswani Kumar Cherukuri (VIT University, India); Jennifer Pounjeba Philip Christopher (National Ilan University, Taiwan)

The advent of newer generations of mobile wireless standards allow for the network providers to offer better, faster and more reliable connections. The roll-out of 4G boasted 5 times faster data transmission than the existing 3G technology and consequently the 5G would allow for at least 3 times the transmission speed that is offered by 4G. M-CORD built on the pillars of SDN, NFV and cloud technologies [1] is an open source solution which makes use of open source software, disaggregation and virtualization of RAN and core functions of the mobile wireless networks. M-CORD provides a state-of-the-art platform for rapid innovation and community participation which allows for the realization of the 5G technology. The experience that a user has on a 5G network would be unparalleled to any previous technology. 5G boasts of a minimum connection speed of 10Gbps with a maximum delay of 1 millisecond round trip delay. The near perpetual availability and wider coverage would also aid the user.

16:20 ***A Study on QoE Estimation from Heart Rate Variability Using Machine Learning*** *171*

Kenko Ota, Takefumi Hiraguri and Hideaki Yoshino (Nippon Institute of Technology, Japan)

Quality of Experience (QoE) depends on user's psychological condition. Hence, in order to estimate QoE, it is necessary to investigate the relationship between QoE and biological information. This research investigates whether QoE, when users watched audiovisual contents, can be estimated from the heart rate variability. Feature quantities used for estimation of QoE are spectral flux, spectral centroid, the average distance of Lorenz plot representing the variability of R-R interval and the area of ellipse approximating the Lorenz plot representing the magnitude of RRI. Hidden Markov model and recurrent neural network are used for estimation of QoE from the parameters of heart rate variability. From the results estimated by these methods, feature quantities and methods required for QoE estimation are discussed.

16:35 ***Investigation of Maximum Power Point Tracking of Different Kinds of Photovoltaic Panels*** *173*

Kuo Lung Lian (National Taiwan University of Science and Technology, Taiwan)

The increasing demand for renewable energy has made PV technology an interesting potential research domain. There are three types of widely used modern PV materials: mono-crystalline, polycrystalline, and amorphous. This work will evaluate all three materials using two different MPPT algorithms: Perturb and Observe (P&O) and Newton Quadratic Interpolation (NQI). Due to their different characteristics, the amorphous material will perform differently from crystalline material. These results can lead to the best match between algorithms and materials.

16:50 ***An Energy Harvester Circuit with Clock Booster for Piezoelectric Energy Harvesting*** *175*

Wan-Ling Wu and Ching-Yuan Yang (National Chung Hsing University, Taiwan)

This paper presents an energy harvester circuit in a 0.18-μm CMOS process. The clock booster is employed to increase the amplitudes of the pulses and easily turn on the buck-boost converter. The proposed technique provides a stable power supply without using a low dropout regulator. The simulation results show the output voltage about 841 mV with the input frequency of 100 kHz, the peak-to-peak voltage of 1.6 V, a load capacitance of 10 nF, and a load resistance of 10 GΩ, respectively. Fully powered by a vibration piezoelectric energy harvester (PEH), the proposed circuit consumes an average power of 114 μW.

17:05 ***A Parellel-SSHI Rectifier for Piezoelectric Energy Harvesting*** *177*

Hao-Hsiang Hsu and Ching-Yuan Yang (National Chung Hsing University, Taiwan)

In energy-harvesting circuits, the traditional rectifier circuits use the full-bridge diode rectifier, but the loss of efficiency is large. In order to improve the efficiency, this paper presents a Parallel-SSHI piezoelectric energy harvesting system in a 0.18um CMOS process. The implemented interface is based on the Parallel-SSHI technique and can harvest from periodic and shock excitations. The device is capable of

cold startup and provides a stable output voltage for powering an application.

Session B5: Advanced Image Processing

Room: 203-2

Chair: Tomio Goto (Nagoya Institute of Technology, Japan)

15:50 ***An Improved Perspective Transform for Image Distortion Correction*** ***179***

Haonan Huang (Beijing Institute Of Technology Zhuhai, P.R. China)

In this paper, we propose a new image distortion correction algorithm. Based on a perspective transform, we add the hue, saturation, lightness (HSL) threshold segmentation and Hough transform to solve the problem of image distortion, and improve recognition accuracy by correcting the edge of the target area. Optical character recognition (OCR) is used as a benchmark to evaluate the performance of the proposed algorithm. The experimental results demonstrate that the algorithm has a wide range of adaptation, good correction and recognition accuracy.

16:05 ***Anonymous Image Data Generation from Gastric X-ray Images for Improving Gastritis Recognition Performance*** ***181***

Ren Togo (Hokkaido University & Japan, Japan); Kenta Ishihara, Takahiro Ogawa and Miki Haseyama (Hokkaido University, Japan)

This paper presents an anonymous gastritis image generation method for improving gastritis recognition performance. We realize the generation of realistic gastritis images by considering label information. Experimental results showed that anonymous images generated by our method had a potential for a gastritis recognition task. Concretely, the recognition performance of a classifier constructed with the anonymous images outperformed the performance of the conventional image generation method-based classifier.

16:20 ***The accuracy analysis of TOF camera based on ANOVA*** ***183***

Yujie Fang (Beijing Institute of Technology & Beijing Institute of Technology Zhuhai, P.R. China); Xia Wang (Beijing Institute of Technology, P.R. China); Yu Su, Kai Zhang and BingHua Su (Beijing Institute of Technology Zhuhai, P.R. China)

In recent years, with the development of imaging technology based on photon time of flight (TOF) measurement, the TOF camera has gradually come into the public horizon. Compared with binocular vision and structured light 3D imaging, TOF imaging system can image the scene in real time without any processing. However, it is difficult to be widely used because of the low resolution and poor depth measurement precision. Based on the imaging theory of TOF camera, the imaging error of TOF camera is analyzed under the action of many factors. After the analysis of environmental light intensity, measurement distance and target reflectivity, the analysis of variance (ANOVA) of the collected data shows that the reflectivity of objects has more influence on the imaging error.

16:35 ***An image contrast enhancement scheme with noise aware shadow-up function*** ***185***

Chien-Cheng Chien, Yuma Kinoshita, Sayaka Shiota and Hitoshi Kiya (Tokyo Metropolitan University, Japan)

This paper proposes a novel image contrast enhancement method based on a noise aware shadow-up function. Images taken by digital cameras have low contrast in dark or bright regions. This is due to a limited dynamic range which imaging sensors have. For this reason, various contrast enhancement methods have been proposed. The proposed method can enhance the contrast of images without over-enhancement and noise amplification. In the proposed method, a shadow-up function is used for preventing over-enhancement. In addition, a mapping function designed by using a noise aware histogram allows not only to enhance contrast of dark region, but also to avoid amplifying noise.

16:50 ***Contrast Enhancement and Detailed Enhancement Method Based on Non-linear Filtering*** ***187***

Tomio Goto and Miho Ikeyama (Nagoya Institute of Technology, Japan); Satoshi Hirano (Naogya Institute of Technology, Japan)

Smart phones with camera devices and media networks such as the internet and have been widely used, and images are used on SNS (Social Network Security). There are a lot of images which have low contrast. So, contrast enhancement, which is a technique to adjust brightness of images, is one of the important image processing technologies and is required. In this paper, we propose a contrast enhancement method based on non-linear filters. Experimental results show that reconstructed images are good contrast and image quality.

17:05 ***Estimation of Image Magnification Change using Hough Transform*** ***189***

Kazuhiko Kitano and Aki Kobayashi (Kogakuin University, Japan)

Many cameras change in the image-magnification for every change in focus position. The change in the image-magnification becomes an obstacle in the depth from focus (DFF) method. Therefore, in this paper, we propose a method for automatically estimating the image-magnification change rate. The DFF method is applied after compensating for change in the image-magnification. In this method, an image is changed by altering the focus position of the edge strength on the straight lines in the taken image. The rate of change is estimated from the slope of the straight lines detected. This paper examined the effectiveness of this method with respect to the compensation degree of change in the image magnification.

Session B6: Intelligent Devices, Circuits, Systems, and Algorithms for Smart Lifes

Room: 312-1

Chairs: Shih-Shinh Huang (National Kaohsiung First University of Science and Technology, Taiwan), Ching-Hu Lu (National Taiwan University of Science and Technology, Taiwan), Jun-Hong Weng (Tunghai University, Taiwan)

15:50 ***App and Mind-map Supported Jigsaw Puzzle for Elderly with Dementia*** ***191***

Fang Lin Chao (Chaoyang University of Technology, Taiwan)

Nostalgia-based Jigsaw Puzzle and App were designed for elderly with Dementia. Image and texts are utilized to trigger memory, which brings out shared experience. By using the mind-map, caregiver may enhance the memory recall of the elderly. Cards are shuffled, player sort these cards into the right sequence. The caregiver can also use QR code to retrieve information. The app also helps record that response and share with the family members.

16:05 ***A Compact Dual-Band Bandpass Filter With Flexible Band Control and Simple Layout*** ***193***

Jhong-Jhen Li, Chi-Feng Chen and Wang Guo-Yun (Tunghai University, Taiwan)

A compact-size dual-band bandpass filter (BPF) with flexible band control and simple layout has been proposed in this paper. By employing the distributed coupling technique, each of the passbands can be independently designed based on the coupling coefficients and external quality factors. For a demonstration, a microstrip BPF operating at 0.7 GHz and 0.9 GHz with third-order Chebyshev bandpass response was designed

and fabricated. Measured results are found in good agreement with the simulated ones.

16:20 ***A Compact Wideband Bandpass Filter Based on Stepped Impedance Line Sections*** ***195***

Wang Guo-Yun, Chi-Feng Chen and Jhong-Jhen Li (Tunghai University, Taiwan)

This paper presents a design of compact wideband bandpass filter (BPF). The BPF is based on the traditional highpass filter formed by three short-circuited stubs separated by uniform impedance lines. Since the uniform impedance line sections of the traditional filter are replaced by the stepped impedance lines, the size of the filter can be miniaturized. For a demonstration, a compact BPF with center frequency of 1.3 GHz and fractional bandwidth of 85% has been designed and implemented in microstrip technology. The size of the fabricated BPF is only about 0.45 λg by 0.8 λg. Moreover, the experimental results are in good agreement with the simulation predictions.

16:35 ***Stable Time Reduction by LDO in PWM Switching Buck Converter*** ***197***

Jun-Hong Weng, Wen-Ting Lu, Kuan-Chou Chen and Wei-Han Huang (Tunghai University, Taiwan)

In this paper, the proposed voltage mode buck converter senses. The output voltage is compared with the reference voltage, and the error voltage is amplified by the error amplifier. Finally, through the PWM signal to achieve the circuit regulator effect. Compared with the current mode buck converter, the voltage-mode buck converter has better noise margin, low impedance power output and single feedback loop, making design and circuit analysis easier. The addition of the LDO circuit allows the buck converter to reach a stable voltage faster and turn off the LDO after the buck converter is stable to reduce unnecessary power waste.

16:50 ***Goal-Driven On-Line Imbalanced Streaming Data Preprocessing*** ***199***

Ching-Hu Lu, Chun-Hsien Yu and Chang-Ru Chen (National Taiwan University of Science and Technology, Taiwan); Shih-Shinh Huang (National Kaohsiung First University of Science and Technology, Taiwan)

For the upcoming era of Internet of things (IoT), plethora of data needs to be processed on a real-time basis. However, most prior data streaming related researches ignored the semantic meaning of the input data, thus often leading to unexpected or even unacceptable results. To address the above issue, this study proposed goal-driven on-line data preprocessing for the analytics of IoT-enabled streaming data. The proposed ontology-based approach can enhance the abilities of semantic understanding for real-time IoT applications. With the above enhancement, the experiment results show its potential in guaranteeing that the data did not go astray from the learning goal due to data imbalance.

17:05 ***Privacy-Preserving Record Linkage via Bilinear Pairing Approach*** ***201***

Lin Chih-Hsun and Chia-Mu Yu (National Chung Hsing University, Taiwan)

In the era of big data, people are increasingly focusing on the useful information of various sources and looking for potential relation hidden in the data. Privacy-preserving record linkage (PPRL) is a means for finding the correspondence of records from different datasets with the guarantee of no privacy leakage from individuals. Here, we propose a simple yet effective PPRL protocol as a platform for the information mining in the real world. We perform an implementation to test the feasibility and efficiency of our proposed protocol.

17:20 ***Cooperative Visual Simultaneous Localization and Mapping by Ordering Keyframes Similarity*** ***203***

Jhen-Wei Ruan, Shih-Yu Shih, Meng-Yang Tsai, Yu-Wei Fang and Cheng-Ming Huang (National Taipei University of Technology, Taiwan)

In this paper, multiple moving cameras, which are employed to build the maps individually, are integrated to construct a complete map of the whole large environment. Since multiple cameras may capture the same scenes during performing its own SLAM, the keyframes similarity of each cameras could be evaluated to construct the relation between the map of each camera. The proposed cooperative SLAM algorithm can efficiently build the complete map and reduce the computational time. Through the experiments and analyses on several environments with different size, the amount of feature points, and the size of overlapping area between cameras, the proposed cooperative SLAM with multiple moving cameras can efficiently obtain the information of moving cameras and the environments.

Session B7: Best Paper Competition

Room: 313-1

Chair: Yeong-Kang Lai (National Chung Hsing University, Taiwan)

15:50 ***Influences of Extremely Low Frequency Electromagnetic Fields on Germination and Early Growth of Mung Beans*** ***205***

Pao-Cheng Huang (Fujian Agriculture and Forestry University, P.R. China); Jing-Yau Tang (National Cheng Kung University, Taiwan); Chen-hui Feng (Fuzhou University, P.R. China); Po-Yuan Cheng (Southern Taiwan University of Science and Technology, Taiwan); Ling-Sheng Jang (National Cheng Kung University, Taiwan)

This study aims to assess extremely low frequency electromagnetic field (ELF-EMF), which is similar to Schumann resonance (SR) frequency. Schumann resonance frequency which is part of the geomagnetic field frequency, affects to mung beans to increase germination rate and early growth. The aim of the study is to evaluate the effects of SR ELF-EMF on mung beans germination rate and growth rate. SR ELF-EMF pretreatment increases the germination rate since the applied SR ELF-EMF promotes level of Ca2+ and K+ contents. Three groups of mung beans were exposed by SR ELF-EMF of 0.3 mT at swapped frequency 7.83 Hz ±0.1Hz. The experiment results show that germination rates of experimental groups with SR ELF-EMF exposing have 8% to 23.3% higher than control groups. Moreover, the length of stem of the experimental groups have the maximum 14% longer than control groups after 72 hours growth.

16:05 ***The Design of Automatic Bird Data Capture Systems*** ***207***

Chia-Yuan Lin (Feng Chia University, Taiwan); Yi-Chun Lin and Che-Jui Chang (Industrial Technology Research Institute, Taiwan); Chi-Feng Chen (Feng Chia University, Taiwan); Ming-Fong Tsai (National United University, Taiwan)

This paper implements an automatic bird data capture system which uploads data captured from social network websites to the server and stores them in the database. When using the Facebook API to capture data of interest, the system needs to filter the captured data to avoid false data storage. This paper takes building an automatic system that includes reinforcing the training database of the bird community as a top priority.

16:20 ***A Tactile Assistance for Improving Fingering Skill in Piano Performance*** ***209***

Hokuto Tsutsumi, Hiroaki Nishino and Tsuneo Kagawa (Oita University, Japan)

Playing a piano requires various techniques and properly acquiring fingering skills without expert's assistance is particularly difficult. While the expert tries to convey his skills through language and physical contacts to trainees, most ICT-based training systems visually present exercise information. We propose a method enabling trainees to easily improve their fingering skills via a tactile feedback technique. It indicates which finger to use by directly stimulating a target finger in parallel with presenting visual information. We made a tactile display for finely indicating fingering information and evaluated a prototype system to verify the effectiveness of the method.

16:35 ***Learning Multi-paths for Edge Networks in a Stochastic Approximation Approach*** *211*

Chengwei Zhang, Hanni Cheng and Xiaojun Hei (Huazhong University of Science and Technology, P.R. China); Brahim Bensaou (The Hong Kong University of Science and Technology, Hong Kong)

Millions of edge devices are now equipped with increasingly strong computing, communication and storage capabilities. It is beneficial to connect these edge devices into networks for sharing different network service workloads so that these services are close to end-users and achieve reduced network access delay. In this paper, we proposed a measurement-assisted learning algorithm to construct efficient multi paths between edge nodes with the assistance of intermediate nodes serving as a core layer for reduced delay in edge networks in a stochastic approximation approach. Our simulation results demonstrate the effectiveness of the proposed learning algorithm.

16:50 ***Product and Service Popularity Analysis on Instagram*** *213*

Yiwei Zhang and Toshihiko Yamasaki (The University of Tokyo, Japan); Kiyoharu Aizawa (University of Tokyo, Japan)

Social media has changed the world greatly and become the significant part of our modern civilization. Investigating information on SNS can help us to understand customers' preferences. For instance, we can analyze customers' experiences of certain products or services, how they are shared, how they affect other customers, etc. In this paper, we analyze how certain products or services are posted onto Instagram, one of the largest social networks, and how they evolved by analyzing tags and image features. We also analyze temporal evolution of certain tags, which can provide different perspectives when analyzing certain products.

17:05 ***VLSI Implementation of ECG Compression Algorithm using Golomb Rice Coding*** *215*

Tsung-Han Tsai, Muhammad Awais Hussain and Ping-Zen Hao (National Central University, Taiwan)

A lossless electrocardiogram compression algorithm has been implemented in VLSI circuit design. This structure is based on memory less model i.e. no RAM is being used in the design. Adaptive linear prediction has been combined with Golomb Rice coding to achieve the lossless data compression. Overall compression ratio for MIT-BIH Arrhythmia database is 3. The design has been synthesized using TSMC 0.18µm technology. The implementation results show decrease in number of gate count as compared to other implementations while working at the processing speed of 100 MHz.

Saturday, May 19, 17:40 - 18:40

Keynote Speech III (Akihiko) Ken Sugiyama

Room: Conference Hall

Chair: Chih-Peng Fan (National Chung Hsing University, Taiwan)

Saturday, May 19, 18:40 - 21:00

Welcome Reception

Sunday, May 20

Sunday, May 20, 09:00 - 10:00

Keynote Speech IV Bor-Sung Liang

Room: Conference Hall

Chair: Pei-Jun Lee (National Chi Nan University, Taiwan)

Sunday, May 20, 10:00 - 10:20

Coffee Break (Break Area)

Sunday, May 20, 10:20 - 12:00

Poster Session B

Room: Corridor at 1st Floor

Chairs: Hsia Chih-Hsien (National Ilan University, Taiwan), Chi-Chia Sun (National Formosa University, Taiwan)

Intelligent Design for Sound Detection of goblet Clinking *217*

Min-Xiang Huang (National Yunlin University of Science and Technology, Taiwan); Ho-En Liao (Feng Chia University, Taiwan); Ming-Hwa Sheu (National Yunlin University of Science & Technology, Taiwan); Jia-Xiang Zheng, Yu-Cheng Ou and Tzu-Hao Kuo (National Yunlin University of Science and Technology, Taiwan)

With the advances in communication technology, our life quickly into the Internet of Things era. This work aims to explore the application of products in the era of Internet of Things through various sensors and communication modules. Through the combination of the sound sensor and the mobile phone APP, the color of the goblet through the LED produces different transformation effects, when have a goblet social

Transmission 255

Yao-Tang Chang (Kao Yuan University, Taiwan); Ching Liang Chang (Yuan Ze University, Taiwan)

In order to enhance confidentiality of wireless wavelength division multiplexing (WDM) networks, the proposed integrated arrayed waveguide grating (AWG) and optical switch is configured to implemented wavelength hopping in current experiment. A pseudo-random noise generator (PRNG) algorithm was embedded with a pair of master-slave microprocessor (i.e., Arduino chips) to generate a time series of electrical signals for triggering optical switch and then the path of optical switch was randomly varied to change the space transmission of AWG router. As result, the varying wavelengths were assigned as authorized users' carrier to realize AWG/optical switch-based wavelength hopping scheme. The experimental results showed that the results showed the transmitted un-compressed high definition multimedia interface (HDMI) video stream was extracted correctly by photo-detector to protect against attacking by interceptor.

Area-Efficient VLSI Architecture of High-Order Matched Filter Design Using Odd-and-Even Phase Processing for Image Recognition Applications 257

Xin-Yu Shih, Yue-Qu Liu and Yi-Ti Cheng (National Sun Yat-sen University, Taiwan)

In this paper, we propose an area-efficient VLSI hardware architecture of matched filter design for image recognition applications, especially for larger number of taps. By using odd-phase and even-phase processing, it can extremely reduce the number of complex multipliers and complex adders utilized. As for a practical design implementation with TSMC 40-nm CMOS technology, a 64-tap matched filter circuit operates up to a clock frequency of 500MHz and only occupies a synthesis area of 0.059 mm^2. It totally saves the design area by a saving ratio of 70.29% compared to a typical transposed form circuit.

Session C1: Communication, Information, and Management Technologies for Future Network Systems-I

Room: Conference Hall

Chair: Takuji Tachibana (University of Fukui, Japan)

10:20 ***A Local Mobility Management Entity (MME) for Stationary Devices in virtual Evolved Packet Core (vEPC) 259***

Qiu Bo-Jun, Li Jia-Ru, Hsueh Yu-Sen, Lin You-Min, Jyh-Cheng Chen and Ping-Fan Ho (National Chiao Tung University, Taiwan)

In the future, there will be many devices in 5G networks, and these devices will cause a great number of control messages. The core network should handle these control messages locally to maintain the quality of other services. Furthermore, the local MME should turn off the location update flows in the initial attach procedure to reduce the number of control messages. We implement an MME, which can turn off the location update flows, and then compare the performance.

10:35 ***An Energy-Efficient Bandwidth Assignment for Large File Transfer with Time Constraints 261***

T Badraa (University of Tokushima, Japan); Masahiko Aihara (Osaka University & Graduate School of Information Science and Technology, Japan); Kazuhiko Kinoshita (Tokushima University, Japan); Nariyoshi Yamai (Tokyo University of Agriculture and Technology, Japan); Takashi Watanabe (Osaka University, Japan)

In recent years, the increase of network traffic leads to large power consumption. On the other hand, various types of data have become available in large quantities via large high-speed computer networks. As an advanced service, time-constrained file transfer receives much attention. We investigate to reduce the energy consumption of network by bandwidth assignment based on large file transfer with a time constraint.

10:50 ***Topology Design based on User Relationship for Cascading Failure in D2D-based Social Networking Service 263***

Hanami Yokoi and Takuji Tachibana (University of Fukui, Japan)

In this paper, we propose a topology design based on user relationship for cascading failures in D2D-based social networking service. In the proposed topology design, node resilience is calculated from topologies of a physical network and a social network, and then an optimization problem for the topology design of the social network is formulated so as to maximize the node resilience. In the proposed method, we add some new user relationships to the social network, and a new topology is designed. We evaluate the performance of the proposed topology design with simulation. In numerical examples, we show that the optimal topology for the social network can be derived by using our topology design and the node resilience is improved.

11:05 ***Development and Experimentation of Smartphone Application for Supporting Proper Cycling Speed 265***

Naoya Yamato and Takuji Tachibana (University of Fukui, Japan)

In this paper, we develop a smartphone application for supporting a proper cycling speed. In this application, there are two types of screens; normal screen and alert screen. On the normal screen, the current cycling speed and the proper cycling speed. The current speed is compared with the proper speed continuously. If the current speed exceeds the proper speed, the normal screen changes to the alert screen automatically. Moreover, this application sounds a warning tone for several seconds. We investigate experimentally how this application works. In the experimentation, we carry around with the smartphone where our application has been installed and collects several kinds of data. From the experimental results, we show the validity of this developed application.

11:20 ***Packet Transmission Scheduling for Enhancing Power Saving and TCP Throughput Performance in Wireless LAN with Multicast/Unicast Flows 267***

Yosuke Tanigawa, Yuta Umeno and Hideki Tode (Osaka Prefecture University, Japan)

In recent wireless LANs, multicast transmission is increasing in addition to unicast that is transferred mainly based on TCP. On the other hand, because mobile and wearable computers have been diffused widely, power saving of wireless stations becomes more important. In this paper, in general environments where multicast and unicast flows coexist, we propose a new transmission method of both multicast and unicast packets, that assigns sufficient transmission opportunities for unicast TCP flows, while achieving power saving performance for wireless stations receiving multicast flows.

11:35 ***Optical Overlapping PPM-CDMA Systems With Novel Two-Dimensional Optical Codes 269***

Shih-Chang Chien and Cheng-Yuan Chang (National United University, Taiwan)

Utilizing the hybrid-coding method on both existing two-dimensional (2D) codes and one-dimensional (1D) optical orthogonal codes (OOCs), novel 2D optical codes are systematically constructed, and applied to optical code-division multiple-access (CDMA) systems with the use of overlapping pulse position modulation (OPPM) technique in this paper. The novel optical OPPM-CDMA system not only can enhance the system confidentiality, compared to the traditional optical CDMA system adopting on-off keying (OOK) technique, but also can further improve the transmission data rate and spectral efficiency due to utilizing OPPM technique instead of the PPM technique.

Session C2: Communication and Information Systems for Next Generation Internet

Room: 101

Chairs: Nobuo Funabiki (Okayama University, Japan), Shinji Sugawara (Chiba Institute of Technology, Japan)

10:20 ***Modeling of Infection Phenomenon and Evaluation of Mitigation Methods for IoT Malware Mirai by Agent-Oriented Petri Net PN2*** ***271***

Shingo Yamaguchi and Hiroaki Tanaka (Yamaguchi University, Japan)

In September 2016, an unprecedented massive DDoS attack was launched by IoT devices. This attack was caused by a new type of malware called Mirai. IoT devices are characterized by the large volume, pervasiveness, and high vulnerability. Thus such a DDoS attack tends to become massive and disruptive. In this paper, since Mirai can produce copies of itself, we modeled the infection phenomenon of Mirai with agent-oriented Petri net PN2. Using the model, we also evaluated the cost-performance of mitigation methods which use reboot and/or a worm Hajime without DDoS capabilities.

10:35 ***Query Forwarding with Multi-Mobile Agents for Content Sharing in Peer-to-Peer Network*** ***273***

Yukihiro Ito (Nagoya Institute of Technology, Japan); Shinji Sugawara (Chiba Institute of Technology, Japan)

Various researches on query forwarding for content sharing over unstructured Peer-to-Peer network have been carried out. With the methods proposed in the past researches, there exist problems such as mis-recognition of information required for contents' searching due to dynamic change of network such as joining and leaving of peers, and increase of cost for keeping the information up to date, then the methods are not necessarily effective. In this research, we propose a method in which multiple dynamic network agents circulate in the network, always grasp the latest topology of contents sharing network and contents' deployment, propagate the grasped information to each peer, and efficiently transfer queries for contents to be searched. Furthermore, the proposed method is evaluated by using computer simulations, and its effectiveness is shown by the result.

10:50 ***A Study of MIMO Host Location Optimization in Active Access-Point Configuration Algorithm for Elastic WLAN System*** ***275***

Mousumi Saha, Nobuo Funabiki and Sumon Kumar Debnath (Okayama University, Japan); Wen-Chung Kao (National Taiwan Normal University, Taiwan)

The active AP configuration algorithm has been proposed to optimize the configuration of the elastic WLAN system that dynamically changes the topology depending on traffic demands and environments. The multiple-input multiple-output (MIMO) is the technology to enhance the transmission capacity by adopting multiple antennas. It is common for access-points (APs) but is still rare for hosts. Thus, the location optimization for MIMO hosts in the field appears to be a contributing factor in improving the performance. In this paper, we study the MIMO host location optimization as an extension of the active AP configuration algorithm. The concurrent communications of multiple hosts with a single AP offer different throughput features from the single communication, which is considered. The effectiveness is verified through simulations and simple testbeds.

11:05 ***A Proposal of Hardware Channel Bonding for IEEE802.11n Wireless Network Using Raspberry Pi*** ***277***

Rahardhita Widyatra Sudibyo and Nobuo Funabiki (Okayama University, Japan); Wen-Chung Kao (National Taiwan Normal University, Taiwan)

Raspberry Pi has become popular around the world as a small-size, low-cost, low-power, and high-performance computing device. It can be used as a software access-point for IEEE802.11n wireless local-area networks. Unfortunately, only the software channel bonding is available where two independent 20MHz channels are used together for each link. In this paper, we present the configuration of Raspberry Pi for the hardware channel bonding to increase the capacity with 40MHz bandwidth. Because the built-in wireless NIC does not support it, the external adapter with USB3.0 is used together. To verify the performance, we conducted throughput measurements in two scenarios.

11:20 ***Development of Wheelchair Tracking System Using Omnidirectional Camera and Full Color LEDs*** ***279***

Kazuyuki Kojima (Saitama University, Japan)

This paper describes development of our wheelchair tracking system using an omnidirectional camera and full color LEDs. We have been developing the wheelchair on which a GPS, an image sensor, an accelerometer, and torque sensors are implemented in order to improve QoL for both patients and caregivers. For this purpose, position, vibration, hand-rim torque are utilized. However, self localization with GPS is restricted in indoor environment because GPS radio waves could not be received. In this paper, to solve this problem, we develop a self localization method by using an omnidirectional camera and full color LEDs.

Session C3: Intelligent Image Content Analysis and Applications-I

Room: 102

Chairs: Pei-Yu Lin (Yuan Ze University, Taiwan), Wei-Yang Lin (National Chung Cheng University, Taiwan)

10:20 ***Leverage Facial Expression and Click Model for Trip Recommendation*** ***281***

Chun-Hsiung Tseng (Yuan Ze University, Taiwan); Yung-Hui Chen (LungHwa University of Science and Technology, Taiwan); Jia-Rou Lin (Nanhua University, Taiwan)

Nowadays, there are quite a few travel agencies who aim at providing trip suggestions. However, current trip recommendation mechanisms do not fit the expectations of their users. In this research, the goal is not to replace existing trip recommendation mechanisms but to augment them. We propose to mix the information obtained from facial expression recognition and click model for trip recommendation.

10:35 ***Learning with Detail and Morphological Refinement for Satellite Image Analysis based on Convolutional Neural Network*** ***283***

Guan-Ting Lin (National Chiao-Tung University, Taiwan); Yung-I Yang (National Tsing Hua University, Taiwan)

we present a multiple stages way to analyze the content of satellite images. Our methodology is divided into three major steps. First, Convolutional Neural Networks (CNNs) for semantic segmentation between buildings and nature scene. Then, the output semantic image would be refined in morphology way. In the last stage, Depth-First Search (DFS) algorithm is used for buildings counting. The experimental results show that refined images have smother boundaries. Base on the output images, we can count buildings using DFS algorithm accurately by refined image.

10:50 ***Traffic Sign Recognition with Light Convolutional Networks*** ***285***

Bo-Xun Wu, Pin-Yu Wang, Yi-Ta Yang and Jiun-In Guo (National Chiao Tung University, Taiwan)

In this work, we aim to design a light net that can be executed on the embedded system in real time. We modify VGG Net to a small net, called Safe Net, and utilize multi-scale features for traffic sign recognition. Moreover, we convert the dataset into grayscale, which has been proved that has a better performance on GTSRB dataset. In addition, we augment the training data by about 6.6 times more via spinning, distorting

and flipping to boost the accuracy. On Nvidia Jetson TX1, Safe Net only takes 4.58ms per image including preprocessing at the testing and Safe Net can even achieve 99.34% accuracy.

11:05 ***A Multiple Vehicle Tracking and Counting Method and its Realization on an Embedded System with a Surveillance Camera 287***

Yi-Hsuan Hsu (NCTU, Taiwan); Ssu-Yuan Chang (National Chiao Tung University, Taiwan); Jiun-In Guo (Department of Electronics Engineering, National Chiao-Tung University, Taiwan)

This paper proposes a tracking-by-detection method with a weighted scoring mechanism to associate the trackers and the detection results for accurate tracking and counting vehicles in a surveillance application. For the vehicle detection, the proposed method uses our robust PVA-lite deep learning model to detect vehicles. The experimental results show that the proposed method can achieve more than 95% in the average counting accuracy.

Session C4: Machine Learning Based Network Techniques

Room: 203-2

Chairs: Xiaojun Hei (Huazhong University of Science and Technology, P.R. China), Tin-Yu Wu (National Ilan University, Taiwan)

10:20 ***A Parallel K-means Algorithm for High Dimensional Text Data 289***

Xiaolei Shan, Yanming Shen and Yuxin Wang (Dalian University of Technology, P.R. China)

This paper proposed a Parallel K-means Algorithm for High Dimensional sparse Text data (PKHT). By using GPU（Graphic Processing Unit）and MPI（Message-passing Interface）, the proposed algorithm achieves a up to 11x lower running time .

10:35 ***An Anti-jamming Game in VANET Platoon with Reinforcement Learning 291***

Yexian Fan (Nideng Normal University, P.R. China); Xingyu Xiao (Xiamen University, P.R. China)

This paper proposes a game strategy of anti-jamming power control-based Dyna-Q reinforcement learning to counter the smart jamming attacks suffered by the periodic beacons in Vehicular ad-hoc networks(VANETs) platoon. Simulation results indicate that without knowing the radio channel model of the jammer, the proposed algorithm can not only realize the vehicle maximize efficiency and improve the signal-to-interference-plus-noise(SINR) of radio channel but also attain better convergence effects compared with a Q-learning based scheme.

10:50 ***Towards Accurate Indoor Localization using Channel State Information 293***

Wei Kui, Shiling Mao and Xiaojun Hei (Huazhong University of Science and Technology, P.R. China); Fan Li (Beijing Institute of Technology, P.R. China)

Indoor location-based mobile applications have been gaining momentum in reshaping the daily activities of Internet users. A large number of indoor localization techniques achieve the localization goal by analyzing the received signal strength indication (RSSI) of pervasive WiFi signals. Compared with RSSI, the channel state information (CSI) provides more comprehensive time and space information with more complex hardware and software cost. In this paper, we proposed two CSI-based indoor localization algorithms: 1) a localization algorithm based on the weighted linear discriminant analysis; 2) a localization algorithm based on two-dimensional principal component analysis. The experimental results show that the proposed algorithms outperform the basic Bayesian algorithm based on the principal component analysis on improving the localization accuracy and reducing the computational complexity.

11:05 ***An Experimental Study of Harvesting Channel State Information of WiFi Signals 295***

Hanni Cheng and Xiaojun Hei (Huazhong University of Science and Technology, P.R. China); Di Wu (Sun Yat-Sen University, P.R. China)

With the pervasive wireless communication networks and devices, WiFi has become an indispensable part of our daily life. The features of WiFi signals are commonly characterized using received signal strength indication (RSSI) and channel state information (CSI). In recent years, many machine learning algorithms have been proposed to analyze CSI of WiFi signals for various applications, such as gesture recognition. In this paper, we conduct an experimental study of harvesting channel state information of WiFi signals and evaluate the impact of various factors on the quality of these CSI data. Our measurement results show the randomness and the inefficiency of the collected CSI samples based on data visualization. Our study may stimulate more attention on the repeatability of the networking experiments and call for more open data initiatives to accelerate the applications of machine learning techniques in networking research.

Session C5: Technology and Application of Internet of Things

Room: 204-1

Chair: Yongan Guo (Nanjing University of Posts and Telecommunications, P.R. China)

10:20 ***Dynamic Performance Monitoring of Current Control System for Fused Magnesium Furnace Driven by Big Data 297***

Zhiwei Wu, Zhenli Ran, Quan Xu and Weizhou Wang (Northeastern University, P.R. China)

By analyzing the dynamic characteristics of the smelting process of fused magnesium furnace (FMF), a kind of dynamic performance monitoring method driven by big data for current control system of FMF is proposed. The dynamic performance indexes of the current control system can be calculated with big data technology on the cloud server, then the online and offline evaluation of the running state and controlled effect of FMF smelting process are realized. Besides, in order to verify the effect of the performance indexes evaluating and monitoring method, the remote and mobile monitoring system of the dynamic performance evaluation indexes of current control system is developed and the system is successfully applied to a fused magnesia plant in China.

10:35 ***Research on Condition Monitoring Platform for Mineral Processing Equipment Based on Industrial Cloud 299***

Quan Xu, Yajie Li and Yangang Chu (Northeastern University, P.R. China)

For different mineral processing enterprises, the development process of condition monitoring system of mineral processing equipment is often very similar, but due to the independence of developers and the lack of information exchange, a lot of code is often written repeatedly when developing a new monitoring system, resulting in higher development costs and lower development efficiency. In addition, the existing monitoring system for mineral processing equipment lacks the collection of equipment operating status data in different mineral processing plants, making it difficult to mine the rules of equipment operating status data. Fault diagnosis algorithms are often designed for specific environments and are not suitable for other environments; monitoring systems are more centralized in the local central monitoring room, it is difficult to achieve mobile monitoring and remote monitoring. In order to solve the above problems, a design on condition monitoring platform for mineral processing equipment based on industrial cloud is proposed. First of all, the platform for monitoring system developers to

provide a series of common data acquisition, transmission, collection, analysis and processing and monitoring services to facilitate the rapid development of monitoring system. Secondly, IOT, industrial cloud and big data technology are used to collect data of equipment operating status of different mineral processing plant and optimize the fault diagnosis algorithm to improve the application range of fault diagnosis algorithm.

10:50 ***Daily Medication Reminder and Detection of Elderly Patients 301***

Kim C. K. Lee, Fang Lin Chao and Yucheng Hsiao (Chaoyang University of Technology, Taiwan)

Hospital provided drugs kit with individual packaging and information. The reminder use QR code to set administrative dosage and the timetable. The app prompts the elder through text or voice. We use Arduino platform, switch, and LED to build a prototype. The sensed user activities transfer to phone app through the Bluetooth connection. The 3D printed prototype and circuit work well with App during user evaluation.

11:05 ***Smart Service System of the Internet of Things 303***

Qingji Da, Yongan Guo and Dapeng Li (Nanjing University of Posts and Telecommunications, P.R. China)

The rapid development of the Internet of things makes the interconnection of all things possible. The platform is a key part of the IoT, which is designed to satisfy the flexible and efficient operation of it. We put forward a kind of resource sharing and user centered smart service platform of IoT: the 3S platform. Finally introduce a specific application of the 3S platform: the smart service store.

11:20 ***A Mash Temperature Monitoring System for Sake Brewing 305***

Yui Uehara and Satoshi Ohtake (Oita University, Japan); Takamoto Fukura (Fukura Syuzo Inc., Japan)

This paper proposes a temperature monitoring system as an application of IoT. The system is designed for mash temperature monitoring during sake (Japanese rice wine) brewing. The system is actually used to monitor temperature of sake-mash fermentation process. It is shown that sake-mash temperature transition can be observed in real time and logged by using the system.

11:35 ***The Demand and Development of Internet of Things for 5G:A Survey 307***

Xiaoqing Liu, Shengchen Wu, Yongan Guo and Chunling Chen (Nanjing University of Posts and Telecommunications, P.R. China)

The Internet of Things (IoT) integrates the sensing technology and radio frequency identification technology between goods. Recent IoT development has the disadvantages of low reliability, poor security, and high maintenance costs. Moreover, IoT applications should have the special requirements of supporting massive connections, low terminal costs, low terminal power consumption, and super-coverage capabilities in 5G scenarios. By integrating 5G with IoT, the information transmission rate can be effectively improved, the transmission delay can be reduced, and the reliability and security of the network can be improved. 5G technology will support the innovation and development of IoT applications, vigorously promote the development process of IoT, and continue to break ground in new areas and discover new worlds.

Session C6: ICT Enabled Power Electronics and Circuits

Room: 312-1

Chairs: Chin Hsia (National Central University, Taiwan), Yen-Chung Huang (National Chi Nan University, Taiwan)

10:20 ***A Beta-band Energy Detecting Circuit for Deep Brain Stimulator 309***

Chung Chiao-Teng and Chih-Cheng Lu (ITRI, Taiwan); Hsin Chen (NTHU, Taiwan)

This paper presents the design and measurement of a feature extraction circuit which is able to detect the pathological Beta-band oscillation related to the Parkinson's disease, so as to control the Deep Brain Stimulator. The proposed circuit includes a 2nd-order transconductance-capacitance (Gm-C) filter and an analog multiplier. The operated signal range is improved by using a fully differential architecture; body input, source degeneration, gate degeneration, as well as a bump circuit are used in the Gm to achieve very low transconductance and high input range. All transistors in the circuit are operated in the sub-threshold region with 1-volt supply voltage, thus the whole circuit consumes only 2.8uW. Finally, the measurement result of the input range is 400mVpp.

10:35 ***Design of Floating High-Voltage Level-Shifters for Power Converter Applications 311***

Chih-Hung Wang (National Central Unversity, Taiwan); Chi-horng Luo and Chin Hsia (National Central University, Taiwan)

Design of fast floating high-voltage level-shifters based on cross-coupled latch pairs for high-side drivers in power converter applications is presented in this paper. A novel pre-charged circuit is proposed to reduce the voltage transition delay caused by parasitic components of the high-voltage DMOS transistors. Experimental results exhibit the designed level shifters with the capability of shifting input of 5V logic level to the maximum output voltage of 25 V and -25 V logic level using 0.25μm Bipolar-CMOS-DMOS technology with the propagation delay of 6.4 nsec and 3.9 nsec, respectively, at cost of 26 pJ per transition.

10:50 ***Over Temperature Protection Circuits for Integrated Power Converters 313***

Deng-Feng Lu and Chin Hsia (National Central University, Taiwan)

Integrated power converters suffer from overheating when they operate under extreme conditions. To prevent destructive breakdown an over-temperature protection circuit (OTP) is usually designed along with circuits that make use of the detected chip temperature within a threshold level. From a design standpoint, OTP output should vary within a limit range throughout the whole process corners in order to support the chip's reliability. The paper presents an OTP circuit with limited fluctuations of triggering and reset points by reducing the comparator errors. Simulated results revealed the designed OTP circuit can reach less than 10 % variation over 300 different corners

11:05 ***Design of Combined PWM/PFM Controlled Boost Converter for Pulsed Doppler Ultrasound Transmitters 315***

Kun Chu Lee and Chin Hsia (National Central University, Taiwan)

The paper presents a boost converter design for medical ultrasound transmitters, particularly applying to a pulsed Doppler ultrasound system. A dual mode controller is employed for the boost converter to maintain high efficiency over a wide load range. The device operates from a 3.3-V supply, capable of producing a 10V output DC voltage. Simulated results exhibit the capability of the designed boost converter can supply 500 mA maximum current with the peak efficiency over 92%, and achieves more than 75% efficiency with a light load of above 10 mA.

11:20 ***A Fast-Switching Current-Pulse Driver for LED Dimming Control Circuits 317***

Yen-Chung Huang (Industrial Technology Research Institute, Taiwan)

In this paper, a fast-switching current-pulse driver for dimming controllers of light-emitting diode (LED) backlight applications is proposed. A pair of current switches, which is used for driving the LED string, employs an adaptive bias circuit for low-power dissipation. A differential pre-amp drives the large-size current switches to achieve fast current switching. The proposed current-pulse driver was fabricated in TSMC 0.25-um 1P4M BCD high-voltage process. The measured rising time and falling time of the LED current are 120 ns and 12 ns, respectively, when the load is a 10-LED string.

Session C7: Internet of Energy for Advanced Electric Power Consuming

Room: 313-1

Chair: Hisayoshi Sugiyama (Osaka City University, Japan)

10:20 ***Adaptive Hysteresis Current Control for PV Connected Inverter in Digital Grid Router*** ***319***

Triet Nguyen-Van and Eri Maeda (The University of Tokyo, Japan); Rikiya Abe (the University of Tokyo, Japan); Kenji Tanaka (The University of Tokyo, Japan)

These instructions give you guidelines for preparing papers for the ICCE (International Conference on Consumer Electronics) Digest of Technical Papers. Use this document as a template if you are using Microsoft Word 6.0 or later. Otherwise, use this document as an instruction set. Define all symbols used in the abstract. Do not cite references in the abstract. Do not delete the blank line immediately above the abstract as it sets the footnote at the bottom of this column.

10:35 ***An Internet of Energy Based Framework of Aggregator for Power Allocation Among Residential Users*** ***321***

Saher Javaid (Japan Advanced Institute of Science and Technology, Japan); Yuto Lim (Japan Advanced Institute of Science and Technology (JAIST) & School of Information Science, Japan); Yasuo Tan (Japan Advanced Institute of Science and Technology & National Institute of Information and Communications Technology, Japan)

Recent advancements in renewable energy sources and Internet of Things (IoT) technologies has urged energy management to enter the era of Internet of Energy (IoE). The development of renewable and distributed power sources along with the change in power market structure due to deregulation require a new agent to manage these resources in the most efficient way. An aggregator can manage the supply side and the demand side in order to provide some services to the grid as well as to consumers. This paper proposes an IoE based framework of aggregator for power allocation among residential users in the presence of distributed power sources. The novelty of our proposed framework rests in (i) power assignment criteria based on detailed residential demand profile (ii) power supply from multiple power sources based on their capacity limitation (iii) consideration of communication delay.

10:50 ***Influence of Pulsed Power Transmission on Radio Wave Environment in Low Frequency Range*** ***323***

Hisayoshi Sugiyama (Osaka City University, Japan)

Influence of pulsed power transmission on radio wave environment in low frequency range is investigated. The pulsed power transmission is already proposed as one of the basics for smart grid technologies. One of the problems of this scheme is a potential influence on radio wave environment by high frequency components of elctric pulse trains. This paper investigates the influence on the radio wave environment especially in low frequency range where standard time signal waves are broadcasted as the lowest frequency of actual radio wave services.

11:05 ***A Design of Network for Packets with Information and Energy*** ***325***

Hiroki Nakano and Yasuo Okabe (Kyoto University, Japan)

"Power Packets" are one of useful ideas of power distribution for a highly-efficient and comfortable society with a low environmental impact and energy efficient systems. It has yet to be shown that it is feasible to generate physical electric power packets and control them with computers. This study aims to propose our definition of packets packed with information and energy (PIE) and show an experimental design of the protocol stack of PIE network. This study suggests a direction to design and implement apparatus to route PIEs. This paper also introduces our experimental router implementation for PIE network.

11:20 ***A Concept Proposal for pee r-to-peer Power Exchange by Market Mechanism*** ***327***

Kenji Tanaka (The University of Tokyo, Japan); Rikiya Abe (the University of Tokyo, Japan)

Electricity has been delivered from high voltage centralized power generating plants to low voltage users based on physics theory. It cannot be sustainable when more and more decentralized energy has been installed to the society. To manage millions generation sites, the energy delivery system based on market mechanisms can be a answer. In this paper, we propose a platform that transfers power between consumers individually using digital grid technology and block chain technology that can freely digitally control power.

Session TW1: Tech Writing Course

Room: 203-1

Sunday, May 20, 12:00 - 13:00

Lunch (Lunch Area)

Sunday, May 20, 13:00 - 14:30

Session D1: Communication, Information, and Management Technologies for Future Network Systems-II

Room: Conference Hall

Chairs: Takuji Tachibana (University of Fukui, Japan), Jing Jou Tang (Southern Taiwan University of Science and Technology, Taiwan)

13:00 ***Efficient Query Induction for Content Searching in Unstructured Peer-to-Peer Network*** ***329***

Kenta Asano, Hiroki Watanabe and Shinji Sugawara (Chiba Institute of Technology, Japan)

When considering content sharing in unstructured Peer-to-Peer network, flooding is usually carried out for contents searching. However, due to the increase of the number of queries, the network is congested, and the improvement of this point has been discussed. In the former research, a method which records the routes of the past content delivery and makes the new queries for the same content follow the trail was proposed. In this research, the conventional method is improved and proposed as a new method which controls query inducing directions according to the number of hops to the destination peers. By using this improved method, network cost during contents' searching and transferring is expected to be reduced compared with the conventional method. The effectiveness of the proposed method is evaluated by computer simulations.

13:15 ***Efficient and Lightweight Convolutional Neural Network for Lane Mark and Road Segmentation*** ***331***

Guan-Ting Lin (National Chiao-Tung University, Taiwan); Jiun-In Guo (Department of Electronics Engineering, National Chiao-Tung University, Taiwan)

Semantic segmentation is one of an important task in computer vision that takes a great part in the perception needs of intelligent autonomous vehicles. ConvNets excel at this task, as they can be adaptively trained end-to-end to yield a set of robust hierarchies of features. The proposed key method is to reduce the unnecessary weights to build an efficient and lightweight network to acquire high accuracy on lane mark and road segmentation at pixel level. The proposed fully convolutional neural network achieves 360x480@28 fps and 97.6% accuracy on our in-house pixel-based hand-annotated lane mark and road datasets. All our models and results are trained and evaluated on an NVIDIA GTX 1080 GPU device.

13:30 ***An In-Vehicle Infotainment Platform for Integrating Heterogeneous Networks Interconnection*** ***333***

Ke-Yu Su, Yu-Ching Mo, Liang-Bi Chen and Wan-Jung Chang (Southern Taiwan University of Science and Technology, Taiwan); Wei-Wen Hu (Southern Taiwan University, Taiwan); Chao-Tang Yu and Jing-Jou Tang (Southern Taiwan University of Science and Technology, Taiwan)

In order to effectively manage the information exchange between telematics equipment and various terminal equipment in a vehicle. This paper proposes a platform, which uses an in-vehicle infotainment (IVI) system as a heterogeneous networks interconnection gateway. The proposed platform integrates the power line communication (PLC), the visible light communication (VLC), the CAN Bus, and the other related heterogeneous networks. Hence, the platform can be used as a heterogeneous networks coordinator, which is a key role of the intelligent transportation system applications. As a result, with the proposed platform, a flexible network can be organized to achieve vehicle-to-vehicle (V2V) communication, and therefore to provide traffic safety related application services.

13:45 ***Performance Analysis and Experimentation of Maximum Transmission Rate Control for Autonomous User Movement*** ***335***

Tomoya Sugii and Takuji Tachibana (University of Fukui, Japan)

In this paper, we propose a dynamic control of maximum transmission rate for ID/Locator separation networks. In the proposed method, the maximum transmission rate decreases as the utilization time of corresponding communication session increases. Moreover, the maximum transmission rate increases and a sampling interval for decreasing the maximum transmission rate becomes large when the corresponding locator changes. By using the proposed method, the network utilization is expected to be improved while promoting users to regularly change the access points. In order to investigate the performance of the proposed method, we construct an analytical model where users arrive at an access point according to a Poisson process. In this analysis, we utilize the probability with which a user moves to other access point in order to improve the maximum transmission rate. We also investigate the validity of the proposed method experimentally. From the experimental results, we show the validity of the proposed method. Moreover, we found how the total bandwidth changes by using the proposed method.

14:00 ***Auto-Quantification of Various Contributing Factors on LiDAR-Camera Modalities toward Autonomous Driving Environment*** ***337***

Peter Chondro (Industrial Technology Research Institute & National Taiwan University of Science and Technology, Taiwan); Pei-Jung Liang, Sum Yi-Fa, Wei-Hao Lai, Jheng-Rong Wu and Tse-Min Chen (Industrial Technology Research Institute, Taiwan)

This study proposes a framework to quantify various factors (including weather condition, luminance conditions, and over-under exposures) that will influence the performance of LiDAR and camera in detecting objects. The proposed framework comprises of the frequency-based and spatial-based image analysis algorithms, which have been tested to achieve the expected results.

Session D2: Sensing, Control and Signal Processing for Intelligent Systems

Room: 101

Chair: Ching-Min Lee (I-Shou University, Taiwan)

13:00 ***Implementation of Permanent Magnet Synchronous Motor Fault Diagnosis by a Stacked Autoencoder*** ***339***

I-Hsi Kao (National Sun Yat-sen University, Taiwan); Wei-Jen Wang (Automotive Research and Testing Center, Taiwan); I-Chieh Chiang (Tongtai, Taiwan); Jau-Woei Perng (National Sun Yat-sen University, Taiwan)

This manuscript presents an effective diagnosis algorithm for permanent magnet synchronous motors running with an array of faults of varying severity over a wide speed range. The fault diagnosis is based on a current signature analysis. The complete fault motor diagnosis system requires the extraction of data based on the proposed method, and a subsequent method for adding classifications. In this paper, we propose a feature extraction method using a stacked autoencoder and a classification method using a softmax layer. The results show that the proposed methods can effectively diagnose five different motor states, including two different demagnetization fault states and two bearing fault states.

13:15 ***Using Hash Table and Cyclotomic Coset method for decoding the quadratic residue code*** ***341***

Yan-Haw Chen, Chong-Dao Lee and Jeng-Jung Wang (I-Shou University, Taiwan); Z. W. Kang (I-shou University, Taiwan)

A algorithm for decoding the binary systematic quadratic residue (QR) code with hash tables is presented. The method can be applied in decoding the (31, 16, 7) QR code with non-factoring generator polynomials. In other words, the mapping between elements of syndrome set and all correctable error patterns is not one to one. The key idea of decoding based on the mapping between the S1, S5, S7 primary known syndrome and error patterns is one to one by cyclotomic cosets 1, 5, 7. In addition, the algorithm directly determines the error locations by hash tables without the operations of multiplication in finite field. According to the simulation result, the new hash table decoding algorithm for the (31, 16, 7) QR code dramatically reduces the memory required by approximately 97%. Moreover, the high speed of decoding procedure could be utilized in modern communication system

13:30 ***RF-Switch: A Novel Wireless Controller in Smart Home*** ***343***

Yegang Du (Japan Advanced Institute of Science and Technology, Japan); Yasuo Tan (Japan Advanced Institute of Science and Technology & National Institute of Information and Communications Technology, Japan); Yuto Lim (Japan Advanced Institute of Science and Technology (JAIST) & School of Information Science, Japan)

This paper presents the design of RF-Switch, a novel method to control the devices in smart home. We replace the traditional switch with passive RFID tags. By analyzing the phase value of the tags, RF-Switch can realize both on-off and volume control which are the most commonly used commands in home environment.

13:45 ***Design and Implementation for a Vision-Guided Wheeled Mobile Robot System*** ***345***

Ping-Yuan Chen, Ching-Min Lee, Heng-Zhi Yeh and Yi-Ching Huang (I-Shou University, Taiwan)

A vision-guided wheeled mobile robot system with PID control law is designed and implemented in this paper for the purpose of autonomous following a given lane. Except for motors, the wheeled mobile robot system consists of a self-designed interface controlling this system; a

camera for vision-guided purpose; a battery/power module for power supplying, as well as an Arduino board being the system platform. By Wi-Fi, images taking from the camera are transmitted to a computer to process so that enable the robot system to detect the edge of the lane. According to the experimental results shown, the control law can efficiently control this implemented system.

14:00 ***Line Tracking with Pixy Cameras on a Wheeled Robot Prototype*** ***347***

Jeng-Han Li, Yi-Shing Ho and Jia-Jie Huang (Southern Taiwan University of Science and Technology, Taiwan)

In this paper, an algorithm is proposed for line tracking and object recognition by using an Arduino controller and a Pixy camera. With the application of a differential-driven wheeled robot, it is possible to track lines and recognize objects which can all be implemented in the industrial application such as AGVs. The proposed algorithm takes central points by a forward facing Pixy camera, in order to perform the movement of tracking successfully with the correlation of a wheeled robot. By tracking the red color, the Pixy camera can identify which path to follow, distinguishing the bright hue over the contrast color of the floor which avoids confusions. Labeling the objects with a specific color allows Pixy camera to understand which object is the target one.

Session D3: Intelligent Image Content Analysis and Applications-II

Room: 102

Chairs: Chih-Yang Lin (Yuan Ze University, Taiwan), Wei-Yang Lin (National Chung Cheng University, Taiwan)

13:00 ***An UNet-based Head Shoulder Segmentation Network*** ***349***

Hong-Xia Xie (Fujian Normal University, P.R. China); Chih-Yang Lin (Yuan Ze University, Taiwan); Hua Zheng (Fujian Normal University, P.R. China); Pei-Yu Lin (Yuan Ze University, Taiwan)

Pedestrian detection is a fundamental and challenging task in both industry and academia with the rapid development of computer vision. As the object segmentation information can help the network to guide the attention of the model during training, in this paper, we propose a head-shoulder segmentation network which based on modified U-Net network. The architecture consists of a contracting path to capture context and a symmetric expanding path that enables precise localization. It initialized with weights from VGG11 pre-trained on ImageNet which improves the accuracy of the typical U-Net. The proposed model aims to segment the head-shoulder part of pedestrians effectively without huge annotated training samples. This paper will show the IOU and running time comparison between the segmentation results of whole part of pedestrians and head-shoulder part on a public dataset.

13:15 ***Secret Sharing Application for Two-dimensional QR Barcode*** ***351***

Chao Wei He, Pei-Yu Lin and Chih-Yang Lin (Yuan Ze University, Taiwan)

A secret sharing system based upon two-dimensional QR barcode is proposed in this article. The proposed approach generates shadows in a specific way and utilizes the characteristics of QR code to embed shadows into cover QR codes. Each cover QR code itself is a valid QR code which can be scanned and decoded by a general QR code reader. According to the experiments, the proposed approach can satisfy the content readability of the QR code and can be distributed via public channels without raising suspicion.

13:30 ***Semantic Segmentation of Colorectal Polyps with DeepLab and LSTM Networks*** ***353***

Wei-Ting Xiao (National Chung Cheng University, Taiwan); Li-Jen Chang (Chiayi Christian Hospital, Taiwan); Wei-Min Liu (National Chung Cheng University, Taiwan)

In this work we attempted to use the existing deep neural network called DeepLab_v3 to detect the polyps in colonoscopy images. Due to its large structure, the location of polyps may not be preserved and transmitted effectively. To address the issue we combined Long Short-Term Memory networks and DeepLab_v3 in parallel to augment the signal of the polyps' location. The new modification was examined with the colonoscopy image database 'CVC-ClinicDB' from MICCAI sub-challenge 2015. After training with 267 images and testing with 345 images, we got a good performance, 88.97% mean Intersection over Union (mIOU). The average computing time is 0.023 second per image. Once the model is applied to clinical colonoscopy exam videos, it could provide effective second opinions in real time to aid the diagnosis.

13:45 ***Automatic size measurement and boundary tracing of wound on a mobile device*** ***355***

Cheng-Hsien Huang, Sing-Da Jhan, Cheng-Hsuan Lin and Wei-Min Liu (National Chung Cheng University, Taiwan)

In the current clinical environment, preliminary wound assessment from the caregiver is still performed visually or manually with more time-consuming and less accurate methods. Although some software tools may exist, many of them were built on commercialized platforms, whose cost is much higher than an open source one. We implement a python-based user interface according to the current workflow. It can be more conducive for nursing staff or the general public to use.

14:00 ***Chest X-Ray Image Segmentation Using Encoder-Decoder Convolutional Network*** ***357***

Chien-Cheng Lee and Lamin Saidy (Yuan Ze University, Taiwan)

This paper presents a deep learning method of segmenting lungs in chest X-Ray image using Encoder-Decoder Convolutional Network on the JSRT (Japanese Society of Radiological Technology) lung nodule dataset. The result of the segmentation has proven efficient enough to be applicable in real world medical environments to bring ease in determining the area occupied by the lungs and some other medical diagnosis.

14:15 ***User Activity Recognition Based on Smart Chair with Pressure Sensors*** ***359***

Chien-Cheng Lee and Fitri Fitri (Yuan Ze University, Taiwan)

This paper presents a smart chair that is able to recognize three daily activities whiles seated. The smart chair is built from six mounted pressure sensors on a chair and a raspberry pi to collect raw data. We used Random Forest classifier to identify whether the user is eating, napping, or working on PC. The system is tested and the accuracy is above 97%.

Session D4: Intelligent Video Analytics and Multimedia Systems

Room: 203-2

Chairs: Yen-Lin Chen (National Taipei University of Technology, Taiwan), Yu-Cheng Fan (National Taipei University of Technology, Taiwan)

13:00 ***Development of An Intuitive Wearable Interactive System based on Augmented Reality and Object Recognition Technologies*** ***361***

Ko-Fong Lee (National Taipei University of Technology, Taiwan); Kai-Yi Chin (Aletheia University, Taiwan); Yen-Lin Chen (National Taipei University of Technology, Taiwan); Hsiang-Chin Hsieh (Institute for Information Industry, Taiwan)

The purpose of this study is to develop an Intuitive Wearable Interactive System (IWIS) based on augmented reality (AR) and object recognition technology, which comprises an object recognition module, an intuitive control module, an AR information display module and a

server linking module, so that the users can master the AR information and 3D objects about the objects in an intuitive operation mode. This new technology application mode enables the users to view the information of virtual objects more easily and rapidly. This study combines the new object recognition technology with gesture recognition technology to generate a friendly man-machine interaction interface, the virtual information is integrated into the real world, applied to the smart glasses device, so that the users can interact with virtual information intuitively, which is integrated and used in ordinary life.

13:15 ***A Comparison of NoSQL and SQL Databases over the Hadoop and Spark Cloud Platforms using Machine Learning Algorithms*** ***363***

Chao-Hsien Lee and Zhe-Wei Shih (National Taipei University of Technology, Taiwan)

Machine learning (ML) algorithms have been widely applied to data analytics and prediction. This paper extends our previous work, which proposed how to automatically convert data from the traditional SQL database to the new NoSQL database, to support the entity-relationship (ER) model. Based on our experimental results over two different cloud platforms, the NoSQL database can always provide better performance than the SQL database while executing ML algorithms.

13:30 ***Preliminary Development of Robotic Personal Aids for ECG Monitoring and Diagnosis Assistance*** ***365***

Hsiao-Chi Li and Zong-Yue Deng (Fu Jen Catholic University, Taiwan); Hsin-Han Chiang (National Taiwan Normal University, Taiwan); Yen-Lin Chen (National Taipei University of Technology, Taiwan)

This paper presents a preliminary development of a robotic assistant system with its solutions for combining robotics and health-care devices. In our approach, the mobile robotic system acts as the sensing equipment for monitoring the heart rate from the continuous electrocardiographic (ECG) waveforms in real-world testing. In addition, with the aid by technical advancements in information and communication technology (ICT), the designed robot aims to provide the assistance in the remote symptom monitoring for end users susceptible to heart failure and to absorb the shortage of professional caregivers in the future. To present the planned features of the designed robotic system with ECG monitoring and diagnosis assistance, consider an end user at home, where the experimental environment is deployed.

13:45 ***3D Environment Detection Using Multi-view Color Images and LiDAR Point Clouds*** ***367***

Po-Tai Wu, Pei-Cian Li, Jian-Hong Chen, Yen-Ju Li and Yu-Cheng Fan (National Taipei University of Technology, Taiwan)

We present a "3D Environment Detection Using Multi-view Color Images and LiDAR Point Clouds" in this proposal. Combining "multi-view color images" and "LiDAR point clouds" to solve the problem of insufficient resolution of traditional LiDAR point clouds to further realize accurate three-dimensional environment detection and recognition. The system adopts eight cameras to capture multi-view panorama images and combines with the depth information of the LiDAR point clouds to establish high-resolution 3D color images and depth images for subsequent objects detection and segmentation. According to the 3D point clouds information and multi-view images, 3D dynamic environment preprocessing, data processing and data format conversion are performed, the neural network input signal is extracted. Then through the neural network training, to determine the three-dimensional environment, and cutting out obstacles such as cars and pedestrians.

14:00 ***Evaluation of a wind noise reduction method using DNN for Bicycle Audio Augmented Reality Systems*** ***369***

Toya Kitagawa (Yamagata University & Graduate School of Science and Technology, Japan); Kazuhiro Kondo (Yamagata University, Japan)

In a previous study, we studied wind noise reduction methods to use with navigation systems for bicycles. As a result, the Wiener (iteration) filter was superior in wind noise elimination performance, and it was able to give a very high navigation speech intelligibility. However, not only the wind noise but also the environmental sounds were overly attenuated. Therefore, in this paper, DNN was introduced to wind noise reduction, Wind noise reduction and environmental sound performance were evaluated. As a result, it was concluded that DNN has high wind noise removal performance while environmental sound can be preserved.

Session D5: Intelligent Signal Processing and Applications

Room: 204-1

Chairs: Ching-Chun Huang (National Chung Cheng University, Taiwan), Guo-Shiang Lin (Da-Yeh University, Taiwan)

13:00 ***Immersive 3D Human-Computer Interaction System*** ***371***

Po-Hsien Wang, Ting-Ying Wang, Ya-Chu Chang and Chingchun Huang (National Chung Cheng University, Taiwan)

In this paper, we proposed a system that allows users interact with the virtual world. We have applied the stereoscopic imaging technology to create 3D virtual reality so that users are able to visualize 3D virtual objects. On the other hand, based on a somatosensory camera (Kinect), we build up a 3D human-computer interface to allow users interact with the virtual objects by fingertip touching. Our experiments also show users can interact with 3D virtual objects seamlessly through our system.

13:15 ***Anatomical Region Identification in USG image with Preoperative CT 3D Model using optical tracking system*** ***373***

Atul Kumar (IRCAD-Taiwan & Chang Bing Show Chwan Memorial Hospital, Taiwan); Sheng-Lei Yan (Show Chwan Memorial Hospital, Taiwan); Yen-Yu Wang (National Changhua University of Education, Taiwan); Chingchun Huang (National Chung Cheng University, Taiwan); Kai-Che Liu (Industrial Technology Research Institute, Taiwan); Shih-Wei Huang (Chang Bing Show Chwan Memorial Hospital, Taiwan)

In USG-guided interventional procedures, the surgeons need to mentally register the reference data set (computed tomography [CT] or magnetic resonance [MR] images), and the working data set of USG (real-time). This study presents a system to combine real time USG information with preoperative 3D CT virtual model using landmark registration. The future goal of this system is to apply for radiofrequency needle tracking during the surgery.

13:30 ***Prediction of Outpatient Visits for Upper Respiratory Tract Infections by Machine Learning of PM2.5 and PM10 Levels in Taiwan*** ***375***

Pei-Hsuan Yang, Mi-Tren Hsieh, Gen Min Lin and Mei-Juan Chen (National Dong Hwa University, Taiwan); Chia-Hung Yeh (National Taiwan Normal University, Taiwan); Zhi-Xiang Huang (National Sun Yat-sen University, Taiwan); Chieh MIng Yang (National Dong Hwa University, Taiwan)

Particulate Matter (PM) 2.5 and PM10 are referred as a mixture of liquid droplets and solid particles in the air with diameters ≤2.5 μm and ≤10 μm, respectively. Both PM2.5 and PM10 can deposit on respiratory tract and trigger inflammatory reactions, which makes the respiratory tract predisposed to infections. The study used machine learning on daily PM2.5 and PM10 levels of consecutive 30 days from the open website datasets of Environment Protection Administration to predict the subsequent one-week outpatient visits for upper respiratory tract infections (URI) from the Centers for Disease Control (CDC) in Taiwan between 2009 and 2017. The weekly URI cases were classified by tertile as high, moderate, and low volumes. In general, both URI burden and PM levels peak in winter and spring seasons. The testing used the mid-month

dataset of each season (Jan., Apr., Jul., and Oct.), and the training used the other months datasets. In the nationwide data analysis, PM2.5 and PM10 levels input to the multilayer perceptron (MLP) can precisely predict the degree of URI number for the elderly (89.05% and 88.32%, respectively) and the overall population (81.75% and 83.21%, respectively). In conclusion, machine learning of PM2.5 and PM10 levels could accurately predict the burden of outpatient visits for URI in Taiwan.

13:45 ***Psoriasis Detection Based on Deep Neural Network*** ***377***

Guo-Shiang Lin (Da-Yeh University, Taiwan); Sin-Kuo Chai (China Medical University, Taiwan)

In this paper, a psoriasis detection method based on deep neural network (DNN) was proposed. The proposed method is composed of several learned layers: convolutional layers and fully-connected layers. These four convolutional layers are used to extract some useful multilevel features from the input image. The max-pooling operation is used to down-sample the feature maps to make the deep network faster. The fully-connected layers similar to the traditional multi-layer perceptron neural networks are used to a classifier. Experimental results show that the proposed method can determine whether the input image is psoriasis well.

14:00 ***Hand-held Food Localization and Food Recognition Using Convolutional Neural Network*** ***379***

Duan-Yu Chen (Department of Electrical Engineering, Yuan Ze University, Taiwan)

In modern society, calories and carbohydrate intake leads to the obesities and diabetes sharply increases. For this reason, food recognition and its application attracted more and more attention. However, a variety of problem such as deformation and color difference cause the difficulty in this task. Especially, localization problem of food item is the most difficult, because the background always colorful and messy. In view of this, optical flow algorithm, which commonly used for foreground separation, is employed in this paper. Based on the speed information, hand-held objects can be isolated from background according to the estimated optical flows. Then, gradient and RGB color value of each pixel in an image are used for recognition. With the advantage of convolutional neural network, high stability and high tolerance, we finally get the remarkable precision in the experiment results, which show the feasibility of our proposed approach for real-world environments.

14:15 ***Teeth-Brushing Recognition Based on Deep Learning*** ***381***

Ming-Xiu Jiang, Yan-Ming Chen, Wei-Hsiang Huang, Po-Hao Huang, Yu-Hsiang Tsai, Yu-Hsuan Huang and Chen-Kuo Chiang (National Chung Cheng University, Taiwan)

In this paper, we propose a multi-stream deep learning framework to tackle the activity recognition problem of sixteen kinds of Bass brushing methods by brushing photos and sensor data. This is a challenge task because the model needs to infer the relevance between images and sensor data. In order to solve this problem, CNN model is exploited to learn the spatial features from images and the LSTM model is used to learn the temporal features from sensor data. Then, a fusion scheme is proposed for prediction. Experimental results show that our model achieves high accuracy by using both images and sensor data under the constraint that the dataset is still quite limited.

Session D6: Smart Circuits and Security Systems

Room: 312-1

Chair: Chang-Ming Wu (Chung Yuan Christian University, Taiwan)

13:00 ***Utilizing Power Management and Timing Slack for Low Power in High-Level Synthesis*** ***383***

Zong-Han Xie, Shih-Hsu Huang and Chun-Hua Cheng (Chung Yuan Christian University, Taiwan)

As the design size continues to increase, low power has become a very important concern. In the high-level synthesis stage, operation scheduling is critical for circuit performance. Previous algorithms do not consider power management and timing slack (operation delay selection) at the same time. Different from previous works, in this paper, we utilize power management and timing slack as possible to reduce the total power under the overall latency constraint. We propose an integer linear programming (ILP) approach to combine operation scheduling, power management, and timing slack selection in order to reduce the total power. Benchmark circuits show that our ILP approach has a significant improvement.

13:15 ***High Output Impedance Current-Mode First-Order Allpass Filter Employing One DXCCII*** ***385***

Jiun-Wei Horng, Shao-Wen Hu and Yi-Siang Jhao (Chung Yuan Christian University, Taiwan)

A high output impedance current-mode first-order allpass filter is presented. The proposed circuit uses one dual-X second-generation current conveyor (DXCCII), two resistors and one grounded capacitor. The frequency response simulation results of the proposed filter confirm the theoretical analysis.

13:30 ***Multiple-Denomination E-Cash*** ***387***

Jia-Ning Luo (Ming Chuan University, Taiwan); Yang Minghour (Chung Yuan Chritian University, Taiwan)

E-commerce has developed rapidly in recent years and online transactions and digital services have become popular. However, existing trading systems such as ATMs, credit cards, Paypal, and prepaid systems are potentially unsecure and users' privacy is not sufficiently protected. This study proposed an e-cash system with multiple denominations that enables e-merchants to give customers change when in an offline environment. The proposed system results in convenient transactions regardless of transaction amount and reduces the amount of e-cash users need to deposit in advance.

13:45 ***Insertion Sort Circuit Design Applied on the Median Filter*** ***389***

Chang-Ming Wu (Chung Yuan Christian University, Taiwan)

In our paper, we proposed the insertion sort circuit of the median filter for the corrupted image. The median filter can be overcome the salt-pepper noise in the figure. We indicate the middle pixel value in a mask window of the figure to overcome the salt-pepper noise occurred. The method concept is easy and efficient. We use the Altera DE2-115 development board to verify our insertion sort circuits. We put the noise image in the SDRAM on the board, and filtered the image by the proposed circuits. In the result, we display the picture on the screen to show the processed image.

Session D7: Interactive and Network-Oriented Applications for Consumer Electronics

Room: 313-1

Chairs: Masaru Fukushi (Graduate School of Sciences and Technology for Innovation, Yamaguchi University, Japan), Hiroaki Nishino (Oita University, Japan)

13:00 ***A Study on Robot Motions Inducing Awareness for Elderly Care*** ***391***

Akihito Yatsuda, Toshiyuki Haramaki and Hiroaki Nishino (Oita University, Japan)

In recent years, there are many applications based on IT for watching the elderly due to the increase of elderly population. Watching and medical care for the elderly is one of the promising application fields in IoT. Among them, detecting and preventing the risk of indoor heat stroke is an important topic. It is a crucial issue on how effectively notice the danger of heat stroke to the elderly. In this paper, we describe

our trial for alerting the risk of heat stroke to the elderly people using a communication robot. We design and verify what kinds of robot motions are effective to solve the risk warning problem.

13:15 ***A Safe Driving Support System Based on Distributed Cooperative Edge Computing*** ***393***

Toshiyuki Haramaki and Hiroaki Nishino (Oita University, Japan)

We propose a new safe driving support system for the car driver. At first, this suggestion method sets up plural sensors to the inside of the car and the driver. Those sensors get the movement of the car, the environment in the car, and the vital sign of the driver. This system analyzes those data generally and predicts the risk of the traffic trouble immediately. And, the system conveys a risk to a car driver and promotes careful driving. Because of the message, we think that drivers can avoid accidents. In addition, the system accumulates and analyzes data acquired from these sensors and gets new knowledge for safe driving. We describe the proposed system design, the implementation method, and the first evaluation in this paper.

13:30 ***BET Estimation Accuracy on Intermittent Disabling Network Device for Saving Smartphones Power Consumption*** ***395***

Tsubasa Murakami (Kogakuin University Graduate School, Japan); Takeshi Kamiyama and Akira Fukuda (Kyushu University, Japan); Masato Oguchi (Ochanomizu University, Japan); Saneyasu Yamaguchi (Kogakuin University, Japan)

Large power consumption is an important issue for smartphones. Applications in a smartphone are invoked and perform communications with its network device even in the screen-off state. Naturally, these behaviors consume its battery. Repeating to disable and enable the network device, we call it intermittent disabling network device, is one of the most effective methods for decreasing power consumption. However, a transition of network device state consumes power and disabling a device in too short a time increases power consumption. Thus, estimation of BET (Break-even time), with which the increased and decreased power consumptions are the same, is essential for utilizing the method. In our previous work, we proposed a method for estimating BET and evaluated the method in a simple benchmark condition. In this paper, we evaluate the proposed method with another device and an application set based on a practical application usage model. Our evaluation demonstrates that the proposed method can estimate BET exactly independent on device and application set.

Session TW2: Tech Writing Course

Room: 203-1

Sunday, May 20, 14:30 - 18:00

City Tour

Sunday, May 20, 18:30 - 21:00

Banquet (Evergreen Laurel Hotel)

Monday, May 21

Monday, May 21, 09:00 - 10:30

Session E1: Advanced Signal Processing for Healthy Living

Room: Conference Hall

Chair: Yi-Chong Zeng (Institute for Information Industry, Taiwan)

09:00 ***A Missing Data Recovery Method of Sparse Graph Signal in GFT Domain*** ***397***

Chien-Cheng Tseng (National Kaohsiung First University of Science and Technology, Taiwan); Su-Ling Lee (Chang-Jung Christian University, Taiwan)

In this paper, a missing data recovery method of sparse graph signal in graph Fourier transform (GFT) domain is presented. First, K-sparse graph signal which only has K non-zero elements in GFT domain is defined. The conventional K-bandlimited constraint is only a special case of K-sparse constraint. Then, missing data recovery problem of K-sparse graph signal is formulated as an optimization problem such that it can be solved by using basis pursuit, orthogonal matching pursuit or iterative hard thresholding method. Finally, real temperature data are used to demonstrate the effectiveness of the proposed recovery method.

09:15 ***Detection of Focal Asymmetry Based on Pair of Mammographic Images*** ***399***

Yi-Chong Zeng (Institute for Information Industry, Taiwan)

Human breasts are not exactly symmetry to each other. However, asymmetry breast tissues reveal risk of abnormality or even cancer. This paper introduces a scheme to detect area of focal asymmetry based on pair of mammographic images. Our scheme consists of transformation process and detection process. In transformation process, the proposed scheme integrates edge detection, curvature computing, and dynamic time warping for estimation of transform matrix. In detection process, we apply histogram matching to target breast image in advance for intensity consistency to pair of images. After transforming reference breast image using the estimated matrix, we then compute image difference between the target and the trans-reference breast images. Eventually, pixels with large differences are treated as a portion of focal asymmetry. The experiment results will demonstrate our scheme achieves good performance in detection of focal asymmetry.

09:30 ***Marker-based Mixed-Reality System for Head Medical Treatment*** ***401***

Ming-Long Wu and Jiann-Der Lee (Chang Gung University, Taiwan); Chieh-Tsai Wu (Chang Gung Memorial Hospital, Taiwan); Jong-Chih Chien (Kainan University, Taiwan)

Cumbersome equipment and complex algorithms are usually introduced in building an entire surgical system. These constraints will usually make the system less efficient, and not suitable in real surgical environments. In order to provide the physician a clear view of the locations of

the lesions, a mixed reality approach to image-guided surgery is proposed. Our system integrates the medical imaging information obtained pre-operatively into the space of the real operation scene. The coordinates of medical images is integrated with a realistic dummy head model using the proposed Improved Alignment (IA) algorithm. In this way, we can help the physician, during the operation, to confirm the path of the operation and to verify the location of the lesion, thereby reducing the risk of the operation and improve the overall safety and accuracy.

09:45 ***Cell Segmentation Algorithm Using Double Thresholding with Morphology-Based Techniques*** ***403***
Chieh-Sheng Chang, Jian-Jiun Ding, Yueh-Feng Wu and Sung-Jan Lin (National Taiwan University, Taiwan)
Cell segmentation has attracted increasing interests since it is helpful for medical research and automatic diagnosis. In this paper, we proposed a method that can well segment cells by applying two stages of thresholds, a global one and an adaptive one, with morphology operations to overcome overlapping problems of cells.

10:00 ***A Real-Time Three-Dimensional Diffuse Optical Tomography System for Breast Tumor Detection*** ***405***
Wen-Jun Wu, Jia-Jiun Guo and Wai-Chi Fang (National Chiao Tung University, Taiwan)
Diffuse Optical Tomography (DOT) is a novel medical image technology with a non-invasive method in the recent years. It is used to assess spatial variation in absorption and scattering coefficients in tumor detection. However, DOT is limited to reconstruct two-dimensional images for the sake of good spatial and temporal resolution. In this paper, we propose an innovative three-dimensional nonlinear reconstruction algorithm. Based on this algorithm, this DOT system has been implemented into an integrated mobile system which includes front-end sensor, analog to digital converter, wireless communication, and GUI interface as a display device. Finally, we demonstrate a static phantom experiment to verify the functionality of the whole proposed system. In the results, the proposed system can detect the tumor size of 6.67mm and depth of 20mm in time.

Session E2: Image, Signal and Data Processing Technologies for Smart Living

Room: 101
Chair: Chih-Peng Fan (National Chung Hsing University, Taiwan)

09:00 ***Fatigue Detection System using Enhanced So and Chan Method*** ***407***
Chia-Yu Wang (National Chung Hsing University, Taiwan); Robert Chen-Hao Chang (National Chung Hsing University & National Chi Nan University, Taiwan); Chih-Hung Lin and Sih-Hao Su (National Chung Hsing University, Taiwan)
The key objective of the ECG monitoring system is QRS complex detection. An Enhanced So and Chan Method is proposed in this paper to improve the So and Chan method. It can effectively reduce the fail detection rate. Compared to the original So and Chan method, the accuracy increases from 94.61% to 99.16%. A FPGA board is used to verify our algorithm. Then we take the RRI data into PC for power spectral density analysis to get LF / HF. The results can be used to determine the driver's state.

09:15 ***Effective Scale-Invariant Feature Transform Based Iris Matching Technology for Identity Identification*** ***409***
Tzung-Da Yang and Chih-Peng Fan (National Chung Hsing University, Taiwan)
In this work, the effective scale-invariant feature transform (SIFT) based iris matching method is developed for identity identification. To avoid the eyelid and eyelash interferences, the retrieved iris region in the proposed design only locates near the pupil around the ring area for the recognition. The iris features are enhanced by the Contrast Limited Adaptive Histogram Equalization (CLAHE) and Gabor filtering processes. Then the SIFT-based method is applied for iris features matching. The SIFT method uses the local features of images, and it keeps the feature invariance for the changes of rotation, scaling, and brightness. Finally, the Random Sample Consensus (RANSAC) skill is used to increase the matching efficiency. In experimental results, the accuracy of iris recognition is up to 96%. Compared with the other methods by using the same iris database and the SIFT-based technology, the recognition accuracy of the proposed design is suitable for the consumer identity identification application.

09:30 ***A Constant Rate Block Based Image Compression Scheme for Video Display Link Applications*** ***411***
Yin-Tsung Hwang and Yu-Ming Huang (National Chung Hsing University, Taiwan)
In this paper, we develop an embedded video compression scheme with a constant compression rate to reduce the communication bandwidth on video display links. The basic compression unit is a 2×4 pixel block and all blocks are coded independently to facilitate the function of partial frame update. The proposed embedded compression scheme features an ensemble of compression techniques. These techniques include various spatial domain predictions and vector quantization. The compression ratio of the luminance component is fixed at 2 and those of the two color components are 4. This leads to an overall 3 times constant rate compression. The compression efficiency of the proposed scheme is evaluated based on a set of test images. The achieved PSNR values range from 23.7dB to 38.86dB and the visual distortions are barely noticeable for display on hand held devices.

09:45 ***On Cloaking Sensitive Pattern Sets for Long-Term LBS Applications*** ***413***
Jian-Kai Song (National Chung-Hsin Universiay, Taiwan); Bo-Wen Duan and Hsu-Heng Chou (NCHU, Taiwan); Hsiao-Ping Tsai (National Chung Hsing University, Taiwan)
To protect privacy for long-term LBS users, we propose a pattern-based privacy preserving LBS system that incorporate a privacy preserving server to handle the privacy protection affairs for all registered users. We formulate the p3 problem for long-term LBS and propose the APP algorithm that iteratively identify sensitive patterns and replace a sensitive pattern with an SPSC region. To prevent adversaries culling out user's patterns, for a sensitive pattern, we define a Secure Pattern-Safe-Cloak (SPSC) region that is a rectangle area containing at least other l-1 companion patterns to conceal the sensitive one. The experimental results show that the p3 problem is very common and the proposed the system is useful and feasible.

10:00 ***Hardware-aware Moving Objects Detection in Satellite Image*** ***415***
Pei-Jun Lee, Zheng-Kai Chiu and Kuang-Zhe Liu (National Chi Nan University, Taiwan); Albert Lin and Chia-Ray Chen (National Space Organization, Taiwan)
This paper proposes an effective way to detect the moving objects in the satellite image. Since the moving objects cannot determine first in the satellite, the corner detection algorithm is applied to obtain the feature of objects. Next, the optical flow algorithm is used to estimate motion vector of objects. In order to speed up the computation and reduce the resource of the hardware, Kalman filter is utilized after the optical flow results. According to the result, objects motion can be detected effectively.

Session E3: Artificial Intelligence in Multimedia Content Analysis with Smart Industry Applications

Room: 102
Chair: Li-Wei Kang (National Yunlin University of Science and Technology, Taiwan)

09:00 ***A VGG-16 based Faster RCNN Model for PCB Error Inspection in Industrial AOI Applications*** ***417***

YuTing Li (National Chiao Tung University, Taiwan); Jiun-In Guo (Department of Electronics Engineering, National Chiao-Tung University, Taiwan)

To detect product error and modify the product error, most industry are using human eyes. However, it is not only costs time but also costs money. Our purpose is to develop a model to detect the PCB board errors and draw the bounding boxes. The model is going to be developed with a pre-trained model VGG16 and data collected from Adventech corp. The error types of training data have been speared into five error types (Bridge, Appearance, Empty, Solder_ball, Solder_balls), where the highest AP result of these classes is over 90%.

09:15 ***Correction of Mobile Positioning and Direction via CNNs Based on Street View Images*** ***419***

Lei-Ju Chu and Wei-Ming Chen (National Ilan University, Taiwan)

We present an application of convolutional neural networks (CNNs) in street view images recognition to help users correct positioning errors and find the right direction under GPS positioning. We create a CNN model for each GPS coordinate point, and the datasets for each model are street view images of eight directions of each point and image samples of the surrounding neighboring and other points. The output labels of each model are eight directions and others. Therefore, we could use a CNN model to rough identify whether an image belongs to the assigned coordinate point and to know which possible direction it is facing. In addition, in order to improve the efficiency of matching possible points, we propose a spiral search neighbors approach. Finally, we use speeded up robust features (SURF) for more precise positioning.

09:30 ***Vehicle Modeling and Detection in Crossroads*** ***421***

Tai-Hung Lin and Chih-Wen Su (Chung Yuan Christian University, Taiwan)

In this work, we proposed a novel method to detect vehicle automatically under different field of view in urban area. First, traffic flow maps are reconstructed to estimate the size and orientation of a vehicle for every position. Vehicle models are then represented by flow information and foreground blob which shows the potential appearance of a vehicle in each position in the crossroad. Finally, we perform a voting strategy to detect the potential vehicle. The experimental results show the robustness of our system. Our algorithm can be applied to the surveillance cameras with different view in crossroads.

09:45 ***Brightness Adaptive Food Recognition Using CNN*** ***423***

Duan-Yu Chen (Department of Electrical Engineering, Yuan Ze University, Taiwan)

With the advance of technology, people's quality of life is getting better and better, but the number of death due to illness gradually increased. At the top ten causes of death, diabetes and kidney diseases account for the fifth and ninth respectively. The two diseases in the following treatment are strict in the diet control. At present, although there are many wearable devices able to calculate how much calories consumed, the wearing device estimating the calories and sodium content of food for the user is not yet popular since food recognition is still challenging due to the variety of their color, shape, and texture. Among them, brightness is one of the most critical problems. In view of this, we employ the brightness to calculate the reflective region, and adjust its hue and saturation without changing the texture. Hence, the region can be consistent with other non-reflective region of color consistency. In the food recognition, we use convolution neural network to extract the simple to complex features, and convert it to fisher vector through fisher kernel. Eventually, we utilize support vector machine for classification.

10:00 ***Reading Behavior Analysis with Gaze Tracking Data*** ***425***

Wen-Chung Kao, Chun-Wei Shen and Chao-Jung Wu (National Taiwan Normal University, Taiwan)

Gaze tracking has become one of the most attractive human machine interfaces on consumer electronics. In addition to providing intelligent interactive functions on the consumer electronics, it also makes possible to collect the data of user attention. Furthermore, the data could be analyzed to predict the reading behavior and the information processing in the brain. In this paper, we propose an automatic tool for the gaze data analysis. A mathematic examination system is used for demonstrating the system performance. According to the gaze data, the experimental results show the feasibility of estimating the learner's ability, and the accuracy has achieved higher than 95%.

Monday, May 21, 10:30 - 10:50

Coffee Break (Break Area)

Monday, May 21, 10:50 - 12:30

Session F1: Advanced Circuits and Signal Processing Systems

Room: Conference Hall

Chair: Po-Yu Kuo (National Yunlin University of Science & Technology, Taiwan)

10:50 ***Area and Speed Optimization of a 5x5 Median Filter Design with 3-Direction Fast Searching Approach for Image Signal Processing Applications*** ***427***

Xin-Yu Shih, Hsin-Hsien Lin and Hong-Ru Chou (National Sun Yat-sen University, Taiwan)

In this paper, we propose 3-direction fast searching approach for a 5x5 median filter hardware architecture in the image signal processing applications. In algorithm, instead of typical serial compared schedule, this systematic approach utilizes grouping comparison in parallel to extremely shrink total comparison time. In hardware realization, it can provide an area-optimized and speed-optimized design architecture compared to other types of median-value searching methods. By using TSMC 40-nm CMOS technology, a design implementation of developed 5x5 median filter with a wordlength of 8 bits is synthesized, only occupying a design area of 0.0099 mm^2 and operating up to 250 MHz.

11:05 ***Analyze Buck Converter with PWM Feedback Circuit Using Matlab Simulink Tool*** ***429***

Po-Yu Kuo and Qi-Jun Zhuang (National Yunlin University of Science & Technology, Taiwan)

The buck converter is commonly analyzed based on Hspice tool in circuit design filed. However, it takes lots of time to design and analyze the buck converter circuit in transistor level. To shorten the analysis time, the system level analysis is applied in this paper using Matlab Simulink tool. In this paper, the stabilization time of buck converter circuit with PID feedback control and PWM generator for buck converter circuit is analyzed and verified using Matlab tool.

11:20 ***Fish-Eye Lenses-based Camera Calibration and Panoramic Image Stitching*** ***431***

Chao-Yung Hsu (China Steel Corporation, Taiwan); Chih-Ming Chang, Li-Wei Kang and Ru-Hong Fu (National Yunlin University of Science and Technology, Taiwan); Duan-Yu Chen (Department of Electrical Engineering, Yuan Ze University, Taiwan); Ming-Fang Weng (Institute for Information Industry, Taiwan)

Fish-eye lenses are common in several computer vision applications, such as four-camera surround view driver assistance, where a very wide angle (e.g., 180 degrees) of view is available. Nevertheless, their applicability is usually limited by the lack of an accurate and easy-to-use calibration procedure. In this paper, we present a camera calibration method for fish-eye lenses and a panoramic image stitching framework for calibrated surround images. To achieve the calibration of fish-eye captured images, it only requires to observe a reference planar pattern (e.g., chessboard), followed by offline estimating extrinsic and intrinsic parameters and save the related parameters. Each fish-eye distorted image can then be efficiently online corrected. Then, each calibrated image is transformed to its top-down view (or bird's-eye view) via the perspective transformation based on the estimated homography matrix. As a result, these surround bird's-eye view images can be stitched to generate the final panoramic image. It is expected that the proposed framework would be applicable to AVM (around view monitoring) system or ADAS (advanced driver assistance system) of vehicles in the future.

11:35 ***Two-Dimensional Indoor Visible Light Positioning Using Smartphone Image Sensor*** ***433***

Lian-Cheng Chen (National Yunlin University of Science and Technology, Taiwan); Jenn-Kaie Lain (National Yunlin University of Science & Technology, Taiwan)

A simplified two-dimensional high-resolution indoor visible light positioning using smartphone image sensor is proposed in this paper. The smartphone can obtain the real coordinate of LED luminaires by the unique identification of each LED luminaires and identify its location using a captured still image. Experimental results demonstrated that the proposed two-dimensional indoor visible light positioning using smartphone image sensor achieves the maximum positioning errors of x- axis and y-axis were within 2.27 cm and 3.87 cm, respectively, under a hexahedron positioning space with 100 cm height.

11:50 ***Elimination of Effect of Heterogeneous Background in Smartphone Visible Light Communications*** ***435***

Fu-Cheng Jhan (National Yunlin University of Science and Technology, Taiwan); Jenn-Kaie Lain (National Yunlin University of Science & Technology, Taiwan)

Much research has been devoted to investigating visible light signal detection using CMOS sensor embedded in smartphone under the scenario of pure white background. However, the characteristics of the reflection surface are not always homogeneous in a practical environment. This study proposed a background-subtraction-like image processing for visible light signal detection under a heterogeneous background. Experimental results demonstrated that the proposed method achieved the same bit error rate and packet error rate performance no matter under the homogeneous background or the heterogeneous background.

12:05 ***A Novel Optimal Route Planning Based on Ramp Lowest Point Search Method for Unmanned Aerial Vehicle*** ***437***

Po-Yu Kuo (National Yunlin University of Science & Technology, Taiwan); Jia-Wei Wan (National Yunlin University of Science and Technology, Taiwan)

The research area of unmanned aerial vehicles (UAVs) is getting popular recently. However, how to find the optimal path is still an unsolved issue. In this paper, a novel optimal route planning based on ramp lowest point search method (RLPS) is proposed to find the route from any point in the space to the target. By applying the RLPS method, the path from the starting point to the end point will be planned automatically without complicated calculations. The proposed method will not only achieve self-correct function but also provide the shortest and optimal path.

Session F2: Supporting Technologies and Optimization for Intelligent System

Room: 101

Chair: Kuei-Chung Chang (Feng Chia University, Taiwan)

10:50 ***CellS: A cell-inspired efficient software framework for Intelligent System*** ***439***

Mike Wu and Ching-Han Chen (National Central University, Taiwan)

Imagine next generation system can talk with people, move around, aware of and respond to changes in the environment, and learn from data. This system needs a lot of sensors and effectors in its hardware. In its software, it must have the capability to handle sensor data autonomously and to generate appropriate responses. This kind of system exactly is BDI (Belief, Desire, and Intention) system. However, traditional BDI system is too difficult to develop a software system, and it needs more cost in maintaining and developing software. To reduce the cost and increase efficiency, we propose a cell-inspired efficient software framework called the CellS. The framework implementation adopted the concept of traditional BDI system refactored by the new cell layer. The cell design can illustrate the BDI concept specifically. Software architectures continue evolvement, from structured programming to object-oriented programming, from single processor programming to multi-processor programming, from passive calls to active execution. Our framework adopted dynamic parallel mechanism, autonomic BDI and Java language. It suits to all java development environments, and developer just need to learn basic BDI concept. The CellS has the following advantages: 1) high performance; and 2) high scalability. An empirical experimental evaluation demonstrates that the CellS work well in performance.

11:05 ***Neural network-based skyline evacuation route planning algorithm for different amounts of rainfall*** ***441***

Ruei-Ping Wang and Yu-Ren Chen (FengChia University, Taiwan); Yi-Chung Chen (National Yunlin University of Science and Technology, Taiwan); Tsu-Chiang Lei and Hsin-Ping Wang (FengChia University, Taiwan)

Skyline path planning algorithms are popular location-based services because they can help users find optimal travel routes in a road network based on multiple conditions. At present, many researchers are incorporating these algorithms into evacuation route planning. However, the issue with previous methods was that they could only query the static dimensions of roads, such as road section length or the safety score resulting from a particular amount of rainfall. They could not process dynamic dimensions such as the safety scores of the same route after different amounts of rainfall, which can vary significantly. This study thus proposed a neural network-based skyline evacuation route planning algorithm that can calculate the safety scores of each road section resulting from different rainfalls and identify reasonable evacuation routes. Experiments demonstrate the validity of the proposed approach.

11:20 ***Using Deep Learning Approaches to Predict Indoor Thermal and Outdoor Rainfall Probability by Embedded Weather Box*** ***443***

Kuei-Chung Chang, Hung Yu Chen, Shing-Yu Yeh and Chin-Sheng Yu (Feng Chia University, Taiwan)

The body of elderly is not only low resistance but also poor temperature regulation and sensitivity. Slight weather changes may cause colds, fever and other diseases. Therefore, how to use a simple application to give people a thermal comfortable living space will be an important issue. Raining can not only affect thermal comfort but also cause inconvenience to people, e.g., shopping or hanging the clothes. This paper aims to use the Arduino weather box to collect the weather data from the living space, and then these data can be analyzed via Support Vector Machine (SVM) and Neural Network (NN) to predict thermal comfort and probability of rainfall. Experimental results show that the accuracy of prediction for temperature using BPN can approximate to 77%, and the accuracy of prediction for rainfall using SVM can approximate to 76%.

11:35 ***Deep Learning Accelerator on FPGA Using Handwritten Digit Recognition for Example*** ***445***

Phat Thanh Vo, Tho Huu Pham and Dat Binh Ha (Ton Duc Thang University, Vietnam); Chung Han Chou (Feng Chia University, Taiwan)

This paper presents an edge inference accelerator for deep learning application "Handwriting recognition" using field programmable gate array

(FPGA). The parameter of the neuron network is trained using GPU and then download to the an off-chip DRAM for the accelerator to access. The image data is transfered through Bluetooth from smart phone to the deep learning accelerator. This accelerator architecture can fit any neuron network and is suitable for consumer electronics such as IoT applications.

11:50 ***Design of License Plate Recognition System Based on Embedded Platform for Temporary Monitoring*** ***447***

Kuei-Chung Chang, Li-Wei Lin and Guan-Lin Chen (Feng Chia University, Taiwan)

In recent years, the issue of environmental pollution is more and more important. Some people may drive to sparsely populated areas and throw a lot of garbage near rivers, which will cause the environment pollution. So, the official organizations have to deploy temporary cameras to make them be punished. Many commercial surveillance solutions can be deployed; but the cost is too high to be deployed at wilderness. In addition, the environment of the wilderness is too complex, and the traditional solution is not capable for the scenario. In this paper, we design a real-time and low-cost license plate recognition system on embedded platform, which can be deployed at roadside for temporary monitoring. The system can adjust different algorithms to fit different situations to recognize the license plate. In the experimental results, the overall recognition accuracy of the license plate number is 87%.

12:05 ***People Trajectory Forecasting and Collision Avoidance in First-Person Viewpoint*** ***449***

Guan Lai (Feng Chia University, Taiwan)

We propose a new deep learning application for first person video, to show the people's trajectory and predicts the future location of the people and make a prevent collision application. We use the coordinates of the trajectory, according to the inertia to calculate the future location, the first person lens screen can show which direction will be hit and will hit the user. Experimental results show that our method is feasible.

Session F3: Smart Applications Based on Machine Learning Techniques

Room: 102

Chair: Jichiang Tsai (National Chung-Hsing University, Taiwan)

10:50 ***A Real-Time Traffic Flow Prediction System for National Freeways Based on the Spark Streaming Technique*** ***451***

Jichiang Tsai (National Chung-Hsing University, Taiwan); Tien-Yu Chang, Yu-Hsiang Fang and En-Shuo Chang (National Chung Hsing University, Taiwan)

In this paper, we discuss how to use the Hadoop parallel computing cluster architecture along with Spark's high-speed computing to analyze national road traffic databases for real-time estimation of future traffic information. Hadoop can process data in parallel and is inexpensive to build. It can also use its cloud data processing system to quickly upload collected data to the Hadoop Distributed File System (HDFS). On the other hand, in addition to enjoying the most suitable platform architecture, Spark also provides Spark Streaming to receive files and information in real time. This allows immediate calculations to make the forecasting system quickly aware of the traffic flow minutes ago. Hence, more accurate forecasting information can be acquired. In conclusion, our real-time forecasting system for national road traffic flows will use the HDFS cooperated with the Spark Streaming and Spark MLlib Decision Tree operations. Furthermore, the parameters of machine learning will be adjusted by the difference between the original data and the estimated one to improve the efficiency and accuracy of the overall system.

11:05 ***SUMOylation Sites Prediction by Machine Learning Approaches*** ***453***

Yen-Wei Chu, Chen Chi-Wei and Chin-Hau Tu (National Chung Hsing University, Taiwan)

In this study, we developed a sumoylation prediction system based on machine learning approach employing SVM (support vector machine) and related information. In the feature coding, we encoded binary code and protein properties based on amino acid sequence. Besides, we encoded other PTM distribution as functional feature and secondary information as structure feature. In addition, we analyzed the number of the post-modification distributions under the central lysine and window size 21 rules, and we provided some of our findings and recommended post-modification types that could be considered. Finally, this study developed a new sumoylation prediction algorithm called SUMOdig. The prediction system of Matthew's correlation coefficient achieves to 0.504.

11:20 ***Smart Facial Age Estimation with Stacked Deep Network Fusion*** ***455***

Kuan-Hsien Liu (National Taichung University of Science and Technology, Taiwan); Pak Ki Chan and Tsung-Jung Liu (National Chung Hsing University, Taiwan)

In this paper, we proposed a stacked deep network fusion model for the apparent human facial age estimation. Three well-performed deep architectures are utilized in the first three stages and the estimation results for each architecture are fused in the last stage to boost the overall performance. In the first stage, a pre-trained deep CNN model is fine-tuned for the gender classification task. For the second stage, two gender-specific age groupers are built to classify the facial images into two non-overlapping age groups. In the third stage, ages are estimated from the three deep networks and fed to the fuser of the last stage to refine age estimation results. Experimental results demonstrate a significant performance improvement of the proposed approach over the state-of-the-art deep CNN models.

11:35 ***Machine Learning and Gradient Statistics Based Real-Time Driver Drowsiness Detection*** ***457***

Cyun-Yi Lin (National Chung Hsing University, Taiwan); Paul Chang and Alan Wang (CHIMEI Motor-Electronics Co., Ltd., Taiwan); Chih-Peng Fan (National Chung Hsing University, Taiwan)

In this paper, the machine learning and gradient statistics based driver drowsiness detection is developed for the real-time application. The proposed system includes four parts, which are the face detection, the eye-glasses bridge detection, the eye detection, and the eye closure detection. The system uses gray-scale images without any color information, and it works effectively in daytime and nighttime. For the face detection, the system uses the machine learning to detect face position and face size, and the face geometrical position is used to reduce the searching range of eyes. Next, the proposed eye detection algorithm for the eye location is separated into two different modes to judge whether the driver wears glasses or not. Finally, the system detects driver's eye state in the eye region. If the driver closes their eyes during an enough time, does not concentrate on driving, or nods his head, the system generates an alarm to notify the driver. In experimental results, the average processing frame rates are up to 245 fps in a PC (i7, 2.59GHz). The average detection rate of eye closure is 91.49% when the driver wears glasses, and the corresponding detection rate is 95% when the driver does not wear glasses.

11:50 ***Application of Artificial Neural Networks for Optimizing Operating Conditions of Chemical process*** ***459***

Kathiravan Srinivasan and Ashish Garg (Vellore Institute of Technology, India); Bor-Yann Chen and Chang-Tang Chang (National Ilan University, Taiwan); Aswani Kumar Cherukuri (VIT University, India); Jennifer Pounjeba Philip Christopher (National Ilan University, Taiwan)

Considering that there are a significantly large number of variables and several reaction steps, in a chemical process, modeling of such a method is non-trivial. Moreover, the process has a non-linear and transience dependence on the conditions. Artificial Neural Network (ANN) and Deep Learning methods based on ANNs are widely recognized as one of the most influential modeling and learning techniques for nonlinear systems. The salient feature of ANN-based modeling is that the detailed mathematical information about the process steps is not pre-determined or fed to the system; instead, the learning takes place by using the training examples. Therefore, it is not surprising that ANN-based modeling is used for predicting the outcomes of biochemical processes. Experimental data will be required to train the model and also to validate the predictions.

12:05 *Intelligent Vehicle Collision Warning System Based on A Deep Learning Approach* 461

Yeong-Kang Lai and Yu-Hau Huang (National Chung Hsing University, Taiwan); Thomas Schumann (Hochschule Darmstadt-University of Applied Sciences, Germany)

This study will identify and mark objects in the Android device using a deep learning approach, and calculate the possible distances of the objects according to the position of the objects in the frame. Through the camera on a mobile device, the position of the object in the input screen is labeled using a frame, and the object in the frame is input to the deep neural network to recognize the object, and the distance from the object through the position of the frame. The frame containing the mark box with object recognition results and objects from the distance, the final screen will be processed after the output to the flat panel display.

Monday, May 21, 12:30 - 13:30

Lunch (Lunch Area)

Monday, May 21, 13:30 - 15:00

Session G1: Circuits Design of Intelligent System

Room: Conference Hall

Chairs: Hou-Ming Chen (National Formosa University, Taiwan), Kuang-Hao Lin (National Formosa University, Taiwan)

13:30 *ADC and PLL for Optical Sensors in Depth and Virtual Reality Augmented Reality Applications* 463

Wen Cheng Lai (National Taiwan University of Science and Technology, Taiwan)

In this article a successive approximation register (SAR) analog-to-digital converter (ADC) and phase locked loop (PLL) implemented in tsmc 0.18-um CMOS process is presented for optical sensors in depth camera through virtual reality (VR) and augmented reality (AR) applications. By applying Vcm-based switching method that reduces switching power of the DAC, the proposed SAR ADC with phase locked loop design uses less capacitor in the DAC array. The proposed PLL with a complementary crossed-couple LC-tank voltage- controlled oscillator (VCO) and a mixed design of current mode logic (CML) and true single phase clock (TSPC) logic in the frequency divider.

13:45 *Integrated Phase Locked Loop and ILFD with VCO for Robotics Transmitter* 465

Wen Cheng Lai (National Taiwan University of Science and Technology, Taiwan)

This article presents phase locked loop (PLL) using frequency expansion technique. The oscillator uses a cross-coupled nMOSFET pair in shunt with the LC-resonator. The wide locking range divide-by-2 RLC injection-locked frequency divider (ILFD) is based on a cross-coupled oscillator. The RLC resonator is used to extend the locking range so that dual-band locking ranges can be merged in one locking range at both low and high injection powers. By utilizing pulse interpolation, the proposed architecture is capable of suppressing high-order harmonics of the reference spur as well as fundamental spur. Varactors in series with inductors are used to tune the oscillator frequency. In robotics implementation, a four-stage pulse interpolator achieves 6-dB additional spur suppression.

14:00 *Organic Light Emitting Diode Lifetime Measurement System Implemented with Arduino and Raspberry Pi* 467

Yu-Sung Liu, Zhen-Yu Huang and Fuh-Shyang Juang (National Formosa University, Taiwan)

This paper adopts Arduino DUE and Raspberry Pi for OLED lifetime measurement. Using DAC port of Arduino DUE output voltage to control the constant current source and generate the constant current to drive OLED, and using ADC port to read the photodetector voltage (then converting to luminance) and OLED voltage. The Qt Creator was installed in Raspberry Pi to control the measuring processes and display the data. Longtime measurement results of OLED luminance were shown in the coordinate graph that was drawn through Qt program Especially studied was to filter the noise in the hardware circuit. With suitable filters to delete the noise, the stable and correct signal from photodetector can be acquired then.

14:15 *Design and Implementation of Augmented Reality Unmanned Vehicle* 469

Chia-Hsin Cheng, Tao-Ping Wang, Feng-Cheng Wu and Hou-Ming Chen (National Formosa University, Taiwan)

This paper mainly uses Arduino Yun on YBB Carriers to set up the server, and then transmits the picture taken by the YBB Car camera to the computer via Wi-Fi. In order to get the location information, we use the computer to progress image processing. After computing, the computer will send command to control the AGV. At the same time, the related information will display on the image at the user side. It will help users to get the information of AGV's location even they are not at the presence.

14:30 *Design and Analysis of a Low Noise Amplifier for 5G Systems* 471

Kuang-Hao Lin and Liang-Yu Ji (National Formosa University, Taiwan); Ming-Fan Wei (National Chung Hsing University, Taiwan); Hou-Ming Chen (National Formosa University, Taiwan); Jan-Dong Tseng (National Chin Yi University of Technology, Taiwan)

This study designed a low noise amplifier (LNA) to achieve the 3.4 ~ 3.8GHz frequency band in the future 5G, and used advanced design system (ADS) for circuit design and simulation. LNA circuit using TSMC 0.18um RF CMOS process, the circuit simulation results at 3.6GHz operating frequency, the input has a good input impedance matching to 50Ω, the output has sufficient gain of 15.2dB and lower noise figure (NF) of 1.34dB, IP3 = -8dBm, P1dB = -13.5dBm, DC voltage of 1.8V and power consumption of 9.3mW.

14:45 *Low-Power Current-Sensing Circuit for Boost Converter* 473

Hou-Ming Chen, Shih-Han Jheng, Yi-Shiang Tsai and Kuang-Hao Lin (National Formosa University, Taiwan)

An improved current-sensing circuit for boost converter is presented in this paper. This proposed circuit uses p-channel switching transistors to replace n-channel switching transistors to eliminate a glitch current. Thus, the proposed circuit consumes less current when the control voltage VGN changes from VDD to GND. The proposed current-sensing circuit has been designed with a standard TSMC 0.18 μm 1P6M CMOS technology. Simulation result shows that a high sensing accuracy 96.38% is achieved at a 484 mA inductor current. Furthermore, the boost converter with the proposed current-sensing circuit can regulate a 1.2 V supply to 1.8 V at a 50 mA load current.

15:00 *Design and Implementation of Brush System for Chinese Writing Based on 3D Printing Platform* 475

Hui-Kai Su, Jing-Jie Zhou, Sung-Kai Wang, Chi-Hsuan Han and Yi-Zu Tu (National Formosa University, Taiwan)

3D printing is a hot topic in recent years. The advantages of its rapid prototyping can meet the customized requirements. The Chinese writing brush is a popular art in Asia region. The paper designs and implements a brush system for Chinese writing based on a simple 3D printing

platform. In the result, the system can write Chinese words automatically according to the users' inputs. The users can construct the system easily by themselves. The value of 3D printing system would be added.

Session G2: The Application and Integration for Digital Signal Processing

Room: 101

Chairs: Shin-Chi Lai (Nan Hua University, Taiwan), Wen Kai Tsai (National Formosa University, Taiwan)

13:30 ***Phase Difference Algorithm and Its FFT Implementation for High-accuracy Power System Frequency Monitoring*** ***477***

Xiaolong Ma and Cheng-Hung Lin (Yuan Ze University, Taiwan); Tao Jin (Fuzhou University, P.R. China)

To track the frequency of power system signals under noisy and harmonic circumstances quickly and precisely, a reliable phase difference algorithm based on discrete Fourier transform and its key module implementation are introduced in this paper. By utilizing main spectral line phase difference of two adjacent data windows, the frequency can estimate easily. The introduced algorithm is suitable for FPGA implementation, and the simulation result shows that it has high-accuracy.

13:45 ***The Prototype of A Driver Attention Level Monitoring System: The Sanbao Radar*** ***479***

Chun-Hsiung Tseng (Yuan Ze University, Taiwan); Jia-Rou Lin (Nanhua University, Taiwan); Chih-Ling Lin, Yue-Chen Wu and Li-Ting Huang (Yuan Ze University, Taiwan)

Our team is committed to improving driving safety by enhancing the attention level while driving. Sambao radar is a car networking application based on driving concentration tests with GPS positioning. Sapphire radar to MediaTek development version Linkit 7688 duo with lens and alert functionality, the detected expression sent to the backend calculation focus, and the picture shows driving the current concentration and the proximity of the vehicle concentration, we will provide driving and Passengers separate the use of the interface, I hope drivers and passengers to grasp the situation in a timely manner, so that damage can be minimized.

14:00 ***Moving Object Tracking Algorithm Design for Unmanned Aerial Vehicle Platform*** ***481***

Wen Kai Tsai (National Formosa University, Taiwan); Ming-Hwa Sheu (National Yunlin University of Science & Technology, Taiwan); Shin-Chi Lai (Nanhua University, Taiwan)

The unmanned aerial vehicle (UAV) has been continuously developed for military uses, agricultural applications and various livelihood activities. This study proposes a moving object tracking algorithm suitable for UAV that help it automatically tracks the designated object. The prototype algorithm can be divided into three steps: 1) object detection; 2) object feature pixel extraction; and 3) feature pixel matching. The experimental result shows that the execution time can be achieved up to 24 fps under the resolution of 1280x720.

14:15 ***Prototype System Design of ECG Signal Acquisition with Lossless Data Compression Algorithm Applied for Smart Devices*** ***483***

Shin-Chi Lai (Nanhua University, Taiwan); Pei-Chen Tai, Meng-Kun Lee and Sheau-Fang Lei (National Cheng Kung University, Taiwan)

This paper presents an efficiently wireless ECG acquisition system with lossless data compressing algorithm. The proposed algorithm were evaluated by using all patterns from MIT-BIH arrhythmia database, and the analytic result shows that the proposed lossless algorithm achieves the CR value of 2.64 in average. Therefore, the proposed algorithm has very outstanding performance.

14:30 ***A prototype development of the smart mousetrap system equipped with LoRa*** ***485***

Wei-Da Chen (Oriental Institute of Technology, Taiwan)

In this study, a prototype of a smart mousetrap system is presented, which features that the portable remote devices based on a LoRa module plus SOC for Bluetooth attempt to lure rodents into a trap and then inform the base station. Mealtimes, all remote devices transmit information on including sensors, the battery status and the GPS coordinates to the base station. Preliminary experiments demonstrate that the system has 5260 meters long distance transmission ability under None-Line-of-Sight (NLOS) conditions

Session G3: Communication and Information Technologies for Smart Cities and Smart Homes

Room: 102

Chair: Cheng-Yuan Chang (National United University, Taiwan)

13:30 ***A Modified PTS Scheme with Monte Carlo Method for PAPR Reduction in OFDM Systems*** ***487***

Hsin-Ying Liang, Chia-Hsuan Chen and Hung-Chi Chu (Chaoyang University of Technology, Taiwan)

The peak-to-average power ratio (PAPR) reduction technique with low quantity of computation is proposed by combining the Monte Carlo Method and the partial transmit sequence (PTS). Its performance improvement in the orthogonal frequency division multiplexing (OFDM) is studied and analyzed. The Monte Carlo method, an important branch of computational algorithms, produces an experimental approximate solution from multiple experiments after the input data are generated randomly. In this paper, the Monte Carlo method is used to improve the large quantity of computation required for the partial transmit sequence. The simulation results show that the proposed method has great improvement in the high computation quantity for the partial transmit sequence technique while keeping the suboptimal PARP reduction performance.

13:45 ***A Platform for Integrating Alexa Voice Service Into ECHONET-based Smart Homes*** ***489***

Cu Van Pham (Japan Advanced Institute of Science and Technology, Japan); Yuto Lim (Japan Advanced Institute of Science and Technology (JAIST) & School of Information Science, Japan); Yasuo Tan (Japan Advanced Institute of Science and Technology & National Institute of Information and Communications Technology, Japan)

Voice is the most natural way of user interaction and there are many studies to utilize voice services for smart home environments. This paper introduces a solution which enables Alexa voice service for ECHONET-based smart homes.

14:00 ***Performance of Resource Allocation for D2D Communications in Q-Learning Based Heterogeneous Networks*** ***491***

Yung-Fa Huang (ChaoYang University of Technology, Taiwan); Tan-Hsu Tan, Yu-Lin Li and Shao-Chieh Huang (National Taipei University of Technology, Taiwan)

This paper investigates energy efficiency issues of device-to-device (D2D) communications in heterogeneous networks. To minimize the

total transmit power, an approach based on Q-learning together with adaptive greedy algorithms is proposed to optimize the connection of user equipment (UE) with base station (BS) or Access point (AP). The proposed adaptive greedy can conduct the adequate exploration and exploitation operations for effective optimization. Simulation results indicate that in the single-cell scenario, the proposed adaptive greedy can obtain performance close to the best solution.

14:15 ***The Improvement of Web Page Ranking on SERPs*** ***493***

Hung-Chi Chu, Chen-You Yan, Zhi-Jie Luo and Xin-Cang Huang (Chaoyang University of Technology, Taiwan)

We can easily and quickly use search engines to find what we want. However, search engines tend to place ads or irrelevant web pages in obvious web pages based on business considerations. This result causes the user really need the information is ranked behind them. In addition, for new content providers, their content often be underestimated by search engines and placed it on unobtrusive web pages. In general, to increase the rank of a particular web page to the previous one in search results, the main factors are paid ads, web page click rate and web page with important keywords. Therefore, this study is based on the development of network technology and software functions to improve the ranking of search results on a specific web page.

14:30 ***A Panoramic navigation and Human Counting System for Indoor Open Space*** ***495***

Hung-Chi Chu, Yong-Lin Jhang, Yi-Xiang Liao, Hao-Jyun Chuang, Jheng-Yi Wu and Yung-Cheng Tseng (Chaoyang University of Technology, Taiwan)

This research contains two major functions: one is the environmental guide, and the other is the human detection. The former utilizes the panoramic image to complete the panoramic view of the indoor space guide system. The latter uses a depth camera and image processing algorithms to calculate the number of people in a specific indoor area and provides instant updates and query records. In addition, the system provides a visualization graph to show the number of people in a given period, and to improve the utilization rate of the space.

14:45 ***Design and Implementation of A Smart Parking Management System for Smart Cities*** ***497***

Siou-Hong Liou, Yun-Chin Hsieh and Cheng-Yuan Chang (National United University, Taiwan)

The vehicles have become the main means of transport today, and especially in the metropolitan area where the requirements for public parking spaces are getting more and more frequent due to growing popularity of the vehicles in the city. Thus, the parking management of vehicles will become even more important. However, there are often some disadvantages in the traditional parking area, such as time-consuming management, lack of parking security, the inconvenience for finding a parking space and so on. In this paper, a design of an efficient smart parking management system is proposed and implemented by mainly using the image processing techniques, Arduino board hardware and electrical apparatuses. The proposed system provides several appealing features, such as automatic license plate recognition, the best recommended parking space reminder, anti-theft parking security, and real-time display of parking space status to further improve the above-mentioned issues in the traditional parking area.