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Monday, May 20 9:00 - 10:30

Session A1: Advanced Signal Processing Technique and Its Applications

Room: evergreen hall i

Chairs: Ying-Ren Chien (National I-Lan University, Taiwan), Po-Yu Kuo (National Yunlin University of Science & Technology, Taiwan)

9:00 ***Affine Projection Sign Algorithm with Combined Regularization Factors in Impulsive Noisy Scenario 1***

Ying-Ren Chien (National I-Lan University, Taiwan); Chen-Yi Chen (National Ilan University, Taiwan)

Regularization parameter plays an important role of a portion of adaptive filtering algorithms, such as the affine projection sign algorithm (APSA). This paper proposes a combined regularization parameter APSA (CR-APSA) to deal with the problem of how to systematically choose the value of regularization parameter. Simulation results confirm that our proposed CR-APSA is able to compromise the convergence rate and resulting misadjustment.

9:15 ***Smartphone-based Positioning with Insufficient Sensed Observations 3***

Shih-Hau Fang (Yuan Ze University, Taiwan); Yu Tsao (Research Center for Information Technology Innovation, Academia Sinica, Taiwan); Ying-Ren Chien (National I-Lan University, Taiwan); Shi-Shen Yang (National Ilan University, Taiwan); Shih-Jyun Ye (Yuan Ze University, Taiwan)

In this paper, we outline the indoor positioning algorithm with insufficient sensed observations by smart phones and its preliminary results. Our positioning algorithm exploits the received signal strength (RSS) values of WiFi receivers, the values of three-axis accelerator meters, and the pressure sensors. By using the validation data, the third quartile of the positioning errors of positioning errors is around 7.37 meters.

9:30 ***Performance Comparison between Single Carrier and Multi-carrier Transmission Systems over Rayleigh Fading Channel 5***

Chen-Yi Chen and Shi-Shen Yang (National Ilan University, Taiwan)

In this paper, the multi-carrier modulation (MCM) is mainly Orthogonal Frequency Division Multiplexing (OFDM). The presented OFDM system has 3kHz bandwidth. The researchers propose system parameters, system architecture, and channel estimation methods to achieve the comparison of bit error rate (BER) characteristics. Under 5-taps Rayleigh fading channel and additive white Gaussian noise (AWGN) channel, multi-carrier transmission systems can obtain desirable BER performance.

9:45 ***The Design of LabVIEW-based Audio and Speech Testing System 7***

Hao-Min Lai and Chih-Cheng Tseng (National Ilan University, Taiwan); Shih-Tseng Yeh, Ying-Jen Liu and Cheng-Feng Yu (Unication Co. Ltd., Taiwan)

Without automation, conventional audio and speech testing systems require experienced engineers and long testing time to perform and complete a sound quality test. To improve these problems, this paper designs a LabVIEW-based audio and speech testing system (LASTS) that not only conducts the sound quality test automatically but also provides modules to record the test logs and generate the test reports automatically. With the convenience brought by the LASTS, both the labor and time costs to complete a sound quality test are greatly reduced. Consequently, the productivity is improved and the profit is increased as well.

10:00 ***Anemometer Signal Processing based on Kalman Filtering for Hazard Warning 9***

Chin-Der Wann and Zong-Yi Chang (National Kaohsiung University of Science and Technology, Taiwan)

In this paper, the Kalman filtering technique is used in the estimation of wind speed for hazard warning systems. From the measures of wind speed, a Kalman filter is adopted in anemometer signal processing, of which the results may be used in formulating decision rules to support safety systems such as the train dispatcher system of mass rapid transit (MRT) during bad weathers. The proposed work provides the estimated state vector from a Kalman filter, including the estimated wind velocity and acceleration, which is then applied in the decision-making process for supplementing the safety status assessment, and enhancing the performance of anemometer warning systems.

Session A2: Computer Networks, Sensor Technologies and Intelligent Signal Processing-I

Room: river hall

Chair: Cheng-Wei Wu (National Ilan University, Taiwan)

9:00 ***Acoustic source direction-of-arrival estimation using circular sensor array in modal space based on compressive beamforming 11***

Haiyan Song (Heilongjiang Institute of Technology, P.R. China); Chang-Yi Yang (National Penghu University of Science and Technology, Taiwan); Gong Zhang (University of Winnipeg, Canada)

In this paper, a new circular array Direction-Of-Arrival (DOA) estimation approach is developed, which can improve spatial resolution by imposing penalties

based on the -norm. Our approach differs from most previous methods mainly in how it applies the compressive beamforming technique to the modal array signal processing in order to achieve better DOA estimation performance. Computer simulation with two closely spaced coherent sources scenario indicates the superior DOA estimation resolution of our proposed approach as compared with the conventional beamforming technique.

9:15 ***A New Online Charging System Based on Context of Mobile Users 13***

Albert Budi Christian (National Chiao Tung University, Taiwan); Cheng-Wei Wu (National Ilan University, Taiwan); Wan Hsun Hu (CHT, Taiwan); Yung-Ju Chang (National Chiao Tung University, Taiwan); Yu-Chee Tseng (National Chiao-Tung University, Taiwan)

This paper studies the potential commercial applications on the top of SDN/NFV network architecture, and proposes a new online charging system based on context of mobile users. The proposed system mainly consists of six core modules: (1) data collection, (2) context recognition, (3) data transmission and receive, (4) promotion rule trigger, (5) service deliver, and (6) promotion rule update. The proposed system collects information of mobile users from smartphones and uses such information to infer their contexts. When the system detects that the user's context has triggered a charging event, it will deliver a corresponding service to the user in an instant manner through the SDN/NFV network architecture. If the delivered service can meets the need of the user and the user is willing to pay to buy the service, the service providers can make instant profits and achieve a win-win situation for both themselves and their customers.

9:30 ***Modeling of Time Series for S-band Spectrum Use in Satellite Downlink 15***

Wen Liu, Tao Hong and Gengxin Zhang (Nanjing University of Posts and Telecommunications, P.R. China)

The development of the Cognitive Radio technology has largely benefit from the availability of realistic and accurate spectrum occupancy models. The spectrum occupancy model proposed in the literature so far are able to capture and reproduce the statistical characteristics of occupied time series. For example, the busy/idle-period lengths of terrestrial wireless network can be fitted by generalized Pareto distribution, exponential distribution, etc. However, in the satellite link spectrum occupancy scenario, the traditional parameter estimation distribution cannot provide the goodness of fit. In this context, this paper proposes a method of kernel density estimation to estimate the probability density function. The conclusion shows that this method can more accurately describe and reproduce the statistical characteristics of the occupied time series of the S-band used in the satellite downlink.

9:45 ***An Efficient Geographical Place Mining Strategy for Social Networking Services 17***

Jong-Shin Chen (Chaoyang University of Technology, Taiwan); Cheng-Ying Yang (University of Taipei, Taiwan); Huai-Yi Huang (Chaoyang University of Technology, Taiwan); Yung-Fa Huang (ChaoYang University of Technology, Taiwan); Chi-Yueh Hsu (Chaoyang University of Technology, Taiwan); Shu-Chen Chang (National Formosa University, Taiwan)

With the rapid development of Social Networking Services (SNS), the Internet environment has generated a large number of geographical places, such as Google Maps places, Facebook check-in places, Foursquare check-in places, ..., and so on. However, it is very difficult to mine these places based on a specific geographic area. Accordingly, in this study, we propose an efficient strategy for mining geographical places.

Session A3: Learning-based Image/Signal/Data Processing Technologies for Smarter Life

Room: peak hall

Chairs: Kuan Hung Chen (Feng Chia University, Taiwan), Chih-Peng Fan (National Chung Hsing University, Taiwan)

9:00 ***Cost-Efficient Adaboost-based Face Detection with FPGA Hardware Accelerator 19***

Keng-Chia Chang and Chih-Peng Fan (National Chung Hsing University, Taiwan)

In this paper, a cost-efficient Adaboost-based hardware accelerator design is developed for face detection. For the realization, a lot of operations and fast calculations of the rectangular Haar features of partial image regions are required. To speed up the processing time for integral image and face detection functions, the hardware accelerator implementation is an important issue for real-time application. In experimental results, by Xilinx XC7a200t device at 205MHz operational frequency, the applied integral image accelerator performs up to 1161 frames/sec with the image size of 240x360 pixels. When the input ROI sizes are 80x80 and 64x64 pixels, the proposed Adaboost-based classifier operates up to 574 and 821 face ROIs/sec, respectively.

9:15 ***Learning Optical Flow Features with Deep Learning for Micro-expression Recognition 21***

Sze Teng Liong (Feng Chia University, Taiwan); Vo Thanh Chuong and Nguyen Hiep (Tôn Đức Thắng University, Vietnam); Yee Siang Gan (National Taipei University of Nursing and Health Sciences, Taiwan)

This paper proposes a method to recognize the micro-expressions. Particularly, several optical flow features are computed from only two frames (i.e., onset and apex) for each video to indicate the patterns of the facial motion. Then, the features are processed by feeding them into a shallow CNN architecture prior to the final classification stage. The experiments are conducted on a spontaneous micro-expression database - SMIC. A recognition result of 56.45% is achieved by employing the proposed framework.

9:30 ***Design and Implementation for an Automotive DMS system 23***

Wei-Ren Chen (National Yunlin University of Science and Technology, Taiwan)

This paper will develop a driving behavior monitoring system that applies a single near-infrared camera to record the driver, detect facial position and convolutional neural network through image recognition for judging whether the driver fatigues, smokes, and uses mobile devices or not. This system employs the NXP S32V234 processor with car grade so as to simultaneously identify a variety of driving behaviors and gaze position of drivers' eyesight. In addition, this system adopts the dual-core APEX-2 visual accelerator to accelerate the mask operation of convolutional neural network and traditional image processing. Comparing to only using CPU, the total average optimization speed is increased by 5 times before optimization.

9:45 *High Throughput Hardware Implementation for Deep Learning AI Accelerator 25*

Chung-Bin Wu, Yu-Cheng Hsueh, Ching-Shun Wang and Yen-Chi Lai (NCHU, Taiwan)

In this paper, a high-throughput hardware accelerator for deep learning neural networks is proposed. Since deep learning operations require high data access from DRAM, we design a high data reuse architecture to reduce the data access directly from external DRAM and provide a pipeline scheme to achieve high throughput requirements. The architecture proposed in this paper uses INT8 precision computing, 128-bit AXI bus protocol, and parallel processing with 16 sets of processing units, and achieved real-time operation at 125 MHz operating frequency and 8GOPS throughput.

10:00 *A Chinese Oral Question-and-Answering System Based on LSTM 27*

Kuan Hung Chen (Feng Chia University, Taiwan); Jui-I Kao (No. 100, Wenhwa Rd., Seatwen & Feng-Chia University, Taiwan); Chia-hung Wu and Yang-Ru Chen (Feng Chia University, Taiwan); Yi-Chin Huang (National Pingtung University, Taiwan)

we have developed a new answering system which recognize questions inputs in natural language and respond accordingly. We implement a deep learning method to understand conversation, dialogue and also sort out a summary of narrative. Many papers have already shown how to combine and apply various tools for similar problems, however, only few of them mentioned how to effectively reduce the error rate of speech recognition and combine this part to answering system. In this paper, we combine these two functional parts and minimize the size of the model, which does not influence the accuracy of it. We believe this model can be used in embedded system in the future.

Session A4: Next-Generation Network Environments

Room: pine hall

Chair: Tsu-Yang Wu (Shandong University of Science and Technology, P.R. China)

9:00 *Distributed Energy Harvesting Management Algorithm in Internet of Things Devices 29*

Chao-Yang Lee (National Formosa University, Taiwan)

Nowadays, we have seen rapid growth in the field of the internet of things (IoT). The IoT technologies can provide ubiquitous and diverse applications. Because of the requirements of IoT devices are usually lightweight and portable, so most of the energy source in an IoT system is powered from finite battery-operated energy. Thereby, the limited lifespan of the battery is the major limitations on operational network lifetime. The energy harvesting methods can be applied to extend their lifetimes for power. However, due to the renewable energy characteristics of low recharging rates in harvesting ambient energy, energy harvesting is unable to provide sufficient energy for system operation. In this version, this study designs the distributed energy harvesting management strategy which aims to prolong the IoT system lifetime to make the harvesting ambient energy useful. Each device builds a sub-network and carries out the linear programming to management the energy utilization. The proposed algorithm can dynamically control energy consumption in each device to prolong the network lifetime for the battery-based IoT system.

9:15 *New Generation Artificial Intelligent Vending Machine System based on LoRaWan IOT Network 31*

Yi-Chang Lin (Far Easy Pass LTD, Taiwan); Chih-Chun Hsu, Chi-Chia Sun and Yeong-Long Shiue (National Formosa University, Taiwan)

The Internet of Things and artificial intelligence are one of the mainstream of technological development in this era. Machine Learning now is often used for image recognition, and it is necessary to develop different models according to requirements in the past. This paper combines Artificial Intelligence and Internet of Things into the vending system, and system is presented in the form of ticket vending machines and veterans. The proposed system can identify the customer's age, gender data, and then sends the data to cloud server through the LoRaWan IOT Network to analyze the customers and merchandise sales. It will monitor the current status of the vending machine at the same time.

9:30 *Security Analysis of Wu et al.'s Authentication Protocol for Distributed Cloud Computing 33*

Tsu-Yang Wu and Zhiyuan Lee (Shandong University of Science and Technology, P.R. China); Yanyu Huang and Chien-Ming Chen (Harbin Institute of Technology (Shenzhen), P.R. China); Yeh-Cheng Chen (University of California, Davis, USA)

Recently, Wu et al. proposed an authentication protocol for distributed cloud computing environment. In their protocol, they claimed that it is secure against several well-known attacks. However, we point out their protocol did not provide perfect forward secrecy under some assumptions in this paper.

Session A5: Technology and Application of Internet of Things-I

Room: orchid hall

Chair: Dapeng Li (Nanjing University of Posts and Telecommunications, P.R. China)

9:00 *A LoRaWAN-Based Network Architecture for LEO Satellite Internet of Things 35*

Zhicheng Qu, Haotong Cao, Yifan Cheng, Shengchen Wu and Gengxin Zhang (Nanjing University of Posts and Telecommunications, P.R. China)

Though short range communication technologies still support the major part of the Internet of Things (IoT) connections in the future, low power wide area networks (LPWAN) have shown great competitive power among other IoT connecting technologies. Moreover, to overcome the coverage limitation of terrestrial networks, IoT combining with satellite networks can provide services globally and seamlessly. Among satellites from different kinds of orbits, low earth orbit (LEO) satellite is a good candidate to provide IoT services due to its low propagation delay, small propagation loss and global coverage ability.In this paper, we present an LoRaWAN-based network architecture for LEO Satellite Internet of Things. Besides, we describe several significant processes for

this IoT network.

9:15 ***Power Minimization for Cell-Free Massive MIMO 37***

Yao Zhang, Haotong Cao, Meng Zhou, Yan Li and Longxiang Yang (Nanjing University of Posts and Telecommunications, P.R. China)

In this paper, we investigate the total power minimization problem for the downlink cell-free massive multiple-input multiple-output (mMIMO) system, subjecting to the users' quality-of-service (QoS) constraint. Specifically, the total power consists of circuit power, data transmission power, and backhaul power. Two precoding methods are considered in this paper, namely conjugate beamforming (CB) and zero-forcing (ZF) precoding. It is proved that the power minimization problems for both precoders can be reformulated as the second-order-cone programming (SOCP) and hence, are easily determined. Simulation results indicate in the low QoS SE regime, the total power required by ZF precoder is larger than CB precoder. However, the superiority of CB precoder in power-saving has vanished in the medium and high QoS SE regimes.

9:30 ***Energy-Efficient Transmission Design for Downlink Non-Orthogonal Multiple Access Network 39***

Dong Hu, Yao Zhang, Haotong Cao, Meng Zhou and Longxiang Yang (Nanjing University of Posts and Telecommunications, P.R. China)

In order to improve the energy efficiency (EE) of non-orthogonal multiple access (NOMA) network, this paper focus-es on energy-efficient transmission design for downlink NOMA network by reasonable resource allocation. We first study the power allocation on multiple users in each cluster and obtain the optimal closed-form solution of the power allocation coefficient. Then, a novel power allocation strategy across clusters is proposed to further maximize the total EE. Since the original optimization problem is non-convex, a successive convex approximation (SCA) method is introduced to find a sub-optimal solution of the non-convex one. Numerical results indicate that NOMA performs well than orthogonal multiple access (OMA) in terms of total EE and our proposed power allocation algorithm significantly outperforms the equal power allocation strategy.

Session A6: IoT Applications and Technologies- I

Room: bamboo hall

Chairs: Chih-Yung Chang (Tamkang University, Taiwan), Wen-Hwa Liao (Tatung University, Taiwan)

9:00 ***Multi-agent Negotiation in Real-time Bidding 41***

Chao Kong, Haibei Zhu, Hao Li, Jianye Liu, Zheng Wang and Yinliang Qian (Anhui Polytechnic University, P.R. China)

In this paper, we study the problem of multi-agent negotiation in real-time bidding scenario. We present a new solution, Extended Q-learning Network (EQN), which iteratively assigns the state transition probability and finally converges to a unique optimum effectively; Importantly, we propose a naïve edge computing framework between mobile devices and cloud servers to handle the data preprocessing and transmission simultaneously to reduce the load of cloud servers; Finally, extensive experiment on real dataset demonstrates EQN's soundness (fast convergence), properties and effectiveness (achieve state-of-the-art in real-time bidding task). Our experimental results manifest that our proposed approach outperforms the comparable baselines.

9:15 ***Ant Colony Optimization Based Dynamic Scheduling Routing Algorithm in Internet of Vehicles 43***

Hai-tao Zhao, Xuanpei Zhu, Chen He, Xiang Ren and Yin-yang Zhu (Nanjing University of Posts and Telecommunications, P.R. China)

With the rapid development of the Internet of Things at this stage, in-vehicle communication as the cutting-edge technology of vehicle intelligence, the adoption of intelligent environment has become more and more important in many application scenarios such as healthcare, asset management and environmental monitoring, The traditional ant colony algorithm cannot meet the requirements of the Internet of Vehicles in terms of delay and energy consumption. By studying ant colony algorithm and simulated annealing algorithm, I use the average energy consumption and end-to-end delay as reference, virtualize resource features for resource allocation and task scheduling, and ensure QoS service quality through hybrid ant colony optimization algorithm and simulated annealing algorithm.Adding the initial temperature and iterative temperature values of the simulated annealing algorithm to the ant colony algorithm to generate the optimal solution, updating the rules of the pheromone,improve the efficiency of task scheduling in the virtual resource environment. Finally,the simulation results show that the average energy consumption drops by about 0.04J, and the end-to-end delay decreases by about 100ms.

9:30 ***Relay-based Cooperative Communication Framework for Narrowband Internet of Things 45***

Guisong Yang, Tingting Liang, Xingyu He, Yan Song and Chunxue Wu (University of Shanghai for Science and Technology, P.R. China)

This paper concentrates on design of cooperative Device-to-Device (D2D) communication by using the advantages of Narrowband Internet of Things (NB-IoT), and a relay-based cooperative communication framework is proposed to improve the network performance by D2D communication, so that the information can be diffused effectivity and reliably in NB-IoT.

9:45 ***Performance Analysis of Patch and Stitch Localization Algorithm in Relative and Transformation Domain 47***

Ping Zhang (Anhui Polytechnic University, P.R. China); Jian Lu (Southeast University, P.R. China)

Patch and stitch strategy is a preferred cooperative localization method because it merges the merits of the accuracy and the scalability in centralized and distributed algorithms respectively. This paper investigates how to partition the network through Cram\'{e}r-Rao lower bound (CRLB) analysis for the relative and global transformation error, which reveals the nature of error propagation and suggests some methods to overcome it.

10:00 ***PC-RPL: A Routing Protocol based on Power Control for IoT-based Low-Power and Lossy Networks 49***

Sheng-Shih Wang and Lin Chou (Minghsin University of Science and Technology, Taiwan)

This paper proposes a routing protocol with a power control strategy for data collection in low-power and lossy networks. The proposed routing protocol determines the node rank mainly considering the proper transmission power to its candidate parent. With the aid of the manner of power adjustment, the node is able to select the proper next forwarding node to establish the energy-efficient upward transmission route. Simulation results validated that the proposed routing protocol significantly extends the path lifetime and network lifetime compared with the routing protocol only using the hop count as the node rank.

Session A7: Smart Information Retrieval (SIR) and Smart Multimedia Technologies- I

Room: sky hall

Chair: Jieh-ren Chang (National Ilan University, Taiwan)

9:00 ***River Blocking Judgment Based on Color Constancy Color Similarity Measure under Complex Disasters 51***

Chunxue Wu, Bobo Ju and Guisong Yang (University of Shanghai for Science and Technology, P.R. China); Yan Wu (Indiana University, USA); Hongming Yang (University of Shanghai for Science and Technology, P.R. China); Naixue Xiong (Tianjin University, P.R.China)

This paper analyzes the map formed by aerial photography of drones, and uses the color constancy color similarity measure CCCI and binary image similarity measure to judge whether the river is blocked and the degree of blockage, instead of the previous artificial judgment on the barrier lake. The results show that the CCCI water body extraction method is less affected by the mountain shadow and thin cloud, which can completely eliminate the "Noise water body" phenomenon caused by the pixel-based CCCI water body extraction method.

9:15 ***Learning Text Representations for Finding Similar Exercises 53***

Mengfei Feng, Yishuai Chen, Yuchun Guo and Yongxiang Zhao (Beijing Jiaotong University, P.R. China); Guowei Fu (TAL Education Group Inc., P.R. China)

A basic task in mathematic intelligent tutor systems is to find similar exercises. To find similar exercises accurately, it is essential to obtain reasonable representations of exercises. In this paper, we propose a new model called Siamese-BERT. We find that, on our Chinese math exercise dataset, its AUC can reach up to 0.90, which is 47.5% and 8.4% higher than that of BERT and Siamese-LSTM model respectively. Visualization analysis also prove that our model obtains better representations than existing models.

9:30 ***ECG Classification Based on Unfixed-Length Segmentation of Heartbeat 55***

Bin Chen, Yuchun Guo, Yishuai Chen and Hongyun Zheng (Beijing Jiaotong University, P.R. China); Tong Liu (Beijing Computer Center, P.R. China)

An automatic ECG classification system is of great significance. Deep learning (DL) methods, e.g. convolutional neural network (CNN), are proved very useful for ECG classification. Due to that DL methods require the input data with fixed length, current work segments beat with fixed length. But obviously, the length of beat is varying with the changing temporal, personal, or contextual conditions. We solve the contradiction by segmenting beat with unfixed length and then reshape the beat to that with fixed length. Based on this, we extract inner-beat, beat and inter-beat representation. We validate our method on MIT-BIH dataset and the accuracy reaches 95.45\%, better than related work.

9:45 ***Adaptive Indoor Localization with Wi-Fi Based on Transfer Learning 57***

Anmin Hu and Lijun Zhang (Beijing Jiaotong University, P.R. China)

Many approaches used in The Wi-Fi based indoor location system (WILS) typically assume the distribution of the signal strength data is fixed over time. However, the assumption does not hold in real world, which cause the location accuracy to drop. To solve this problem, we propose an algorithm which can adjust the distribution of training data by mixing fraction new data. Experimental results show that our algorithm can greatly improve the localization accuracy and reduce a great amount of the calibration effort

10:00 ***Bystander: QoE Perception for Dynamic Video Streaming from Encrypted Traffic 59***

Jialin Zhang, Hongyun Zheng, Yongxiang Zhao and Yuchun Guo (Beijing Jiaotong University, P.R. China)

In this paper we introduce a new application layer objective QoE metric and propose a machine learning approach to infer the introduced metric for QoE estimation based on features abstracted from encrypted traffic. Experimental results show that our method can infer video users QoE with an accuracy higher than 80%.

Monday, May 20 10:30 - 10:50

Coffee Break
(Break Area)

Monday, May 20 10:50 - 12:20

Poster Session A

Room: poster area

Chairs: Wei-Tsong Lee (Tamkang university, Taiwan), Tin-Yu Wu (National Ilan University, Taiwan)

Studying an Adaptive Fuzzy PID Controller for PMSM with FOC based on MATLAB Embedded Coder 61

Hung Khong Hoai and Seng Chi Chen (Southern Taiwan University of Science and Technology, Taiwan)

The paper presents a method to build an Adaptive Fuzzy PID Controller for a three-phase PMSM with a Field Oriented Control (FOC). However, there are many different approaches to design and code the program. This is dependent on the systems hardware. The Texas Instrument DSP is normally used in conjunction with the CCS environment which requires C languages skill. To simplify the process and reduce coding time, this paper recommends a new method to design the algorithm based on the Embedded Coder and the Fuzzy Logic Designer Toolbox in MATLAB. The results were verified on the platform with the F28069 Control Card and loaded conditions.

Early Warning System for Smart Street Lights 63

Shih-Jie Chou (Instrument Technology Research Center, NARLabs, Taiwan); Wu Tzong-Dar (Department of Electrical Engineering, National Taiwan Ocean University, Taiwan); Zhi-Jun Chen (National Taiwan Ocean University, Taiwan); Rui-Cian Weng (Taiwan Instrument Research Institute, National Applied Research Laboratories, Taiwan); Chun-Ming Chang (Instrument Technology Research Center, National Applied Research Laboratories, Taiwan); Yen-Pei Lu (Instrument Technology Research Center, Taiwan); Chun-Li Chang and Wen-Hong Wu (Instrument Technology Research Center, National Applied Research Laboratories, Taiwan)

The purpose of smart street lights (powered by the IoT) that automatically and immediately report malfunctions through wireless networks, allowing government agencies to manage street lights effectively, save electricity, and increase administrative efficiency. The collected long-term data on road environments, electricity usage, and sensor readings can help relevant device manufacturers conduct big data analysis and develop relevant applications for disaster prevention and neighborhood safety.

Thermal Countermeasures of Glass Wearable Devices 65

Kodai Matsuhashi and Atsushi Kurokawa (Hirosaki University, Japan)

This paper presents thermal countermeasure methods for glass wearable devices by effectively using the structural features of the devices. We show the effectiveness of the main measures, i.e., the use of Al for frame material, a wider rim, and placements on both sides to divide the device. We also show the effects of other measures, e.g., the use of a side heatsink and front center placement of the device. Experimental results demonstrate that the main measures can reduce the temperature rise that glass wearable devices generally produce by 28%.

Why do people use the ride-sharing service 67

Li-Wen Chuang and Shu-Ping Chiu (Lingnan Normal University, Taiwan); Tsai-Feng Kao and Yi-Zhan Du (Minnan Normal University, Taiwan)

In recent 20 years, Information and Communications Technologies (ICTs) has made progresses rapidly, expanded its scope of influence constantly through connection with client-side mobile terminal, as well as accelerated development and increased influences of commercial application needs like social media, network community, electronic commerce, mobile commerce and Internet. Till now, Internet, social media and mobile commerce all closely correlate with consumers' life and become associated with each interpersonal network, but also lead to sense of alienation between people in real world. Only interpersonal selflessness can make the world tend to be harmonious and united. Selfless sharing between people helps utilize the limited global resources sufficiently and effectively, and generate the new important role in commercial economy- sharing economy. Therefore, enterprise business managers urgently need to understand the connections with motive, attitude and behavioral intention requirement of consumer's using sharing economy services, so as to take the preemptive opportunities in future business development. By finding the existed and potential consumers, The primary concern of this research is to analyze the impacts of perceptions on reputation, social value, habit, attitude and consumer behavioral intention to use a ride-sharing service. Therefore, the questionnaire was completed by survey data (N = 136) gathered from active consumers who have participated in ride-sharing service with Didi Chuxing in China. Then analyzed with structural equation modeling (SEM), and confirmatory factor analysis (CFA) was also applied, using the software of SmartPLS 2.0, to verify if the empirical survey data become suitable to the proposed research model. Finally, the consequences of this study offer empirical research proof that reputation, social value, habit and attitude all influence the consumers behavioral intention to use a ride-sharing service in sharing economy. All the results of this research with implications for theory and practice would be further pondered, too.

Examining Consumer Continuance Intention in social media and online shopping context 69

Li-Wen Chuang and Shu-Ping Chiu (Lingnan Normal University, Taiwan); Yi-Zhan Du and Tsai-Feng Kao (Minnan Normal University, Taiwan)

Along with rapid development of modern information and communication technologies, various traditional industries like clothes, daily necessities, books,

3C digital, agricultural products and fresh products begin to utilize Internet and E-commerce platform to expand enterprise marketing channels. Besides actively developing offline business, online business is also initiated to occupy the market. Additionally, based on gradual popularization of Internet and mobile terminal device, as well as united vertical integration, development and expansion of currently popular social media and social interpersonal network, social media have become indispensable important tools in people's daily life. Social media also break through the initial communication function as social utility. In response to popularity of social media such as WeChat in consumers' interpersonal social network, the business mode of "social media + online shopping" appears and evolves into prevailing "social shopping". Its characteristic is especially embodied by WeChat friend circle and WeChat group, so that various types of social shopping become emerging online shopping modes. With social shopping business mode of "WeChat + Taobao" as the background, this study investigates consumers' continuous intention and motivation to use. The research results discover that the relationship among word of mouth(WOM), perceived quality, perceived value, satisfaction and consumer continuance intention are all significant. In addition, this proposed research model probes that satisfaction plays as the key predictor in the influence of consumer continuance intention. Finally, all the proposed findings of this research would provide proper and important comments and suggestions with implications for the academic and practical meanings, including research limitations and future research direction.

Implementing a Neural Network Controller for a Permanent Magnet Synchronous Motor based on MATLAB Function 71

Hung Khong Hoai and Seng Chi Chen (Southern Taiwan University of Science and Technology, Taiwan)

In this paper, a Radial Basic Function Neural Network (RBFNN) is built to control a three-phase PMSM with a Field Oriented Control (FOC). The parallel structure of a RBFNN and a conventional PID Controller is used to simplify design the online adaptive learning law. Moreover, depending on the central processor, the code is developed in the appropriate software. To improve the flexibility and integration in implementing the algorithm with the Texas Instrument DSP, this paper proposes a method to execute the algorithm based on the MATLAB Function and the Embedded Coder. The experiment was verified on the platform with the F28069 Control Card and loaded conditions

A Preliminary Work of Distributed Area Coverage in WSNs 73

Haibao Chen and Yuyan Zhao (Chuzhou University, P.R. China)

Coverage is one of the most important issues in wireless sensor networks. With the development of charging technology, more and more wireless sensors are equipped with solar cells. Many studies have proposed centralized solutions for coverage problem. In this paper, we aim to address the coverage problem by introducing a distributed area coverage approach.

A Framework of Social Robot for Elderly individuals 75

Haibao Chen, Yuyan Zhao, Shenghui Zhao, Guilin Chen and Liang Zhao (Chuzhou University, P.R. China); Jinjun Liu (Hefei University of Technology, P.R. China); Yang Wang and Lu Yin (Chuzhou University, P.R. China)

Developing and studying robots as an assistive tool for health-care professionals is a growing area of research due to the rapid growth in the number of elderly people and the demand for specialized caregivers. This paper presents our preliminary work of perceptive social robot for improving the quality of life of elderly individuals.

Voice based Home Behavior Self-Management System for The Elderly 77

Liang Zhao and Haibao Chen (Chuzhou University, P.R. China); Jinjun Liu (Hefei University of Technology, P.R. China); Shenghui Zhao and Guilin Chen (Chuzhou University, P.R. China)

Aiming at the serious social problems of increasingly population aging, we designed a system to identify users' daily behavior, which based on various low power sensors as well as speech recognition and synthesis technology. In the initial stage, the system acquires trigger signals based on sensors, and prompts users to say what they are doing based on voice. After speech recognition, the system automatically annotates the above sensor information. In the recognition stage, users do not need to interact based on voice. The system can automatically judge users' behavior according to the collected sensor information. The volunteer test in the laboratory shows that the system can perform the corresponding operation well and is more practical.

Image Super-Resolution Using Residual Convolutional Neural Network 79

Pei-Ying Lee and Chien-Cheng Tseng (National Kaohsiung University of Science and Technology, Taiwan)

In this paper, a single-image super-resolution using residual convolutional neural network (CNN) is presented. The proposed residual CNN model includes one short-cut and seven convolutional layers with the batch normalizations and ReLU activation functions. The transposed convolutional layer is also employed to eliminate the need of bicubic interpolation in the image preprocessing and to speed up the calculations of network. Several public benchmarks are tested to show that the proposed network architecture has better performance than the plain convolutional networks without using residual connection.

An Architecture for Test Execution in Video Monitor and Digital TV Receiver Production Lines 81

Ruan Josemberg, Caio Cruz, Petrina Kimura and Allan Amorim (TPV Technology, Brazil); Eddie B de Lima Filho (TPV & Universidade Federal do Amazonas - UFAM, Brazil); Osmar Silva and Lucas Coimbra (ICTS, Brazil)

Production lines for video monitors and digital TV receivers usually present a myriad of verification tasks, which may lead to allocation of many workstations. The present paper addresses this issue and proposes a flexible testing architecture, which is able to gather different testing procedures in only one framework.

A Methodology for Intuitive and Low-Attention TV Remote Control on Smart Phones 83

Guilherme Freitas Guimarães and José Fernandes (TPV Technology, Brazil); Andre de Souza Costa (ICTS, Brazil); Rômulo Fabrício, Jr. and Manoel José de Souza Júnior (TPV Technology, Brazil); Eddie B de Lima Filho (TPV & Universidade Federal do Amazonas - UFAM, Brazil)

This article proposes a new methodology regarding TV remote-control applications on smart phones, which employs a paradigm based on simple and intuitive gestures. Experiments with users were performed and showed its feasibility and effectiveness.

Microorganism Image Counting Based on Multi-threshold Optimization 85

Fang Zhou, Wenjun Cao and Zhi Wu (Anhui University of Technology, P.R. China); Xin Wei (Nanjing University of Posts and Telecommunications, P.R. China)

In view of the characteristics of multiple targets, uneven distribution of gray scale and multiple peaks in the histogram in microscopic image of sewage, a multi-threshold image counting method based on improved particle swarm optimization (PSO) was proposed in this paper to effectively solve the problems of error counting and leakage counting. We extended the two-dimensional maximum entropy algorithm to design the objective function by using of exponential entropy and adopted an improved PSO algorithm to acquire its maximum value and the best image segmentation effect. Furthermore, the breadth-first search (BFS) algorithm was applied to complete the microorganism marker and counting in the segmented images. Compared with other methods, the counting scheme in this paper achieved better anti-interference ability and higher counting precision.

Capacity Analysis of OAM Millimeter Wave System in the Off-axis Misalignment Case 87

Qi Yang, Mingkai Chen, Haie Dou, Lei Wang and Baoyu Zheng (Nanjing University of Posts and Telecommunications, P.R. China)

The main problem of orbital angular momentum (OAM) millimeter wave communication system is the off-axis misalignment between the transmitter and the receiver. In this paper, the channel modeling of the system is carried out based on the energy transition characteristics of OAM modes in the off-axis misalignment case. Numerical results show the power distribution between different OAM modes and capacity of the system with different mode sets.

An Incentive Caching Mechanism in Wireless Networks Based on Stackelberg Game 89

Lei Wang, Jincheng Li, Mingkai Chen, Sulan Tang and Baoyu Zheng (Nanjing University of Posts and Telecommunications, P.R. China)

In this paper, an incentive caching mechanism between multiple mobile network operators (MNOs) and multiple video service providers (VSPs) is proposed to alleviate the traffic burden on the cellular backhaul link. MNOs provide storage space to VSPs and VSPs compete to decide the caching demand amount to improve users' experience. The caching resource allocation problem is formulated as a Stackelberg game, in which MNOs act as leaders and VSPs act as followers. The existence of Nash equilibrium (NE) in followers' non-cooperative game is proved. The optimal strategies of MNOs and VSPs are obtained by using distributed iteration algorithm to solve the game problem. Simulation results show that the proposed mechanism could obtain higher revenue than other schemes.

UGC Online Learning Proactive Caching Strategy for Multi-levels Wireless Networks 91

Yiming Song and Mingkai Chen (Nanjing University of Posts and Telecommunications, P.R. China); JingWu Cui (Nanjing University of Posts And Telecomm, P.R. China); Lei Wang and Baoyu Zheng (Nanjing University of Posts and Telecommunications, P.R. China)

User Generated Content (UGC) increases rapidly owing to the development of mobile Internet. Proactive caching can unload popular content flow and reduce content request delay to improve QoS. The effectiveness of proactive caching depends on the imformation about content popularity. In this paper, we suggest a UGC online learning proactive caching strategy. In this strategy, with the utilize of multi-level online learning and user clustering, the preference similarity among cache group members is improved, thus improving online learning efficiency and cache hit ratio. Simulation results demonstrate the effectiveness of the proposed method.

Resource Allocation Based on Utility Function in CDN Replica Server 93

Gaibin Li and Mingkai Chen (Nanjing University of Posts and Telecommunications, P.R. China); Yaqiu Liu (Shanghai Radio Monitoring Station, P.R. China); Lei Wang and Baoyu Zheng (Nanjing University of Posts and Telecommunications, P.R. China)

With the rapid growth of Internet traffic, content delivery network (CDN) has become an indispensable network component. Therefore, various technologies of CDN have been widely studied. In this paper, we develop an optimization model for replica server resource allocation. First, we consider user requests to obey the Zipf Distribution. Under the premise that there is a difference in the amount of content requests, we define a utility function that takes into account monotonicity and marginal utility. Then based on this scientific utility function, we design an objective function based on the average user utility and the average utility of the content. Finally, we use genetic algorithms to get a relatively ideal solution. Through our proposed optimization model, we can get higher user utility and ensure that different types of users get relatively fair service.

An optimized grey model with quadratic time-varying parameters based on background value optimization 95

Ziheng Wu (Anhui University of Techonolgy, P.R. China); Fang Zhou (Anhui University of Technology, P.R. China)

In this paper, an optimized grey forecasting model with quadratic time-varying parameters is put forward, in which the formula to improve the background value of the traditional grey NGM(1,1,k2) model is deduced and a new kind of adaptive parameter optimized by PSO is introduced. Experimental results have shown the practicality and effectiveness of the presented optimization model.

Accurate Object Detection of Electric Power Equipment Based on CapsNet Framework 97

Li Wang and Fang Zhou (Anhui University of Technology, P.R. China)

The automatic inspection of the electric power equipment through computer vision is the critical part of intelligence of the power industry. While the accurate object detection of electric power equipment is the premise of automatic inspection.The best-performing methods are complex ensemble systems that typically combine multiple low-level image features with high-level context. In this paper, we propose a detection algorithm that solve the multiple object detection of electric power equipment once with higher mean average precision (mAP). Our approach ' s key insight is: we apply CapsNet framework to classify the region proposals in order to localize and segment object. Instead of CNN, we use capsules with dynamic routing to classify the features extracted compare to RCNN. We find that this method outperforms the RCNN with samples not large and retain more direction relationships between the

different parts of the objects.

A Novel Reservation Approach for Smart Parking System 99

Jiazao Lin and Jimin Wang (Peking University, P.R. China); Guilin Chen (Chuzhou University, P.R. China)

It is difficult for drivers to find a parking space in most urban areas, especially during the peak hours. The difficulty emerges from not knowing whether there are available parking spaces at the time at the destination; even though known, numerous drivers may seek for very limited parking spaces to cause serious traffic problem. Therefore, we proposed a novel Reservation Approach for smart parking system, by integrating the mobile device application and Internet of Thing technology, as well as their related models and methodologies. Our solution is to design a novel reservation based on multi-objective approach as part of user-targeted service to facilitate drivers in finding and reserving a free parking space indeed. Finally, we conduct a real-world case in the central areas of Jiaxing to show our proposal is feasibility.

Aircraft Group Recognition Based On Archimedes Spiral 101

Chen Li, Fa Jiang and Mingkai Chen (Nanjing University of Posts and Telecommunications, P.R. China); Lindong Zhao (Nanjing University of Post and Telecommunications, P.R. China); Haie Dou and Lei Wang (Nanjing University of Posts and Telecommunications, P.R. China)

Although the recognition of dense population has already been very mature, the methods and strategies of sparse target groups recognition are still few. The algorithm for identifying sparse populations with graph models is not accurate. In this paper, a sparse group target recognition method based on Archimedes spiral is proposed, which has rotation invariance and scale invariance, so the recognition accuracy is greatly improved. At the same time, a similarity measure method based on probability density function and loss function is presented. In terms of identifying aircraft groups, accuracy is greatly improved compared to other methods.

On the Layer Choice of the Image Style Transfer Using Convolutional Neural Networks 103

Pei-Ying Lee and Chien-Cheng Tseng (National Kaohsiung University of Science and Technology, Taiwan)

In this paper, the layer choices of the image style transfer method using the VGG-19 neural network are studied. The VGG-19 network is used to extract the feature maps which have their implicit meaning as a learning basis. If the layers for stylistic learning are not suitably chosen, the quality of style transferred image may not look good. After making experiments, it can be observed that the color information is concentrated on lower layers from conv1-1 to conv2-2, and texture information is concentrated on the middle layers from conv3-1 to conv4-4. As to the higher layers from conv5-1 to conv5-4, they seem to be able to depict image content well. Based on these observations, the methods of color transfer, texture transfer and style transfer are presented and make comparisons with conventional methods.

A Method for Delivery of IP-based Broadcast Stream over Cable TV Network 105

Joon-Young Jung (ETRI, Korea); Sang-Jung Ra (Electonics and Telecommunications Research Institute, Korea); Han-Jae Im (Huton Co. Ltd, Korea)

This paper presents a method for transmitting IP-based broadcast stream, a transport layer protocol of ATSC 3.0 standard adopted as terrestrial UHDTV broadcasting standard, in existing cable broadcasting network without conversion or modification. In addition to re-transmitting the terrestrial UHDTV service to the cable network, the cable broadcasting system uses IP-based broadcasting stream as the transport layer protocol of L2 or higher without changing the transmission method of the physical layer in order to accommodate various IP-based TV services.

A Multi-dimensional Dataset Construction Strategy for Scratch 107

Cong Peng, Yan Sun and Wei Ren (Beijing University of Posts and Telecommunications, P.R. China)

Scratch is a widely used visual programming language in education field. However, the current dataset about Scratch is coarse and incomplete, which incurs the poor analysis results. In this paper, we propose a multi-dimensional dataset construction strategy to resolve this problem. It mainly includes the user and project data, which are extracted from the Scratch platform. Additionally, we utilize Scratch Analysis Tool to obtain the computing thinking scores and static data. Then a multidimensional data model is devised to store the required data. Finally, the experimental results show our strategy can provide the effective data basis for programming research, and further facilitate the computer education.

A New Evaluation Metrics for Block-based Python Code 109

Liu Zheng, Hong Luo and Xiaolin Chai (Beijing University of Posts and Telecommunications, P.R. China)

The programming education for the students set off a global enthusiasm. The Block-Python programming tools can fill the gap from block-based programming to language coding. However, there is little work focus on the evaluation metrics for block-based python code. The past block-oriented evaluation metrics based on Computational Thinking (CT) were not language-oriented, and program volume was often ignored. In this paper, we propose a new evaluation metrics for block-based python code, which combines the CT dimensions and program volume. The experimental results show that the correlations between the proposed metrics and Halstead, McCabe complexity algorithms are both above 0.7, which is higher than Dr.Scratch.

A Pattern Similarity-based User Behavior Analysis System for Scratch 111

Pai Liu (Beijing University Of Posts and Telecommunications, P.R. China); Yan Sun and Wei Ren (Beijing University of Posts and Telecommunications, P.R. China)

Scratch is a visual programming language used by youth and has received widespread attention of education field. Different from the process data in a project, the time series data (TSD) is comprised by the multiple projects of a user from a longer time span, which contributes to the analysis of user behavior patterns and improvement of programming habits. However, there is little work focusing on this field. In this paper, we first design a prototype system collecting and processing TSD from Scratch platform. Then an analysis scheme based on pattern similarity is proposed to obtain user behavior patterns and differences. Additionally, we summarize their common type and characteristics through clustering. Finally, the experimental results demonstrate the feasibility and effectiveness of our claim.

Research on Extracting Named Entities in Software Engineering Field from Wiki Webpage 113

JiaPei Guo, Hong Luo and Yan Sun (Beijing University of Posts and Telecommunications, P.R. China)

Extracting entity concepts from wiki pages is a common way of entity recognition. The common methods for named entity recognition are based on Conditional Random Field (CRF) and rules, such as Harvesting Domain Specific Knowledge Graph from Content of Webpages (HDSKG). However, the features of entity concepts and term phrases in the field of software engineering are not fully considered in HDSKG. To solve the problem, we propose a more efficient algorithm. We first use the webpage title to construct the domain dictionary, and then design the regular rules according to the entity concept features in the software engineering field. Next, the domain dictionary is used to improve the NP chunks in the chunking process. The experimental results show that compared with HDSKG, the proposed algorithm has a significant improvement in the number of entities, accuracy, precision and recall rate.

A New Automatic Prediction System of Optimal Machine Learning Algorithm for Text Classification 115

GuanYi Huang, Hong Luo and Yan Sun (Beijing University of Posts and Telecommunications, P.R. China)

Machine learning is an important research area of artificial intelligence application technology. It has also become a hot spot in science, technology, engineering and mathematics (STEM) education. For beginners, it is crucial to select a training algorithm with high accuracy. This paper first proposes a method for processing data sets by using term frequency-inverse document frequency technology (TF-IDF). Then, we analyze the matching relationship between different model training sets and algorithms. Additionally, a training method is given to obtain the automatic prediction model with high accuracy. This model implements the automatic matching process from training set to training algorithm. Finally, we prove the availability of this method by analyzing the experimental results.

A High-availability Data Backup Strategy for IPFS 117

LinFei Shi (Beijing University of Posts and Telecommunications, P.R. China); Hong Luo, XueMei Yang and Yan Sun (Beijing University of Posts and Telecommunications, P.R. China)

The InterPlanetary File System (IPFS) is a peer-to-peer distributed file system. It can greatly reduce the cost of data storage and improve the performance of data download. Currently, the IPFS-based distributed storage systems mostly uses the centralized backup mechanism. Although it can provide high data availability, centralized nodes will be single fault peer and become the bottleneck of system performance. This paper proposes a high-availability data backup strategy based on QoS and interest of IPFS nodes. Compared with the existing methods, the experimental results demonstrate that our proposed strategy is more effective and practical.

Inferring Student's Attention in a Machine Learning Approach: A Feasibility Study 119

Jiachun Li, Xiong Zhang, Ruiqi Li, Yuting Zhou, Junlin Xian and Xiaojun Hei (Huazhong University of Science and Technology, P.R. China)

It is important that students learn with full attention. In this paper, we propose a multi-modal teaching assistant system for smart classroom, which may capture and analyze the video and audio of student's learning process. We design and implement a machine learning algorithm to infer student's attention in order to effectively help the teacher to facilitate appropriate learning activities. Such capacity may also help achieve personalized learning recommendation for students. Our preliminary study demonstrate the feasibility of this multi-modal inference of attention in order to develop effective learning analytic towards formative assessment.

Session B1: Biomedical Circuits and Systems Design for Wearable Device

Room: evergreen hall i

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

10:50 ***A wearable multi-lead ECG signal acquisition device 121***

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

In this study, a multi-lead wearable ECG signal device is designed, which can simultaneously acquire the electrocardiograms of three leads (I, II, and V1) and be placed on the human body by ECG test clothing. To meet the low power requirements of wearable devices, the hardware and software are designed at the same time. Results show that the ECG waveforms collected by this device are clear, and each waveform is complete. When the low power design on the device is implemented, the power consumption of the entire device decreases by 31%.

11:05 ***A Delta-Sigma ADC Design for a Wearable ECG Application 123***

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

The study proposed a switched-capacitor delta-sigma modulator with single-loop and third-order structures for wearable electrocardiogram acquisition device for low-power and high-precision applications. Several techniques, including chain of integrators with weighted feedforward structure, gain-enhanced current-mirror push-pull operational transconductance amplifier, and dynamic comparator with a set-reset latch are adopted to improve the signal-to-noise ratio (SNR) and reduce the power consumption. Simulation results shows that the SNR and the corresponding effective number of bits are 104.2 dB and 17.02 bits, respectively, which fulfill the requirements of an presented system. The circuit will be fabricated by the SMIC using a 0.18 μm general purpose process in the near future.

11:20 ***Wearable Shoulder Periarthritis Photon Therapy Device 125***

Xuedan Pei and Kai Zhang (Beijing Institute of Technology Zhuhai, P.R. China); Wang LiLi (BeiJing Institute of Technology, ZhuHai, P.R. China); Yu Wulong (Beijing Institute of Technology, Zhuhai, P.R. China)

This paper describes the development of a wearable device for the treatment of shoulder periarthritis based on near-infrared light stimulating the

acupuncture points on frozen shoulder. Study includes related pathology of frozen shoulder, the key points in treatment, near-infrared wave length selection, and the design of hardware and software systems. Intel 8051 microprocessor is used as the main control unit in this wearable periarthritis photon therapy device.

11:35 ***Research on Blood Oxygen Saturation Measurment System Based on Reflective Signal*** ***127***

Xuedan Pei and Kai Zhang (Beijing Institute of Technology Zhuhai, P.R. China); Wang LiLi (BeiJing Institute of Technology, ZhuHai, P.R. China); Yujie Fang (Beijing Institute of Technology & Beijing Institute of Technology Zhuhai, P.R. China); Shufen Chen (Beijing Institute of Technology Zhuhai, P.R. China)

This project designs a reflective oxygen saturation measurement system based on microprocessor STM32F103, which controls peripheral module circuit. It is portable and reliable. The sensor MAX30100 collects the signal and converts it into data for processing. The algorithms are developed with Keil platform. This reflective oxygen saturation measurement system uses red (600-750 nm) and infrared (850-1000 nm) wavelength of light to meet the requirements for accurate measurement.

11:50 ***Perceiving the World with Hearing in Virtual Reality*** ***129***

Chi Wang and Chien-Wen Cheng (National Taipei University of Technology, Taiwan)

Although vision is usually considered to be the most important of the five senses, sound design of an inferior quality may still heavily influence a user's feeling of presence in virtual reality. In this study, a 3D sound system for virtual reality based on ambisonics was built to explore the influence of audio upon users' feeling of presence in a virtual reality environment. The research participants wore an HTC Vive device with a two-channel headset to perceive the virtual reality. They were asked to identify the location and the origin of a detected sound in terms of direction and distance and to perceive the size of a space through hearing. For comparison, visual hints were provided to determine whether they affect the participants' audio perception. The results of the experiment are analyzed to provide practical suggestions on interactive sound system design for virtual reality games or training systems in scenarios where hearing is crucial.

Session B2: Computer Networks, Sensor Technologies and Intelligent Signal Processing-II

Room: river hall

Chairs: Hsin-Hung Cho (National Ilan University, Taiwan), Hai Wu Lee (Huaiyin Institute of Technology, P.R. China)

10:50 ***Design and Implementation of a SAS Conformance Test Tool for 5G Citizens Broadband Radio Service (CBRS)*** ***131***

Whai-En Chen and Xiang-Yuan Fan (National Ilan University, Taiwan)

With 5G deployment, the enhanced broadband services and massive Internet of Things (IoT) devices requires larger bandwidth. To response this requirement, the US government proposes a Citizens Broadband Radio Service (CBRS). The CBRS spectrum contains a 150 MHz band ranging from 3550 MHz to 3700 MHz. Through spectrum sharing, mobile operators can utilize the CBRS spectrum to provide 5G mobile broadband services (AR/VR) or IoT services. The Spectrum Access Server (SAS) is one of the most important components in CBRS. The SAS manages the requests from the CBRS devices (CBSD) and assigns the CBRS spectrum to the authorized CBSDs. To verify whether the SAS development can conform to the CBRS standards, this paper develop a conformance test tool to examine the CBRS interface and operation of SAS.

11:05 ***Target Tracking in Small-Cell Mobile Networks*** ***133***

Chin-Der Wann and Tsu-Hsiang Ni (National Kaohsiung University of Science and Technology, Taiwan)

In this paper, we present the positioning schemes for the LTE small-cell mobile networks. Along with the development of next generation mobile communication network, the application of small-cell has become an important issue in cellular mobile networks. The accuracy of target positioning and location can be improved efficiently through small-cell mobile network. We use the observed time difference of arrival (OTDOA) positioning scheme to build cellular base station networks based on the Long Term Evolution (LTE) mobile communication network. The effects of geometric dilution of precision (GDOP) for OTDOA positioning and target tracking performance by using Kalman filtering were investigated. Computer simulation results of two different layouts of eNodeBs, staggered and non-staggered layout methods were included in our work.

11:20 ***Study on the Computer Vision of the Biped Robot for Stable Walking on the Stairs*** ***135***

Hai Wu Lee and Ce Wang (Huaiyin Institute of Technology, P.R. China); Bing-Yuh Lu (Tungnan University, Taiwan)

With the social change and scientific progress, artificial intelligence technology has developed rapidly. Robots have gradually entered people's lives. Biped robots are widely used in some environments with high degree of danger and complex terrain. This thesis mainly studies the biped robot to move up and down stairs in the stair environment combined with image processing technology. It is mainly divided into three steps: 1. Gray level co-occurrence matrix method is used to obtain the texture features of stairs to distinguish whether to go up or down stairs; 2. Canny edge detection operator is adopted to obtain a clear stair edge image; 3. The camera is calibrated by Zhang's calibration method to obtain the world coordinate system at the same time, and then the distance between the stairs and the camera is measured by corresponding equations.

Session B3: Network Design, Management and Control for Consumer Communications

Room: peak hall

Chairs: Yu-Cheng Fan (National Taipei University of Technology, Taiwan), Kazuhiko Kinoshita (Tokushima University, Japan)

10:50 ***On the simplification of multi-focus image fusion using dictionary-based sparse representation 137***

Chienan Lin (National Chung Hsing University, Taiwan)

This paper proposes a fast implementation for multi-focus image fusion using dictionary-based sparse representation. The proposed method reduces the computation complexity of the method in [1] by synthesizing feature signals from the trained sparse coefficient feature vectors for classifying each pixel in a source image as focused or defocused, which help remove the computation of the OMP algorithm in [1]. As a result, the complexity of the propose method can be only 1/100 of [1]. Simulation results further demonstrate that the fused image of the proposed method has the same quality as that of [1].

11:05 ***QoS Control for Various Applications in ZigBee/Wi-Fi Coexistent Environment 139***

Taisho Ugai and Kazuhiko Kinoshita (Tokushima University, Japan)

In recent years, along with the development of short-distance wireless communication technology, IoT has spread rapidly Consequently, the opportunity to use ZigBee, is increasing. Since ZigBee and Wi-Fi are used in the same 2.4-GHz band, interference increases with frequent usage increases. In this paper, we propose a method that satisfies the requirement by determining the request to be achieved for each application of ZigBee and controlling the time during which ZigBee can communicate with Wi-Fi.

11:20 ***A Routing Method for Time-constrained File Transfer in Wireless Mesh Networks 141***

Yuki Uemoto and Kazuhiko Kinoshita (Tokushima University, Japan)

In recent years, the number of requests to transfer files through networks are increasing, and the file capacities is also getting larger. These requests are generally processed with the best effort, and depending on the network situation. On the other hand, a model is considered when a file transfer is completed by a specified deadline, and a request that cannot be completed by the deadline is rejected. Wireless mesh networks are expected to be a system that can provide disaster information without depending on communication infrastructure during a disaster. When using wireless networks, however, the communication environment becomes unstable compared with wired networks and more requests will be rejected. In order to reduce the number of rejected requests, it is important to find more efficient routes. In this paper, we propose a routing method for such a time- constrained file transfer in wireless mesh networks.

11:35 ***A Channel Assignment Method for Wireless Mesh Networks in Disaster Situation 143***

Kohki Ikeda and Kazuhiko Kinoshita (Tokushima University, Japan)

In recent years, a wireless mesh network (WMN) capable of connecting a plurality of access points and deploying a wide range of networks has garnered particular attention. In this paper, we focus on WMN for disaster use and propose a channel assignment method to improve the average throughput, so that each user communicate fairly.

11:50 ***High Precision Canthus Alignment for Visible-Spectrum Gaze Tracking System 145***

Wen-Chung Kao, Jyun-Yi Li, Shao-Ching Lin and Yi-Chin Chiu (National Taiwan Normal University, Taiwan)

The visible-spectrum gaze tracker gains the advantages of good user experience and makes superior usability of consumer electronics applications. Still, the system accuracy as well as the precision of the gaze tracker appears to highly depend on the accuracy of the eye position. This paper addresses the issues of eye alignment and presents a robust algorithm for positioning the inner eye corners.

Session B4: Circuits and Systems for Intelligent Sensors

Room: pine hall

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

10:50 ***Design of A 0.8GHz-3GHz Duty-Cycle Corrector With a 20%-80% Input Duty Cycle 147***

Chien-Yu Lin (Feng Chia University, Taiwan)

An analog duty cycle correction circuit using a novel pulse-width modification cell. We correct the duty-cycle by changing the phase of the voltage. Our calibration allows the input duty cycle to range from 20% to 80%, and the circuit corrects the duty cycle to 50%. The proposed circuit operation frequency is at 0.8GHz to 3GHz, and it correctes to less than 1% error. The duty-cycle correction circuit is implemented in a 1.8V, and 180nm CMOS technology at 25°C.

11:05 ***Settling Time Enhancement of Output Capacitor-Less Low-Dropout Regulator 149***

Po-Yu Kuo and Ting-Yao Gao (National Yunlin University of Science & Technology, Taiwan)

An output capacitor-less (OCL) low-dropout regulator (LDO) with a buffer and a slew-rate enhancement (SRE) circuit. By using the proposed SRE circuit, the transient response can be improved. Moreover, the circuit stability can also be enhanced. The proposed voltage regulator was simulated by Spice simulation tool with a 5V power supply. From the simulation results, the proposed regulator provides a maximum load current of 1000 mA. The proposed regulator can achieve 433.01ns settling time.

11:20 ***Capacitive digital-to-analog converter for low-power SAR ADCs 151***

Chi-Chang Lu and Sheng-Yan Lai (National Formosa University, Taiwan)

A low-energy and area-efficient capacitor switching scheme for a successive approximation register analog-to-digital converters is proposed. The switching scheme employs the reference voltage Vaq for the least significant bit conversion. Compared with conventional architecture, the average switching and the total capacitance can be reduced by 99.42% and 87.5%, respectively.

11:35 *Pesticide Residue Testing System for Fruits and Vegetables by Color Identification Technology 153*

Fuh-Shyang Juang, Chang-Chi Lee, Yu-Sung Liu, Chun Hsiang Tseng, Jeng-Yue Chen, Yung-Ying Chang and Hung-Chih Hsu (National Formosa University, Taiwan)

This paper uses color identification technology to construct a pesticide residue testing system for fruits and vegetables, which can not only reduce testing costs but also shorten the testing time. The proposed system consists of citing the Acetylcholinesterase (AChe) pesticide testing method, applying Raspberry Pi 3B and network camera to conduct color identification processing on the color changing rate of the chemical reaction of the pesticide test solution under the compiler of QT Creator, and then converting the pesticide concentration. We then converted RGB color values corresponding to each pixel on camera images. In the absence of a pesticide, the test solution is dark yellow with RGB values of (255, 255, 0); when a pesticide is present, the test solution is light yellow with RGB values of (255, 255, 200), with changes in the blue value being the most significant. Therefore, the software specifically records and analyzes the change of the blue value with the reaction time during color identification. Then we calculate the integral area of the blue value variation curve over time to convert the pesticide concentration residue, thus achieving a quick and low-cost pesticide residue testing target.

11:50 *Low EMI Boost Converter with a Ringing Killer 155*

Hou-Ming Chen, Kuang-Hao Lin and Yong-Xin Lin (National Formosa University, Taiwan)

This paper presents a ringing killer for boost converter. The proposed ringing killer adopted a p-channel transistor between the inductance L and high-side switch to eliminate the ringing effect when a reverse current flows into the inductor L in the DCM operation. The proposed boost converter with a ringing killer has been designed and implemented using standard TSMC 0.18 μm 1P6M CMOS technology. In the measurements, the proposed ringing killer can eliminate the ringing effect at the DCM operations. Additionally, the proposed boost converter can regulate a 1.2 V supply to 1.8 V at a 50 mA load current and has 93 % power efficiency.

12:05 *Automatic Guided Vehicle with Artificial Intelligence Navigation 157*

Kuang-Hao Lin and Hou-Ming Chen (National Formosa University, Taiwan); GuanJin Li (National Formasa University, Taiwan); Jing-Chen Tu and Ssu-Shun Huang (National Formosa University, Taiwan)

This paper presents an automatic guided vehicle with artificial intelligence navigation. To realize the automation of the assemble line, goods are handled using a robot with a magnetic tape wheel. However, the robot stops by misjudgment if the magnetic tape is broken. Moreover, the robot cannot change its route when it encounters obstacles. Therefore, we investigate the application of the divergence wheeled robot in a factory to smooth in crowd.

Session B5: Technology and Application of Internet of Things- II

Room: orchid hall

Chair: Dapeng Li (Nanjing University of Posts and Telecommunications, P.R. China)

10:50 *Energy-Efficient Offloading and Resource Allocation for Multi-Access Edge Computing 159*

Zhiqian Xu, Yao Zhang, Xu Qiao, Haotong Cao and Longxiang Yang (Nanjing University of Posts and Telecommunications, P.R. China)

Multi-access edge computing (MEC), one of the key technologies of 5G, offloads the computing tasks generated by smart devices to MEC servers. Compared with traditional centralized cloud computing, MEC can significantly reduce the delays in the transmission and data exchange process, and relieve the computational burden of the core network (CN) server. In order to minimize the weighted total energy and time consumption under delay requirements, this paper presents a strategy which can offload the computing task from user to MEC server and CN server. Moreover, a priority-based joint calculation offloading algorithm is proposed to figure out the resource allocation problem. In particular, the proposed algorithm sets a priority for each user, and the user with high priority can preferentially select a channel with high transmission quality. The simulation results indicate that the total cost of the proposed algorithm is reduced by 50 percent, compared with the local computing.

11:05 *Power Control Strategy for User-Centric in Cell-Free Massive MIMO 161*

Yan Li, Yao Zhang and Longxiang Yang (Nanjing University of Posts and Telecommunications, P.R. China)

Cell-free (CF) massive multiple-input multiple-output (MIMO) system is a promising technology for 5G , where each mobile station (MS) is simultaneously served by all access points (APs). However, early research shows that only a fraction of APs are contributing in providing service for a MS. In this paper, we consider a user-centric (UC) approach for CF massive MIMO, where each AP only serves a limit number of MSs. We introduce a strategy to assign served MSs for each AP. Then a power control algorithm based on the assignment are proposed.

11:20 *Max-Min Fairness for Uplink Massive MIMO Systems with Low-Resolution ADC 163*

Meng Zhou, Yao Zhang, Haotong Cao, Dong Hu and Longxiang Yang (Nanjing University of Posts and Telecommunications, P.R. China)

In order to ensure uniformly good service for uplink massive multi-input multi-output (MIMO) systems with low-resolution analog-to-digital converter (ADC), in this paper, a max-min fairness power allocation algorithm is proposed. The uplink spectral efficiency expression is first derived, and we convert the original optimization problem into a standard geometric programming (GP). Numerical results show that our proposed algorithm can guarantee the egalitarianism to all users.

11:35 *Hybrid Precoders and Combiners for Sub-Connected and Fully Connected Structures 165*

Xu Qiao, Yao Zhang, Haotong Cao, Zhiqian Xu and Longxiang Yang (Nanjing University of Posts and Telecommunications, P.R. China)

In Massive Multiple-Input Multiple-Output (MIMO) systems, the hybrid beamforming (BF) has been put forward to reduce the high implementation cost and energy consumption resulted from the tremendous requirements of dedicated Radio Frequency (RF) chains. This paper aims at to design hybrid analog and digital precoders (combiners) for sub-connected and fully connected structures. In order to minimize the Euclidean distance between the optimal precoding matrix and products of analog and digital precoding matrices, an alternating optimization method and a method for maximizing signal power are exploited. Then, based on Linear Minimum Mean Square Error (LMMSE) combiner, the same method is introduced to find the hybrid combiner. Simulation results demonstrate the proposed optimization algorithm 1 has a fast convergence rate, and the proposed hybrid BF method for sub-connected structure outperforms the case for fully connected structure.

11:50 ***Design of Intelligent Ward Monitoring System with LoRa 167***

Chaoban Chen and Yongan Guo (Nanjing University of Posts and Telecommunications, P.R. China)

Aiming at the low efficiency and high cost of traditional wired ward medical monitoring system, a real-time remote monitoring system for ward environment based on LoRa communication module was designed. In the monitoring area of the ward, the system uses sensors to measure key information in the monitoring area, such as temperature and humidity, infusion progress, patient vital signs parameters, etc., and transmits data to the terminal control system through an advanced LoRa communication wireless network. The system makes a judgment and performs effective processing at the same time.

12:05 ***Spectrum Occupancy Prediction for Internet of Things via Long Short-Term Memory 169***

Haoyu Li, Xiaojin Ding, Yiguang Yang, Xiaogu Huang and Gengxin Zhang (Nanjing University of Posts and Telecommunications, P.R. China)

With the development of Internet of things (IoT), the demand on spectrum is increasing rapidly. Moreover, due to lack of power and the feature of short burst, the signals of IoT may be transmitted relying on accessing the idle spectrum, leading to a higher successful transmitting probability. Thus, the spectrum should be allocated in advance for the ongoing terminals of IoT. In this paper, a long short-term memory aided spectrum-prediction (LSTMSP) scheme has been conceived by analyzing the relationships between time and frequency of historical spectrum data. Performance evaluations on real-world spectrum data show that the accuracy of the spectrum occupancy prediction is above 0.7, demonstrating the benefits of the conceived LSTMSP method.

Session B6: IoT Applications and Technologies- II

Room: bamboo hall

Chairs: Chih-Yung Chang (Tamkang University, Taiwan), Wen-Hwa Liao (Tatung University, Taiwan)

10:50 ***Development of Device Description for HART Field Device 171***

Yun-Shuai Yu (National Formosa University, Taiwan); Chun-Hung Chen and Kelvin Cheng (FineTek Co., Ltd., Taiwan)

It is estimated that over 40 million field devices supporting HART (Highway Addressable Remote Transducer) protocol are installed worldwide. Many controllers require suitable device descriptions (DDs) to communicate with HART field devices. This paper introduces a general developing process of a DD for a HART field device. We validate the DD via simulations. The test results prove that our DD can not only read the measurements form the field device but also write configuration data to the field device.

11:05 ***Design and Implementation of Capacity Control Display System with Tilt Vibration Sensor 173***

Hsin-Yu Huang, Yong-Yi Fanjiang, Chi-Huang Hung and Yi-Shiun Lee (Fu Jen Catholic University, Taiwan)

This paper proposes a new design of capacity control display system with tilt vibration sensor. The system contains 4 tiling arrays, data collect and transmission unit (DCTU), real time display. The tiling arrays are used to collect personnel stepping data on the sensing array. The MCU inside the DCTU calculate the step data and get the direction of the person through foot state analysis. The system count incoming and outgoing personnel. Finally, MCU transmits the data to the cloud database for the administrator to read. That information will show the real time display.

11:20 ***A Koji Temperature Monitoring System 175***

Yui Uehara (Graduate School of Engineering, Oita University, Japan); Satoshi Ohtake (Oita University, Japan); Takayuki Karyu (Bungomeijyo Co., LTD, Japan)

This paper proposes a temperature monitoring system as an IoT application. The system is designed for temperature monitoring of koji which is an important material for sake, Japanese rice wine, brewing and investigating of brewing environment. The system has been installed in a brewery and is being used to monitor temperature of koji from steamed rice and koji mold. The communication in the system is done with LTE network provided as a demonstration experiment of SINET Wide Area Data Collection Infrastructure. We demonstrate that koji temperature transition can be observed in real time and logged by the system.

11:35 ***A Study on DRX Mechanism for Wireless Powered LTE-Enabled IoT devices 177***

Diptendu Sinha Roy (National Institute of Technology Meghalaya, India)

Long Term Evolution (LTE) networks enabled Internet of Things (IoT) devices are characterized by limited lifetime since they are battery powered and power hungry services. Recently, researchers have come up with Wireless Power Charging (WPC) mechanism that harvest energy from received radio frequency power for extending battery lifetime of IoT devices. However, existing Discontinous Reception (DRX) mechanism is not tailored for the advantages of WPC and configure the DRX based on limited battery energies and WPC. Therefore, in this paper, we propose mathematical model and analysis of the DRX mechanism of LTE-enabled IoT devices based on fixed WPC.

11:50 ***The development of IoT-based non-obstructive monitoring system for human's sleep monitoring 179***

Satetha Siyang (Mahidol University, Thailand); Shongpun Lokavee (Materials Science and Engineering Programme, Thailand); Teerakiat Kerdcharoen (Mahidol University, Thailand)

During the past few years, the Internet of Things (IoT) has unprecedentedly become a buzz word in most areas of business and industry. In this paper, we have developed an IoT solution for human's sleep monitoring based on a data pillow system over the internet via 3G/4G LTE or internet router. A private java application server displays the sleeping information via graphs and widgets together with Node-Red which is a platform on Android and iOS mobile apps. To observe sleep information, we have adopted force sensitive resistors (FSRs) installed under the pillow for collecting breathing data. A small single board computer, LattePanda, was used as a data acquisition and management system. Initial test results showed that the data pillow successfully to upload sleep data to the server smoothly. The analysis of raw sleep data shows that the IoT data pillow can be detecting difference breathing signals between normal respiration, hypopnea, and apnea. The integration of sensors, wireless technology, and IoT could improve the data pillow system in terms of facilitating the users to measure their own sleep quality at home while the doctor can access to sleep data of patients over the internet.

Session B7: Smart Information Retrieval (SIR) and Smart Multimedia Technologies- II

Room: sky hall

Chair: Jieh-ren Chang (National Ilan University, Taiwan)

10:50 ***Binary Relevance Model for Activity Recognition in Home Environment using Ambient Sensors 181***

Manan Jethanandani (The LNM Institute of Information Technology, India); Thinagaran Perumal (University Putra Malaysia & IEEE Consumer Electronics Society, Malaysia); Yuh-Ching Liaw and Jieh-ren Chang (National Ilan University, Taiwan); Abhishek Sharma (The LNM Institute of Information Technology, India); Yipeng Bao (National Ilan University, P.R. China)

One of the most important applications of the smart home environment is health monitoring and assistance by analyzing activities of daily living and here Human Activity Recognition (HAR) plays a major role. The HAR problem, basically a temporal classification problem has been modelled in the past with various methods such as Bayesian Networks, Hidden Markov Model, Conditional Random Field, etc. Here, we propose the Binary Relevance Method of the multi-label classification to tackle the multi-resident activity recognition problem on real world dataset. Through the results obtained by the evaluation metrics namely accuracy, precision and hamming loss, it can be inferred that the model not only computes competitive results to previous works but also signifies the importance of the baseline Binary Relevance method to solve multi-label problems.

11:05 ***Multi-Resident Activity Recognition using Multi-Label Classification in Ambient Sensing Smart Homes 183***

Manan Jethanandani (The LNM Institute of Information Technology, India); Thinagaran Perumal (University Putra Malaysia & IEEE Consumer Electronics Society, Malaysia); Jieh-ren Chang (National Ilan University, Taiwan); Abhishek Sharma (The LNM Institute of Information Technology, India); Yipeng Bao (National Ilan University, P.R. China)

Activity recognition in smart home environment using wireless ambient sensing is a well-known problem that is being researched very actively. Rapid development in the sensing technologies has made human activity recognition very important for various fields such as health care, home monitoring, surveillance, etc. In this paper, we describe the use of Classifier Chain method of the Multi-Label Classification approach to tackle the task of multi-resident activity recognition. We evaluate the developed model of Classifier Chain with K-Nearest Neighbor as base classifier on real world ARAS dataset which consists of two smart homes with evaluation metrics such as accuracy, precision and hamming loss. Through results, it can be inferred that Classifier Chain method successfully caters the problem of multi-resident activity recognition taking into consideration underlying label dependencies.

11:20 ***The Willingness of Information Exchange on Social Media Environment 185***

Jui Hsiang Lee (China University of Technology, Taiwan)

Social media has become an attractive platform for users to exchange ACG information with others. The social media platforms online for ACG creative artifact work sharing supports artists at every level by offering a range of services to connect, inform, educate and promote digital artists worldwide together. However, little research has been done to identify the determinants of ACG information exchange on social media environment. By integrating aspects of users' satisfaction and perceived interactivity, this study proposes a research model to investigate the antecedents of users' willingness on ACG information exchange in social media.

11:35 ***An adaptive authentication based on Reinforcement learning 187***

Ziqi Cui, Yongxiang Zhao and Chunxi Li (Beijing Jiaotong University, P.R. China); Qi Zuo and Haipeng Zhang (Beijing Computing Center, P.R. China)

People require different authentication confidence when doing different amount of online commercial transfer. This inspired us that we should use different combination of authentication method adaptively according to different level of authentication confidence requirements. This paper propose an adaptive multi-factor authentication based on reinforcement learning to realize this function. Numerical result shows our scheme can reduce the authentication cost while satisfying authentication confidence.

11:50 ***User Review based Rating for E-Commerce Platform 189***

Wei Wang, Chunxi Li, Yongxiang Zhao and Xin Meng (Beijing Jiaotong University, P.R. China); Baoxian Zhang (University of Chinese Academy of Sciences, P.R. China)

A typical e-commerce platform has too many similar items for sale, making it difficult for customers to choose from. User reviews left by previous buyers are worth reading to help customers make purchase choices. However, due to the large number of reviews, users cannot read all reviews to extract real useful information. In this paper, we propose a user review driven rating system, which is designed for Tmall, a famous Chinese e-commerce platform, to help customers to understand the differences among similar items for finding a satisfactory one. Numerical result demonstrates that, on average, aggregated score calculated by our rating system for items is as efficient as the score given by Tmall, while our rating can differentiate items at much finer granularity by the computed multi-dimension scores.

12:05 *Cross-Platform Measurement on Ad Exchanges 191*

Chenyue Zhang, Chunxi Li, Yongxiang Zhao and Nanxi Huang (Beijing Jiaotong University, P.R. China); Baoxian Zhang (University of Chinese Academy of Sciences, P.R. China)

As a key component of online advertising ecosystem, Ad exchange platform (ADX) has been studied extensively. However, existing work is mainly for studying individual ADX platform, and they are not suitable for measuring and comparing the performance of different ADXs. A challenge for comparing the performance of multiple ADXs is as follows: How to enable different ADXs to acquire the same piece of information from a same user, such that we can accurately compare their performance according to the ads they delivered to the same user. For this purpose, in this paper, we propose a parallel cross-platform measurement method, which creates a user (a virtual role) to access the webpages jointly monitored by different ADXs to enable these ADXs to acquire the user-profile from the same user. We collect ads that the ADXs deliver to same user, and compare their ad targeting performance based on these ads. The results validate the efficiency of our proposed method.

Monday, May 20 12:20 - 13:00

Lunch
(Lunch Area)

Monday, May 20 13:00 - 14:00

Session C2: Software-Defined Computer and Network Infrastructure

Room: river hall

Chair: Li-Chi Ku (National Center for High-performance Computing, Taiwan)

13:00 *Deploying SDN-IP over Transnational Network Testbed 193*

Hui-Lan Lee, Te-Lung Liu and Min Chen (National Center for High-Performance Computing, Taiwan)

SDN-IP is a promising technology which integrates Software Defined Networks (SDN) and traditional IP networks, so it has the advantages from both side such as the SDN's flexibility and the ubiquity of traditional IP networks. This paper will introduce and exploit features of SDN-IP to implement an inter-domain network testbed and deploy interconnecting architecture among transnational research sites. A measurement was performed to evaluate the performance of the transnational testbed that fulfills the requirements of the SDN-IP network testbed with flexibility, elasticity and convenience.

13:15 *Web UI System of TWAREN High-Speed Data Transfer Network 195*

Ta-Yuan Chou, Che-nan Yang and Li-Chi Ku (National Center for High-performance Computing, Taiwan); Te-Lung Liu (National Center for High-Performance Computing, Taiwan)

This paper demonstrates the construction of a Web UI system of Data Transfer Network (DTN) on TWAREN. On the hardware aspect, via the TWAREN backbone, we connect 6 access nodes for high-speed data transfer through dedicated broadband lines. On the software aspect, we adopt widely-used tools, such as Fast Data Transfer (FDT) and GridFTP so that effective utilization of network bandwidth can be yielded. We also develop a Web UI system for users instead of Command Line Interface (CLI). Using the proposed system, which can be easily studied and operated, users can share research data more efficiently and effectively.

13:30 *ONOS-based System of TWAREN Virtual Dedicated Network Provisioning in Web UI 197*

Ta-Yuan Chou and Jen-Wei Hu (National Center for High-performance Computing, Taiwan); Wun-Yuan Huang (National Applied Research Laboratories - National Center for High-performance Computing, Taiwan); Te-Lung Liu (National Center for High-Performance Computing, Taiwan)

This paper demonstrates an ONOS-based provisioning system of ONOS in Web UI. ONOS, based upon Software Defined Network (SDN), can provide the function of VPLS. Comparing with the previous version of provisioning system developed by the authors, the proposed system can provide more kinds of services. To enhance the original ONOS VPLS CLI, auxiliary information records, and information display, we develop a Web UI provisioning system of ONOS VPLS functions. Network administrators can obtain information very quickly, and input instructions via the GUI instead of CLI so that more effective provisioning can be yielded. Experiment show that the proposed system can work on Mininet and Physical SDN network of TWAREN.

13:45 *The Future Role of P4 in International Research and Education Networks 199*

Li-Chi Ku (National Center for High-performance Computing, Taiwan); Te-Lung Liu (National Center for High-Performance Computing, Taiwan)

Research and education networks have a quite different role than commodity Internet. The special requirement of research and education network leads to unique problems including routing and big data transfers. As a newly emerging technology, P4 show a very promising potential to solve these long lasting problems in research and education networks. This paper introduces the possible P4 roles as a cure to the problems of international research and education network collaborations.

Session C3: Deep Learning for Consumer Electronics

Room: peak hall

Chair: Pao-Ann Hsiung (National Chung Cheng University, Taiwan & Amity University, India)

13:00 ***Anomaly Detection at the IoT Edge using Deep Learning 201***

Darmawan Utomo (Satya Wacana Christian University, Indonesia); Pao-Ann Hsiung (National Chung Cheng University, Taiwan & Amity University, India)

Irregularities in the use of electrical energy could result in failure of power grids and blackouts. Anomaly detection is required not only for ensuring grid safety, but also to prevent illegal hacking. Long-term data are recorded for such anomaly detection. However, due to the nonlinear characteristics of the time series data, correlation regression becomes difficult when using non-deep learning techniques. To address this issue, we use Long-Short Term Memory (LSTM) recurrency techniques. We experiment with two datasets from two different smart meters, which are sampled once every 30 seconds for one month. A total of 120,000 data samples were used for training and 40,000 data samples for testing. From the experiment results, the testing accuracy, True-Positive Rate, and False Positive Rate were 0.92, 0.81, and 0.50, respectively. Further, to demonstrate that the LSTM model can actually be designed at the network edge, we implemented the model and the trained weights on a Raspberry Pi platform. The inference time for each sample was 935 micro-seconds, which is short enough for realizing edge-based anomaly detection.

13:15 ***Intersection Crossing for Autonomous Vehicles based on Deep Reinforcement Learning 203***

Wei-Lun Chen and Kwan-Hung Lee (National Chung Cheng University, Taiwan); Pao-Ann Hsiung (National Chung Cheng University, Taiwan & Amity University, India)

Future intersection crossings for autonomous vehicles will not be controlled by traffic signals, rather a controller will be used for communication among vehicles that need to cross an intersection. In this work, we propose an innovative management system called Deep Reinforcement Learning-based Autonomous Intersection Management (DRLAIM) system, which is the first system to use deep reinforcement learning.We train the system to learn a good intersection control policy by interacting with traffic environment through reinforcement learning. The brake-safe control model is used to ensure the safety of each autonomous vehicle while crossing. Experiment results show that after training using reinforcement learning, the throughput of intersection control model increased by 83%. In comparison with the Fast First Service (FFS) policy, the average waiting time of DRLAIM reduced by about 1.2% to 11.4%.

13:30 ***Personalized ACC System for Smart Vehicles 205***

Trong-Yen Lee, Po-Hsuan Hung, Tsai Ju-Tse and I-An Lin (National Taipei University of Technology, Taiwan)

In this paper, a personalized adaptive cruise control (PACC) system is proposed which can learn driver habit and auto-control the car. In proposed learning mode, the PACC system can be trained by fully connected deep learning algorithm with filtered data. In proposed driving mode, the PACC system can determined the keeping the expected distance by personality. From experimental results show that the mean absolute percentage error (MAPE) is 58% based on the proposed default mode, and could be reduced to 21% after training by the driver's data.

Session C4: Deep Learning in Multimeida Processing

Room: pine hall

Chairs: Jeih-weih Hung (National Chi Nan University, Taiwan), Pei-Jun Lee (National Chi Nan University, Taiwan)

13:00 ***An evaluation study of modulation-domain wavelet denoising method by alleviating different sub-band portions for speech enhancement 207***

Jian-Yu Lin, Yan-Tong Chen, Kuan-Yi Liu and Jeih-weih Hung (National Chi Nan University, Taiwan)

In this study, we investigate and extend the capability of the method of modulation-domain wavelet denoising (ModWD) in speech enhancement primarily analyzing the unequal importance of different sub-band signals. The recently developed ModWD is shown to improve the speech quality in adverse noise environment by processing the magnitude spectrogram of a noisy speech signal with a one-level discrete wavelet transform (DWT) and then alleviating the obtained detailed portion, which is shown more vulnerable to noise. This study follows the idea of ModWD and use a wavelet packet decomposition (WPD) to decompose the magnitude spectral time series into four sub-band sequences at first. Then any of these four sub-band sequences is zeroed out while the other three ones are kept unchanged. Finally, these four sub-band sequences are used to construct the updated spectrogram. The main purpose of the aforementioned procedure is to evaluate the noise-robust capability of the magnitude series at different sub-bands which possess twice (modulation) frequency resolution compared with those used in ModWD. The presented method is conducted on a subset of the Aurora-2 connected digit database, and the speech quality evaluation results in terms of Perceptual Evaluation of Speech Quality (PESQ) scores reveal that diminishing the second highest frequency band (roughly within the range [25 Hz, 37.5 Hz]) gives rise to the optimal performance.

13:15 ***License Plate Recognition System Based on Deep Learning 209***

Tzung-Yan Tsai (National Chung Cheng University, TW, Taiwan); Zhe-Yu Lu and Ching-Chun Huang (National Chung Cheng University, Taiwan)

In this paper, we proposed a license plate recognition system. This system contains two object detection Networks(YOLOv2). When we input a car image, the first network can detect the position of license plates, and the second network can recognize characters from the output of the first part. In the second part, we improve YOLOv2 loss function for recognizing characters. Then the system outputs the predictive plate numbers after post-processing.

13:30 ***Smoothing the acoustic spectral time series of speech signals for noise reduction 211***

Yan-Tong Chen, Jian-Yu Lin, Kuan-Yi Liu and Jeih-weih Hung (National Chi Nan University, Taiwan)

In this study, we propose a novel speech enhancement scenario that applies a low-pass filter to the spectrogram of a noise-corrupted signal along the temporal axis. According to our recently developed method, modulation-domain wavelet denoising (ModWD), the speech quality of noisy utterances can be promoted by alleviating the temporal-domain detail component of the respective spectrogram created by discrete wavelet transform (DWT), which implies the high (modulation) frequency part has little to do with speech quality and is relatively vulnerable to noise. For this reason, this study presents employing the conventional low-pass filter structure, including a moving-average (MV) filter and a median filter, to diminish the aforementioned high modulation frequency components in noise-corrupted spectrogram to see whether the speech quality can be improved. The preliminary experiments conducted on a subset of the Aurora-2 connected digit database show that the presented scenario can provide noisy signals with moderate improvement in speech quality, and the corresponding results are superior to those obtained by ModWD.

13:45 ***Adaptive Histogram Normalization based Loss Function in Deep Learning Algorithm for Face Recognition 213***

Ren-Shin Lin, Pei-Jun Lee and Trong-An Bui (National Chi Nan University, Taiwan)

To improve the recognition accuracy and to solve the over-fitting problem of traditional face recognition methods, this paper proposed an adaptive histogram normalization algorithm to reduce brightness effect in training data and designing loss function. The proposed algorithm can adaptive adjustment training images and inference parameters based on the real-time captured images data. In experimental results, the proposed algorithm has higher accuracy than other algorithms and has higher testing accuracy to improve overfitting.

Session C5: Technology and Application of Internet of Things- III

Room: orchid hall

Chair: Dapeng Li (Nanjing University of Posts and Telecommunications, P.R. China)

13:00 ***LFM-ALS: A Novel IoT Resource Discovery Algorithm Based on Latent Factor Model 215***

Anzhi Wang, Shu Cai, Yongan Guo and Xiaoqing Liu (Nanjing University of Posts and Telecommunications, P.R. China)

Traditional keyword-based "passive" resource searching technology, which is for Internet, is no longer applicable for Internet of Things (IoT) since the number of sensors is skyrocketed. Therefore, this work aims to provide a new formulation for the IoT resource recommendation problem, transform it into a correlation prediction problem based on matrix decomposition, and then solve it by using a latent factor model (LFM). Simulation shows that the proposed algorithm outperforms item-based collaborative filtering algorithm in some aspects.

13:15 ***A Meals Ordering System by Using Augmented Reality Technology 217***

Yi-Shiun Lee, Yong-Yi Fanjiang, Chi-Huang Hung and Hsin-Yu Huang (Fu Jen Catholic University, Taiwan)

This paper describes an ordering system using augmented reality technology. The augmented reality ordering system (AROS) is dividing into two parts: ordering system and meal picking system. The ordering system uses the smart device to display the food picture on the menu by using augmented reality technology. The picking system let consumer use a smart device to take out food from dining cabinet by scan marker. It will reduce the mistake in ordering meal for foreigners, children or seniors who do not understand the country's language.

13:30 ***Performance Evaluation of LTE-R System for Coexisting Macro User and Railway Networks 219***

Jingjing Yan and Dapeng Li (Nanjing University of Posts and Telecommunications, P.R. China); Youyun Xu (Nanjing University of Posts and Telecommunications & Shanghai Jioatong University, P.R. China)

In this paper, performance evaluation and system level simulation have been done for the communication between the base station and train users, macro users. And an improved proportional fair algorithm has been proposed to ensure that train users are prioritized to get the resources and differentiate service priority transmission. By using this algorithm, train users will access to resources first. Under this premise, the service with higher priority will be assigned to resources preferentially. The simulation results show the proposed algorithm can improve the performance of the train users, as well as which of the service with a higher priority by the simulator.

13:45 ***A Review of Research on Security of Cloud Service Platform in Medical Environment 221***

Kun Liu (Nanjing University Of Posts and Telecommunications, P.R. China); Chunling Chen (Nanjing University of Posts and Telecommunications, P.R. China); Jianjun Guo (the First Affiliated Hospital, Nanjing Medical University, P.R. China); Qi Li and Yongan Guo (Nanjing University of Posts and Telecommunications, P.R. China)

This paper analyzes the security threats facing the medical environment from the perspective of cloud service platform and points out related solutions. This paper investigates the latest developments in related algorithms and techniques. The cloud service platform layer mainly uses anonymous authentication and cipher-text policy based on attribute-based encrypted access control to prevent malicious attackers from disguising as users, stealing user identity, and cloud service providers stealing user information and other dangers, and providing user permission revocation

Session C6: Advanced Cryptography and Its Applications

Room: bamboo hall

Chair: Yasuyuki Nogami (Okayama University, Japan)

13:00 ***Boundary for the Linear Complexity of Well Balanced NTU 223***

Yuta Kodera, Takuya Kusaka and Yasuyuki Nogami (Okayama University, Japan)

A pseudorandom sequence has an inseparable role in various types of security applications. Especially, the linear complexity of a sequence is a measure of

the randomness that should be large for secureness of a system. This paper considers the boundary of linear complexity of a geometric sequence called NTU sequence which is generated with a uniformization technique.

13:15 ***A Consideration on Generating Uniform Binary Sequence with High Linear Complexity*** ***225***

Tomoya Tatara, Yuta Kodera, Takuya Kusaka and Yasuyuki Nogami (Okayama University, Japan)

There are many pseudorandom sequences. However, not all of them are suitable for practical security applications. For example, uniformity of bit distribution and difficulty of predicting the next bits are essential measures to evaluate the randomness of a sequence. In this paper, the authors propose and evaluate a geometric sequence such that it has a uniform distribution and high linear complexity.

13:30 ***FPGA implementation of ECDSA for Blockchain*** ***227***

Shoi Tachibana and Shunsuke Araki (Kyushu Institute of Technology, Japan); Seiji Kajihara (Kyushu Institute of Technology, Izuka, Japan); Shigeyuki Azuchi, Yukishige Nakajo and Hideki Shoda (Chaintope Inc., Iizuka, Japan)

In this paper, we address Field Programmable Gate Array (FPGA) implementation of the Elliptic Curve Digital Signature Algorithm(ECDSA), which is suitable for cryptocurrencies realized in blockchain. Although the ECDSA requires high computational efforts, utilization of a specific logic circuit on the FPGA allows us quick and easy computation. We implement the ECDSA with both a software and a hardware by an FPGA, and show the superiority of FPGA implementation by comparing the processing time.

13:45 ***NIST Statistical Test for Random Sequence Generated by Möbius Function*** ***229***

Fatema Akhter, Yuta Kodera, Yasuyuki Nogami and Takuya Kusaka (Okayama University, Japan)

Random sequences play important roles in many security applications. Several security protocols have been developed based on random sequences. Hence, their generation is one of the topic of interests among many cryptographic researchers. Previously, the authors proposed a pseudo random sequence over odd characteristic field which is generated by applying primitive polynomial, trace function and möbius function. Some important properties such as period, autocorrelation and cross-correlation have been presented in previous work. Randomness is generally measured by statistical tests and NIST Statistical Test Suite (NIST STS) is one of the most popular tools for randomness analysis. In this work, the randomness of the generated sequence is investigated by NIST STS.

Monday, May 20 14:00 - 14:10

Opening Ceremony

Room: evergreen hall i

Monday, May 20 14:10 - 15:10

Keynote Speech I (Yutaka Ishibashi)

Room: evergreen hall i

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

Monday, May 20 15:10 - 15:30

Coffee Break
(Break Area)

Monday, May 20 15:30 - 17:00

Panel Discussion

Room: evergreen hall i

Chair: Tsung-Han Tsai (National Central University, Taiwan)

Monday, May 20 17:00 - 18:30

Session D1: Intelligent Devices, Circuits, Systems, and Algorithms for Smart Live

Room: evergreen hall i

Chairs: Ching-Hu Lu (National Taiwan University of Science and Technology, Taiwan), Chien-Cheng Tseng (National Kaohsiung First University of Science and Technology, Taiwan)

17:00 ***A Graph Signal De-Noising Method Using Spanning Tree and Graph Filter Bank 231***

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

In this paper, a graph signal de-noising method using spanning tree and graph filter bank is presented. First, the minimum spanning tree representation of sensor network graph signal is constructed by using the distances among the sensors. Then, graph signal on spanning tree is transformed into a signal on bipartite graph by vertex re-ordering. Next, the prefect reconstruction two-channel graph filter bank on bipartite graph is used to reduce the noise superimposed on graph signal by suitably attenuating the signal energy at high-pass channel. Finally, the signal to noise ratio (SNR) is used to evaluate the performance of the proposed de-noising method.

17:15 ***Design and Application of Bernstein-Polynomial-Based Riesz Fractional Order Differentiator 233***

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

In this paper, the design and application of Bernstein-polynomial-based Riesz fractional order differentiator (FOD) is presented. First, the Bernstein polynomial is used to design Riesz FOD. The analytic closed-form solution of filter coefficients is obtained, so the Riesz FOD can be easily designed without performing optimization. Next, an image sharpening algorithm is developed by using Riesz FOD where the sharpened image is computed by adding Riesz fractional derivative image to original image. Finally, a numerical example is demonstrated to show the effectiveness of the proposed Riesz FOD method.

17:30 ***27 MHz High Efficiency Variable Gain Amplifier for Shortwave Diathermy 235***

Chiu-Chin Lin and Kang-Chun Peng (National Kaohsiung University of Science and Technology, Taiwan)

This paper proposed a 27 MHz high-efficiency variable gain amplifier (VGA) that could be applied to short-wave diathermy, as a way to improve the efficiency for long-term operation of such amplifier in the therapy. We used a class-B amplifier architecture for design, which allowed the variable gain amplifier to be extremely efficient, both at high and low power output. In addition, we also effectively suppressed the second and third harmonics, further permitting this variable gain amplifier to be practical for commercial use. We adopted this high-efficiency variable gain amplifier with a hybrid circuit at an adjustable gain range of 5.8 dB to 31 dB under an input power of 0 dBm. Within the gain adjustment range, the power additive efficiency (PAE) of the VGA was almost always maintained above 50 % with the suppression of the second harmonics at more than 65 dB.

17:45 ***Lightweight Image De-raining for IoT-enabled Cameras 237***

Bo-En Shao and Ching-Hu Lu (National Taiwan University of Science and Technology, Taiwan); Shih-Shinh Huang (National Kaohsiung First University of Science and Technology, Taiwan)

A traditional surveillance system with image enhancement often heavily relies on cloud-tier processing, which demands higher bandwidth and increases latency. To reduce the bottleneck on the cloud and bandwidth under raining weather, we propose a novel image de-raining network for recourse-constrained IoT-enabled cameras by leveraging edge intelligence. The experiment results show that our network is capable of de-raining under heavy-rain conditions, and achieves faster processing time compared with previous researches.

18:00 ***Automatic driving interaction strategy and interface research 239***

Hung-Yih Tsai (Automotive Research & Testing Center, Taiwan)

This paper presents an automatic driving interaction strategy and interface. A majority of recently developed advanced vehicles have been equipped with copilot systems. The copilot system is cooperative driving between a driver and the system. During the automated driving, the system may propose the takeover request to the driver at any time. Thus, it is to be expected that human and systems interaction frequently of the switch control mode and transfer control authority. This study proposed a safety takeover strategy and interface. It is an adaptive adjustment of warning time of driver takeover target when the system request to the driver.

Session D2: Game-based Learning and Gamification

Room: river hall

Chairs: Chih-Ming Chu (National Ilan University, Taiwan), Huei-Tse Hou (National Taiwan University of Science and Technology, Taiwan)

17:00 ***The development and evaluation of an educational board game with augmented reality integrating contextual clues as multi-level scaffolding for learning ecosystem concepts 241***

Po-Yen Wang and Hsin-Ta Lin (National Taiwan University of Science and Technology, Taiwan); Shu-Ming Wang (Chinese Culture University, Taiwan); Huei-Tse Hou (National Taiwan University of Science and Technology, Taiwan)

The study developed an AR board game - Ecological Restoration, which employed AR as multi-level cognitive scaffolding for learning ecosystem concepts. The advantage of this "hybrid" approach is it introduced the flexibility and adaptability to educational board games, which its learning content is generally fixed in printed cards. The game was implemented in a biology class for evaluation. Results show that students generally perceived the game as useful and ease of use for learning. Students' understanding of ecosystem concepts were also significantly improved. Implications of these findings are discussed.

17:15 ***Designing a gamified activity with visual representation-based scenario and technology-based scaffolding for learning electric potential 243***

Ching-Ying Huang (National Hsinchu Girl Senior High School, Taiwan); Hsin-Ta Lin (National Taiwan University of Science

and Technology, Taiwan); Shu-Ming Wang (Chinese Culture University, Taiwan); Huei-Tse Hou (National Taiwan University of Science and Technology, Taiwan)

Learning science concepts can be challenging as these concepts are usually abstract and complex. Science visualization and analogies are applied in teaching practices for improving students' understanding of the concepts. This study seeks to promote students' learning performance and flow engagement by integrating visual representation as scaffoldings with game elements. An electric potential gamified teaching activity based on CSLS teaching model (Card-game, Slide, and Learning Sheet gamification teaching model) was proposed and evaluated [1]. The results indicate that the proposed teaching activity could improve students understanding. In the meantime, students generally possessed positive perception toward the game and were having positive flow experiences. Implication and suggestion for future study is discussed based on the findings.

17:30 ***An Augmented Reality Game with Magic Book for Chinese Culture 245***

Jia-Jin Lee, Zi-Ming Guo, Zong-Han Guo, Yi-Wen Pan and Yan-Zhen Lin (Tainan University of Technology, Taiwan); Min-Chai Hsieh (National University of Tainan, Taiwan)

This study has developed an augmented reality interactive game combined with a picture book for "Lantern", which is not only an object for lighting but a cultural symbol of Chinese culture. The game called Soul Village is a puzzle game about a lantern story. In this game, players must use AR cards to help the protagonist pass each level. By doing so, they can slowly discover the storyline, the story of the Soul Village.

17:45 ***Game-based Learning and Augmented Reality Navigation APP for Children's Libraries 247***

Yu-Wei Lee and Ko-Chiu Wu (National Taipei University of Technology, Taiwan)

Digital technology has been introduced into libraries. Innovative services and quality information are required in libraries to meet the needs of digital natives. The study design of the Augmented Reality navigation APP is to bring children a novel technological experience. Through simulation and games, children's curiosity can be enhanced. They can be attracted to explore the library and motivated to learn more spontaneously. The AR navigation APP constructs an indoor positioning system by combining iBeacon with the APP system. The AR navigation APP is expected to stimulate children to have more patience and opportunity to explore library entities and virtual resources. It also offers the possibility of letting children study and learn together with their parents. Finally, Augmented Reality should build more development in the field of education in the future.

18:00 ***Study of RFID Board Game Cloud Computing System 249***

Chih-Ming Chu and Hsuan-Yu Lin (National Ilan University, Taiwan)

This research uses the Arduino Mega board to develop related peripheral modules such as RFID cards and combine cloud computing to form an 「RFID Board Game Cloud Computing System」. This system uses the form of board game to learn how to build the computer hardware. Use an easy to understand pairing mechanism. Write the RFID reading information through the program to auto judge whether the student is successfully paired and achieve the purpose of game-based learning. This system can also record the game process of each student and upload it to the cloud server. Through the computational and analysis, the results are provided to the teacher for reference to understand the students' learning process and problems. The system has completed the construction of the system interface and game mechanism, including: RFID card reader interface, Arduino main control board program and game card which can make the game card and system function connection normally. Currently, the program function can read the RFID card and execution card pairing rule, in addition ,reading data is displayed on the computer screen to understand the student's learning process.

Session D3: Non-invasive Biomedical Technology and Digital Health Care

Room: peak hall

Chair: Pao-Cheng Huang (Fujian Agriculture and Forestry University, P.R. China)

17:00 ***Non-contact Heart Rate Monitoring with Mobile Phone Camera 251***

Shu-Yen Lin and Meng-Ru Tsai (Yuan Ze University, Taiwan)

In this work, we focus on non-contact heart rate monitor to monitor the patient's heart activity circle by mobile phone camera. However, non-contact monitoring is susceptible to external light sources and brightness. Different color spaces and different filters are combined to get more accurate heart rate. In our experiment, three color spaces and four types of filter are analyzed. Combining Butterworth and Savitzky-Golay filter with quadrature color space can get more precise heart rate, and the error range is less than 2.58%.

17:15 ***Human odor sensing for health status detection and tracking by using electronic nose 253***

Tanthip Eamsa-ard, Thara Seesaard and Teerakiat Kerdcharoen (Mahidol University, Thailand)

In this work, the development and implementation of an electronic nose system based on nano-composite polymer gas sensors for human odor detection and tracking health status are proposed. To evaluate the performance of gas sensors, we have performed tests from human odor including breath and urine. The results also show that our lab-developed gas sensors have an excellent performance to detect the volatile that released from the human body. The discrimination ability of the electronic nose evaluated by principal component analysis (PCA) could successfully group and discriminate pattern odors based on the volatile presented in its head-space. And it can distinguish clearly different groups of health status.

17:30 ***A Microwave Resonator Biosensor Based on MEMS Technology and Rough Cu Electrodes for Biological Cell Detection 255***

Chia-Feng Liu (National Cheng Kung University, Taiwan); Pao-Cheng Huang (Fujian Agriculture and Forestry University, P.R. China); Min Haw Wang (Chinese Culture University, Taiwan); Chun-Hong Chen (Tunghai University, Taiwan); Ling-Sheng Jang (National Cheng Kung University, Taiwan)

This work presents a near-field microwave resonant sensor combining with a micro-channel for detecting biological cells. The hairpin biosensor with a high-

Q dielectric resonator allows the detection of a small variation of DUT in the micro-channel by measuring the scattering parameters responses at resonance of around 2.2 GHz. The sensor was constructed by using microelectromechanical-system (MEMS) technology. Cu electroplating technique was used to fabricate 14-μm-thick Cu electrodes to reduce the transmission loss caused by the rough surface of electrodes and to match the size of cells. Measurements of Dulbecco's modified Eagle's medium (DMEM) and B16F10 melanoma cells (mus musculus skin melanoma) were performed. The results showed that the thick Cu electrodes provided two advantages: loss reduction and cell detection sensitivity. These analysis results are helpful for further applications such as cell trapping, measurement, and characteristics.

17:45 ***Two-stage Adaptive Filter in Electrocardiogram Application*** *257*

Lu Xu, Ming-Kai Yue and Liang-Hung Wang (Fuzhou University, P.R. China); Chia-Feng Liu (National Cheng Kung University, Taiwan); Riqing Chen and Pao-Cheng Huang (Fujian Agriculture and Forestry University, P.R. China)

Motion artifacts can cause baseline shifts and disrupt the waveform of the ECG signal. There will be a serious impact on the diagnosis when motion artifacts not removed. In this paper, a two-stage adaptive filter is proposed. In the first stage, the reference ECG signals are measured under static status, and the noise signals also be obtained. The obtained noise signals become reference signals for the second stage, and finally the desired ECG signal obtained. The experimental results show that the two-stage adaptive filter can filter out the noise of 0.1~10Hz in the ECG signal which containing motion artifacts well.

18:00 ***Improvement of Concentration in Working Using Extremely Low Frequency Electromagnetic Field*** *259*

Jing-Yau Tang (National Cheng Kung University, Taiwan); Pen-Jan Chen (China Medical University, Taiwan); Chia-Feng Liu (National Cheng Kung University, Taiwan); Pao-Cheng Huang (Fujian Agriculture and Forestry University, P.R. China); Ling-Sheng Jang (National Cheng Kung University, Taiwan)

This study presents a new method for improving concentration and efficiency for working. An extremely low frequency electromagnetic field (ELF-EMF) composed of 10 to 17 Hz frequency electromagnetic field (EMF) was used to increase the concentration by regulating the brainwaves. Subject use the portable ELF-EMF in working.

18:15 ***Influence of Heart Rate Fragmentation on the Assessment of Heart Rate Variability*** *261*

Junichiro Hayano and Masaya Kisohara (Nagoya City University Graduate School of Medical Sciences, Japan); Emi Yuda (Tohoku University & Graduate School of Engineering, Japan)

Heart rate fragmentation (HRF) is a type of sinoatrial instability characterized by frequent (often every beat) appearance of inflection in R-R interval time series despite that ECG shows sinus rhythm. Because the assessment of vagal function by heart rate variability (HRV) analysis depends on the assumption that the high frequency (HF, 0.15-0.4 Hz) component of HRV is mediated solely by the vagus, HRF that is measured as a part of HF component confounds the assessment of vagal function by HRV. In this study, we analyzed HRF in 24-h ECG big data, ALLSTAR, and investigated the changes in HRF occurrence with age and its influence on the assessment of HF component of HRV. We observed that HRF is often observed during childhoods (0-20 yr) and after 80 yr, but its influence on the HF component of HRV monotonously increases with age.

Session D4: QoS/QoE-Related Technologies for Future Communication Systems

Room: pine hall

Chairs: Nobuhiko Itoh (NEC Corporation, Japan), Ryogo Kubo (Keio University, Japan)

17:00 ***The QoS Trade-off in IEEE 802.11n EDCA and DCF for Voice, Video, and Data Traffic*** *263*

Eko Fajar Cahyadi (Asia University, Taiwan & Institut Teknologi Telkom Purwokerto, Indonesia); Muhammad Rafi Raihan (Institut Teknologi Telkom Purwokerto, Indonesia); Achmad Danisya (ST3 Telkom Purwokerto & Telkom University, Indonesia); Min-Shiang Hwang (Asia University, Taiwan)

This study investigates a comparison between Enhanced Distribution Channel Access (EDCA) against the "legacy" IEEE 802.11 Distributed Coordination Function (DCF) method for three traffic services e.g. voice, video streaming, and data, using an NS-3 simulator. The results showed that EDCA can fix the value of end-to-end delay and jitter better against the DCF scenario. However, in contrary DCF is superior in throughput and packet loss ratio.

17:15 ***Sequential Radio Tomographic Imaging Using Mobile Measurement Nodes*** *265*

Kento Fukuda and Takahiro Matsuda (Tokyo Metropolitan University, Japan); Fumie Ono (National Institute of Information and Communications Technology, Japan); Shinsuke Hara (Osaka City University, Japan); Ryu Miura (NICT, Japan); Fumihide Kojima (National Institute of Information and Communications Technology, Japan)

By analyzing attenuated wireless signals traversed across a region, Radio Tomographic Imaging (RTI) estimates a spatial loss field (SLF), which corresponds to a map quantifying attenuation of wireless signals at every spatial position within the region. In this paper, we propose a sequential RTI scheme using mobile measurement nodes such as unmanned aerial vehicles (UAVs). In the proposed scheme, the attenuation measurements between mobile nodes are collected and the SLF is estimated by means of a time-varying Kalman filter.

17:30 ***Performance Evaluations of Tile-based 360-degree DASH Streaming with Clustering-based Viewport Prediction*** *267*

Yuya Shinohara, Satomi Shirasaki, Yiyan Wu, Kenji Kanai and Jiro Katto (Waseda University, Japan)

Recently, the demand for immersive VR (360-degree) video delivery is increasing, and an efficient (high quality and low traffic) 360-degree video streaming methodology is mandatory. To address this fact, in this paper, we introduce a tile-based 360-degree DASH streaming with viewport prediction. We evaluate the prediction accuracy of future viewport movement patterns by using clustering and image and audio information. In addition, we perform rate adaptation based on viewport prediction results. Through evaluations, we confirm the tile-based 360-degree DASH streaming achieves higher objective image quality and lower total video traffic volume.

17:45 *Performance Evaluations of IEEE 802.11ad and Human Pose Detection towards Intelligent Video Surveillance System 269*

Mayuko Okano (WASEDA University, Japan); Kenji Kanai and Jiro Katto (Waseda University, Japan)

Towards an intelligent video surveillance system (high throughput and high detection accuracy), in this paper, we quantitatively validate the network performance of 60GHz IEEE 802.11ad and the contribution of 4K resolution to image-based human pose detection. In the performance evaluation of 11ad, we evaluate TCP throughputs by changing the communication distances (up-to 6m). In the performance evaluation of human pose detection, we evaluate the detection accuracy of human pose detection by changing a distance between a camera and a subject (up-to 100 m) and input image resolutions.

18:00 *Effects of Time Delays on Observer-based Cyberattack Detection in Interactive Networked Control Systems 271*

Ryogo Kubo (Keio University, Japan)

A rapid increase in cyberattacks such as a false data injection attack against networked control systems (NCSs) is a serious problem. In particular, the cyberattacks in interactive NCSs including a human operator may cause a hazardous situation involving human lives. The tamper detection observer (TDO) has been proposed to detect the false data injection attack in the interactive NCSs. This paper assesses the effects of the time-delay difference of redundant paths in the TDO scheme on the observer-based cyberattack detection.

18:15 *Opportunistic Routing for Heterogeneous IoT Networks 273*

Yasushi Okamura (The University of Electro-Communication, Japan); Ryo Yamamoto (The University of Electro-Communications, Japan); Satoshi Ohzahata (The University of Electro-Communications & Graduate School of Information Systems, Japan); Toshihiko Kato (University of Electro-Communications, Japan)

IoT networks under IoT gateways generally composed of terminals with multiple communication technologies and required to utilize IoT gateways for mutual communications among terminals. However, deploying bunch of IoT gateways for gaining connectivity is costly, thus SSGW (Solution Specific Gateways), which can only convert specific technologies, is introduced to reduce the cost maintaining the connectivity. Although the routing protocols for IoT network with SSGW using specific fixed routes has been proposed, there still be a room for improvement in an adaptive routing according to network environments. This research tackles the issue with Opportunistic Routing SSGW using ETX as forwarding decision metric. The simulations clarify, the effectiveness of the proposed routing protocol from the viewpoint of load balancing and delay.

Session D5: Technology and Application of Internet of Things- IV

Room: orchid hall

Chair: Dapeng Li (Nanjing University of Posts and Telecommunications, P.R. China)

17:00 *Location-Fair Based mmWave Stable Beamforming Scheme for High Speed Railway 275*

Yin Hui and Rui Jiang (Nanjing University of Posts and Telecommunications, P.R. China); Youyun Xu (Nanjing University of Posts and Telecommunications & Shanghai Jioatong University, P.R. China); Dapeng Li and Feng Tian (Nanjing University of Posts and Telecommunications, P.R. China)

In this paper, a location-fair based mmWave stable beamforming scheme under interlaced redundant coverage architecture is proposed to improve the stability and reliability of high speed railway communications. In the proposed scheme, an adaptive searching algorithm is presented to calculate the transmitting (TX) beamwidth and positions for beam switching. Thus, optimal TX beams with different beamwidth are formed by base station to balance the data rate. Theoretical analysis and simulations are conducted to verify the improved stability and reliability performance.

17:15 *EODN: A Design of Intelligent Optical Distribution Network Management System 277*

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

As the scale of optical distribution networks (ODN) grows, the management of optical networks becomes harder. In order to reduce the dependence of network management on personnel and improve management efficiency, we designed an intelligent ODN management system called EODN. EODN system consists of a management platform, management terminals and intelligent equipment. This paper shows the structure and functions of EODN.

17:30 *Machine Learning Based Handover Performance Improvement for LTE-R 279*

Donghang Li and Dapeng Li (Nanjing University of Posts and Telecommunications, P.R. China); Youyun Xu (Nanjing University of Posts and Telecommunications & Shanghai Jioatong University, P.R. China)

A handover scheme based on Elman network is proposed in this paper to reduce link failure and enhance the user experience under LTE-R system. In this handover scheme, we divide the different scenarios and set up corresponding neural network prediction system with which the handover decision parameters like RSRP and RSRQ can be continuously observed and predicted. By correlating past measurement parameters with future handover decisions, we can accelerate the handover execution and optimize the handover process. It can be seen from the experimental simulation results that the Elman-based handover algorithm has a better performance than the gray prediction model-based handover algorithm and is more suitable for the high-speed rail scene with changing geographical environment.

17:45 *NFV MANO Based Network Slicing Framework Description 281*

Jinbo Chen, Haotong Cao and Longxiang Yang (Nanjing University of Posts and Telecommunications, P.R. China)

Network slicing is an emerging technology that is anticipated to realize the diverse QoS requirements required by the next generation (5G) networks. As key enablers of network slicing, software-defined network (SDN) and network function virtualization (NFV) has been fully researched and integrated into 5G architecture. In this paper, we propose a NFV MANO based network slicing framework for 5G networks. The proposed framework is a three-layered

architecture using the MANO to control, manage and coordinate the slices' behavior.

18:00 ***Multi-agent crowdsourcing model based on Q-learning 283***

Xin Fang and Yongan Guo (Nanjing University of Posts and Telecommunications, P.R. China)

The multi-agent crowdsourcing system is a very popular field in recent years, and Q-learning is an algorithm that is the most practical in reinforcement learning. Based on the single agent reinforcement learning Q-learning algorithm, a new learning collaboration algorithm is proposed. Based on this algorithm, a new multi-agent crowdsourcing system structure model is proposed. The most important feature of this structure is the knowledge sharing.

18:15 ***Smart City Traffic Lights Management System: A Case Study to Improve Crosswalk Safety in Taipei 285***

Sara I Sanchez Alquijay and Sheng-Ming Wang (National Taipei University of Technology, Taiwan)

Smart cities and intelligent infrastructures promise to solve issues caused by urban population growth and improve public welfare. Taiwan is an example of a place where smart city technologies have been employed but traffic management is still a topic of great interest for councils and researchers since it has great impact on the daily life of the citizens and several accidents continue being reported attempting pedestrian's safety. The proposed architecture in this study suggests the possibility to control the time of the traffic lights considering the number of pedestrians waiting to cross the road. This paper presents a detailed analysis of the scenario, a description of the proposed system and an evaluation of its performance.

Session D6: Human-Centered Computing and System Design

Room: bamboo hall

Chair: Jim-Min Lin (Feng Chia University, Taiwan)

17:00 ***The Design Concept of Intelligent Guide Cane 287***

Chi-You Wei, Bo Yi Li and Hsin-Wen Wei (Tamkang University, Taiwan); Wei-Tsong Lee (Tamkang university, Taiwan)

people with poor vision can only live in a familiar environment to ensure their own safety. The mobility of people with impaired vision is restricted and they may live in inconvenient life. Therefore, in this study, we aim to provide a design concept of novel intelligent guide cane to enhance the mobility of visually impaired people. The proposed design is to add some functions to the original guide cane and connect the intelligent guide cane with hand-held device. Since the hand-held device that is widely used in today and has a considerable amount of computing, the proposed design can act as an auxiliary machine similar to guide dogs or better than guide dogs. The proposed design aims to provide the functions such as route planning, navigation, obstacle detection, and object recognition. With the proposed design, the mobility of visually impaired people can be greatly improved.

17:15 ***Enhancing an MOOC Platform with Emotional Sensing and Robot Interaction Features 289***

Jim-Min Lin and Yu-Kai Chen (Feng Chia University, Taiwan); Zeng-Wei Hong (Universiti Tunku Abdul Rahman, Malaysia)

This paper is to report how to add emotional sensing and robot interaction mechanisms to the MOOC platform, so that the MOOC course designers could author and trigger the robot actions of the corresponding content entity in a course. It makes a link between the stored action and the emotional sensing identification result. It increases learner's interests in studying the course and receives the user emotional feedback in studying the course through emotional recognition. As a result, the learner - course interaction is increased.

17:30 ***Improving QoE of Wireless Charging Based on 802.11 Wi-Fi System 291***

I-Han Lee and Bo-Han Zhang (Tamkang University, Taiwan); Wei-Tsong Lee (Tamkang university, Taiwan); Hsin-Wen Wei (Tamkang University, Taiwan)

This paper will study the use of 802.11 Wi-Fi AP RF signal to charge electronic products. Using this technology, we will explore how to choose the most efficient Wi-Fi AP for providing charging and surfing Internet services. By using instant feedback, the information needed to select the Wi-Fi AP will be transmitted back to the AP one by one. The selection algorithm will find the best candidate AP based on the feedback information. Finally, the system will provide it back to the user for better solution of Wi-Fi APs. The experimental results show that the proposed method can simultaneously consider the charging efficiency and network capacity.

17:45 ***The Design of Smart Suitcase 293***

Chun-Sheng Yang and Bo-Han Zhang (Tamkang University, Taiwan); Wei-Tsong Lee (Tamkang university, Taiwan); Hsin-Wen Wei (Tamkang University, Taiwan)

With the development of the Internet of Things (IOT) and the wave of artificial intelligence (AI), more and more embedded systems combine AI to make life easier and more convenient for people. This paper integrates image recognition and object-following techniques to create an intelligent AI suitcase. By recognizing the back view of the user, the smart suitcase can move and follow the user with appropriate speed. When the user is too close, the suitcase performs corresponding actions to slow down or to stop to avoid collision; while the user is too far away, the suitcase will accelerate to maintain the distance between the users to avoid of losing connection with user. For image processing, we use Convolutional Neural Networks (CNN) as our algorithm and OpenCV for implementation to achieve object recognition and tracking. The Wi-Fi module is installed on the suitcase, it serves to detect whether the target is missing by connecting to the user's mobile phone. When the detected Wi-fi signal is too low, the mobile phone will issue a warning to remind the user that the luggage distance is too far. In terms of control, we use fuzzy control and machine learning to control the motor to make tracking of the user more stable.

18:00 ***Development of Innovative Online Shopping Experience to Overcome Procrastination through Self-Rewarding 295***

Shih-Yu Pu, Nan-Ching Tai and Kah-Hoe Ng (National Taipei University of Technology, Taiwan)

This study reviewed the psychological anti-procrastination through temporal motivation theory to develop corresponding options that can be incorporated into an online shopping website. In this paper, a prototype website is presented that incorporates an experimental online shopping model to allow

customers to utilize strategies of goal setting, self-rewarding, self-monitoring, and peer support to motivate themselves to complete tasks on time.

Monday, May 20 19:00 - 21:00

Welcome Reception (Yamagata Kaku Hotel)

Tuesday, May 21

Tuesday, May 21 9:00 - 10:30

Poster Session B

Room: poster area

Chairs: Hsia Chih-Hsien (National Ilan University, Taiwan), Shyang-Yuh Wang (Chinese Culture University, Taiwan)

Fault Prediction for Network Equipment based on Oversampling Method in Imbalanced Dataset 297

Faming Yin and Qingbo Du (Nanjing Vocational College of Information Technology, P.R. China); Mingzi Chen, Qiuxia Bao and Yun Gao (Nanjing University of Posts and Telecommunications, P.R. China)

Nowadays, there are two main problems in Network service. On one hand, Network customers require better service and experience. For another, the Network service providers prefer to improve users' quality of experience (QoE) in order to increase their revenues. In this paper, we combine the network parameters and user complaints to establish a fault prediction model. Firstly, we clean the data and use an improved SMOTE algorithm called K-SMOTE to balance the data. Then we use principal component analysis (PCA) to perform dimensionality reduction on the data, which is beneficial to algorithm efficiency. Finally, in order to get a more accurate model, we conduct our experiment based on some machine learning models in our dataset. Experimental results show that decision tree model using K-SMOTE algorithm has a better performance than other models.

QoE Prediction Model with Personalized Parameters in IPTV Domain 299

Jialin Zhao, Xin Wei, Yun Gao and Wenqin Zhuang (Nanjing University of Posts and Telecommunications, P.R. China); Faming Yin and Qingbo Du (Nanjing Vocational College of Information Technology, P.R. China)

With the rapid development of multimedia services, such as Internet Protocol Television (IPTV), Quality of Experience (QoE) has increasingly attracted the attention of service providers. In this paper, we propose a QoE prediction model to map users' QoE, which combines IPTV viewing records and personalized parameters. We simplify the model by identifying the effective features through data mining technology. The simulations demonstrate that the proposed model can achieve high accuracy of QoE prediction.

Design and Analysis of Cost-Efficient Ultra-High-Order Matched Filter Architecture Using 4-Phase Calculating Paths for Underwater Applications 301

Xin-Yu Shih (National Sun Yat-sen University, Taiwan)

In this paper, we propose a cost-efficient VLSI hardware design of matched filter architecture for underwater applications, especially for ultra-high-order demands. By using proposed 4-phase calculating paths, it aims to reuse the main hardware components and extremely saves the hardware cost without any system performance loss. In a design implementation via TSMC 40-nm CMOS technology, an 80-tap matched filter hardware only requires a synthesis design area of 0.061 mm^2, which saves 75.9% of circuit area with respect to a conventional transposed form circuit.

A Smart Home Energy Management System as an Intelligent Electricity Energy Audit Based on AI-empowered Non-Intrusive Load Monitoring 303

Yu-Hsiu Lin, Shuo-Yuan Tsao and Yu-Hsuan Lin (Southern Taiwan University of Science and Technology, Taiwan)

Electrical energy demands requested from down-stream sectors of a smart grid are continuously increasing. One way to meet those demands is to monitor and manage industrial, commercial as well as residential electrical appliances efficiently in response to demand response programs. This study aims to develop a smart Home Energy Management System (HEMS) that acts as an intelligent electricity energy audit based on Non-Intrusive Load Monitoring (NILM) technology. NILM instead of HEMS conducted as a benchmark in a field of interest is able to infer appliance-level power consumption without an intrusive deployment of smart e-meters installed and attached on monitored individual electrical appliances. To NILM as a load classification task, a Radial Basis Function-Artificial Neural Network (RBF-ANN) hybridized with k-Means clustering is developed and used to identify individual electrical appliances monitored in a realistic residential environment. The experimentation reported in this study shows that, the presented HEMS utilizing the proposed k-Means clustering-hybridized RBF-ANN-based NILM as an intelligent electricity energy audit gave an overall load classification rate of 72.57%.

A Blowing Control Method for Paralyzed People Care 305

Hsin-Chuan Chen (University of Electronic Science and Technology of China, Zhongshan Institute, P.R. China); Junlin Ai, Rongzhi Zhu, Yixuan Guo and Maolin Chen (Beijing Institute of Technology, Zhuhai, P.R. China)

For those people with disabilities or paralysis caused by accident or illness, their daily life almost relies on the care of others, it is indeed a heavy burden on their family. In this paper, we try to propose a blowing control method, which uses the principle of airflow vibration to make the microphone induce a small signal, and then converts it into a corresponding pulse width. Under the co-design of the software programming, the identification of blowing pulse width

for multiple microphones is completed to further control the electrical appliances commonly used in life. Therefore, such a method of blowing control not only improves the life quality of paralyzed people, but also reduces the care burden for their family.

Learning with Drift Detection based on k Time Sub-concept Windows 307

Li Liu (Huizhou University, P.R. China); Nathalie Japkowicz (American University, USA); Dan Tao (Beijing Jiaotong University, P.R. China); Zhen Liu (Guangdong Pharmaceutical University, P.R. China)

Concept drift detection has attracted many concerns from researchers, due to the massive amount of streaming data continuously generated. Traditional concept drift detection methods, those based on monitoring the performance of base learners over instances from a data steam's whole time window, are not sensitive enough to sub-concept drifts and discover them late or not at all. This is because when aggregated together, the sub-concepts that form a concept are not carefully described. To solve this problem, we propose the kTSW based method that divides the instances from a data stream's one time window into k sub-concept windows, and then builds a concept-drift monitor for each sub window. Once a sub window has experienced a concept drift, we update the leaner model. Two real data sets are used to verify the validity of our method in data stream classification. Experimental results show that our method obtains higher accuracy and recall than methods based on the whole time window.

Mobile Cellular Based Fingerprinting Approach For Indoor Positioning 309

Tianyu Niu and Jie Wei (Beijing Jiaotong University, P.R. China); Xiaofeng Zhong (Tsinghua University, P.R. China)

Location-based services are key applications in wireless cellular networks, under both outdoor and indoor environments. Location fingerprinting method is favored by most researchers because of its suitable for indoor scenario and high accuracy. This paper establishes an indoor positioning environment to distinguish floors. As shown in simulation ,the proposed algorithm could achieve indoor positioning with an accuracy of about 2 meters and floor distinguish accuracy of about 70 percent.

Low-SNR Speech Enhancement and Separation in Driving Environment 311

Jie Wei (Beijing Jiaotong University, P.R. China); Lingling Li (China Mobile Communications Group Beijing LTD, P.R. China); Xiaofeng Zhong (Tsinghua University, P.R. China)

Noise is the key factor related to the voice recognition performance, and there are complex noises in driving environments. In this paper, the low frequency suppression pretreatment of mixed signal with noise is proposed; Secondly, the first-order recursive smoothing noise estimation algorithm is improved, and bias compensation algorithm is added to reduce the estimation error. Furthermore, the FastICA algorithm based on negative entropy is improved to reduce the impact of initial value sensitivity. As verified by experiments, the proposed algorithms have improved the target driver's speech quality, and much suitable to the speech enhancement and separation in the low-SNR driving environment.

A Smart Real-Time Monitoring System for Fault-Diagnosis of Ball-Bearings 313

Chin-Sheng Chen and Yu-Chang Ke (National Taipei University of Technology, Taiwan); Lap-Mou Tam (Institute for the Development and Quality, Macao); Shih-Yu Li (National Taipei University of Technology, Taiwan)

In this paper, a smart real-time monitoring system is developed, which attempts to produce key features for different kinds of sensing targets via applying chaos mapping strategy. Traditional way for machine learning is to extract and select those features from original signals, which requires domain knowledge related to the sensing targets, and many of statistics approaches are necessary for further selecting high-correlated features. In this paper, a smart machine with feature-production is developed, where those measured signals are mapped into chaotic domain. Through properly parameters adjusting and autonomous optimization of feature values, different and obvious key-features can be obtained for each of distinct states, which are clear as well as unique to their original signals properties. Finally, simple criteria can be further defined for states classifications. The classical ball-bearing system with four distinct states is illustrated for investigations. The experiment results reveal the proposed strategy is effective and feasible, where the high accuracy rate for states classifications can be achieved.

Advanced Signal Processing for Personal Image Encryption on Consumer Electronics 315

Shih-Yu Li, Chun-Hung Lee and Chin-Sheng Chen (National Taipei University of Technology, Taiwan); Lap-Mou Tam (Institute for the Development and Quality, Macao)

In this paper, an advanced signal encryption processing for personal image is developed, which provide a more secure way to protect the privacy of images transmitted through consumer electronics. A selected moving window is decided before operating the two main encryption stages, which divides the plain image into several sub-images. Shuffling pixels in binary is obtained in the permutation stage, and multi-level ciphering process, comprising cipher-data picking up as well as information hiding, asymmetric translation, is implemented in the diffusion stage. Simulation results show that the proposed advanced signal processing for image encryption is effective to protect the privacy of personal images.

Process and Cognition: Power Conversion Under the Development of Internet of Things 317

Tian-Jun Gu and Yu-Huan Wang (Renmin University of China, P.R. China); Shyang-Yuh Wang (Chinese Culture University, Taiwan)

The development of the Internet of Things (IoT) puts people and everything in a network of all-round information interaction, realizing the organic interconnection between the material world and human society, which not only brings major changes to the existing communication structure, but also brings about the conversion of power under the empowerment of information. The IoT system that has mastered the power of information can use technology to control the information people see, and thus influencing their cognition and behavior, thus realizing the transfer of power from the government to the IoT system. At present, the information gap caused by algorithm recommendation technology through the shaping of information cocoons is the Internet - an important source of power in the IoT era. The risk of power conversion is that under the empowerment of information, the public is more likely to be manipulated invisibly, and privacy is difficult to be guaranteed.

Short Videos Bring Opportunity for Internet Celebrities Under New Media Environment 319

Yue-Nuo Yen (Chinese Culture Universiry, Taiwan); Shyang-Yuh Wang (Chinese Culture University, Taiwan)

In recent years, people from all walks of life pay close attention to short videos because of the evolution of new media, more needs for entertainment, improvement of network environment, and rise in popularity of smart devices. Being a newly developed media and a new way of spreading information, it has become the major forms of production for content creating entrepreneur and internet celebrity. The word "internet celebrity" (or called "Wang-Hong" in Mandarin Chinese) becomes a frequently appearing word on the Internet. Great popularity of mobile terminal makes short videos become an important way for receiving information and a way of entertainment for the public, so as to make good use of their fragmented time, and hence, "internet celebrity economy" has developed. Short videos have gradually developed into a new type of media by its own advantages; it creates an alternative to the traditional one. Rise of these short videos was generation-driven. The paper will analyze the current domestic and foreign developing situation of short videos, and discuss how to hold the opportunity brought by short videos to internet celebrity economy.

Causes and Characteristics of Short Video Platform Internet Community 321

Yu-Huan Wang and Tian-Jun Gu (Renmin University of China, P.R. China); Shyang-Yuh Wang (Chinese Culture University, Taiwan)

In the past two years, the short musical video platforms in China, represented by TikTok and Kuai Shou, have developed rapidly, and the number of users and social influence have risen sharply. As a result, many internet communities have formed within the platforms. These internet communities are generally characterized by youthfulness, large quantity, low thresholds, and discretely organized. Their formation and aggregation also lie in their satisfaction with the needs of users' cognition, emotion, personal integration, social integration and pressure relief. This paper will combine the theory of uses and gratifications, social identity and media law, and internet and offline research methods to analyze the characteristics and causes of the internet community of short video platforms.

Ultrasonic section locating method based on Hough transform 323

Xin Chen, Houjin Chen, Dan Tao, Jingjing Xie and Xinran Li (Beijing Jiaotong University, P.R. China)

Reconstructed 3D ultrasound imaging based on low-dimensional array transducer can not only visually display the measured object, but also accurately measure the size of the object. Furthermore, the cost is lower than other 3D ultrasound imaging methods, and the experience the measured object is also improved. Due to the uncertainty of the measured object, it is hard to position the 2D ultrasonic section and reconstruction the 3D image. This process has high requirement for the probe user, and increase the complexity of post-processing algorithm. In order to solve this problem, this paper proposes an ultrasonic section locating method based on Hough transform. By specifying and measuring a number of detection points inside the targeting object, the Hough transform is used to calculate the spherical coordinate points in the known radius. The probe position is obtained by an external sensor. By comparing the probe position with the coordinate points obtained by the Hough transform, the 2D slice can be quickly positioned and the 3D image reconstructed. This method can effectively overcome the effect of changes in the surface of the object.

Improvement of the BPTI Scheme for Reversible Data Hiding 325

Kuan-Yu Chi (National Taipei University of Technology, Taiwan)

Data hiding is a technique for embedding secret data into digitalized carriers, such as images, videos, and documents. With remarkable demand for quality image in the past decades, reversible data hiding (RDH) has attracted researchers' attention. In the RDH methods, not only the secret information can be extracted, but the original image can also be recovered without loss. In the present study, we attempt to improve an existing RDH scheme known as bit-plane truncation image (BPTI). The proposed method follows the block division used in the BPTI, and achieves higher embedding capacity without extra memory to store the peak point and zero point values. Experimental results show that the image visual quality of the proposed method is very satisfactory.

Developing a Construction Tool for the Web-based Diagnostic Multimedia Test 327

Ah-Fur Lai and Jia-Han Li (University of Taipei, Taiwan)

To evaluate and diagnose leaner's learning progress, assessment is important for teachers in their teaching. Recently, with widespread of information and technology developed, many teachers have strong intention to adopt computerized tests. In addition, in the test, a diagnostic information with remedial learning is also an essential mechanism in self-directed learning for learners. However, making computerized tests with diagnostic messages is a tedious and complex task for most teachers who have no sophisticated programming skills. This study aims to develop a construction tool for teachers to create their own web-based diagnostic multimedia tests. Once the test created with related concept structures followed by remedial resources, this tool automatically constructs a web-based module for testing. After an expert evaluation carried out later, this tool receives positive feedback from expected users in education.

Smartphone Mobile-Learning Application for Implementing Analytical Drawing Process in On-site Sketching 329

Nan-Ching Tai (National Taipei University of Technology, Taiwan)

Analytical drawing is a method to study the three-dimensional configuration of a subject and to represent the same with a freehand drawing. Further, applying this method to architectural sketching requires imagination, to disassemble complex architectural scenes into geometric forms and shapes and to reassemble these scenes on paper step-by-step with lines drawn freehand. To assist with this process, a smartphone application prototype with interactive illustration of underlying theoretical concepts and stepwise drawing processes of selected architectural examples is presented in this paper. This interactive mobile learning application was tested in an actual class, with promising responses from students.

Reconstruct Programming 101 for Social Science Preference Students 331

Yih-Jiun Lee (Chinese Culture University, Taiwan); Kai-Wen Lien (Chienkuo Technology University, Taiwan)

Information technology has become one of the leading forces in socio-economic, educational and cultural development in the past decade. With the development of information technology and the Internet, information technology utilization has become the basic requirements for future talents. This research aims to reconstruct the curriculum of programming for the school of art, communication and social science. Scaffolding and Learning by doing are used in teaching activities. Students are encouraged to observe and think creatively. After one semester of experiments, the preliminary conclusion shows that the students' responses are generally satisfied, and study motivation is confidently increased.

BN-IQA: A Rapid Image Quality Assessment based on Blue Noise Dithering 333

Jing-Ming Guo and S Sankarasrinivasan (National Taiwan University of Science and Technology, Taiwan)

A simplistic full reference image quality assessment (IQA) based on digital halftone (DH) technique is proposed. The method exploits the properties of ordered dithering screens of digital halftoning and attempt to capture the quality degradation by evaluating its halftone output. The dither screens utilized in the approach pertains to the blue noise (BN) spectrum and the output halftone patterns exhibits dispersive and homogeneous distribution. The proposed IQA is based on the premise that the image degradation can be estimated through its halftone version (binary image). It is also supported from the finding on visual system that the light sensitive cells in retina are arranged in the blue noise pattern. From various experiments, it has been found that the proposed IQA establish a good correlation with human quality score. For performance validation, the BN-IQA is tested in a LIVE image database and compared with existing FR image indices. It has been found that the proposed IQA is found to have attained consistent performance and advantageous with respect to execution time and computational demand.

A Study of Developing a Web-based Management System of Document Annotation for Teaching and Learning 335

Ah-Fur Lai and Yung-Fu Cheng (University of Taipei, Taiwan)

In education, the annotation can promote learning effects in the learning process. Several annotation systems have been equipped with this function for learners' learning, such as math problem-solving, writing, physics training, and Chinese calligraphy skills. However, some are limited within the learning devices or the operating system due to possible dilemma existed with the system. To improve this, this study tries to develop a web-based system of document annotation using the technology of responsive web design for education. It supports an automatic document type conversion, offered with several types of annotation both for school- and class-based managements. Teachers can employ this system for their teaching activities, such as peer corrections with comments, annotation sharing, and problem-solving, from basic keyword annotations to multiple perspectives. An evaluation was also conducted to assess the system's appropriateness before making it for a real use. The related feedbacks show the usefulness and friendliness for users to use it in educational activities of learning and teaching.

Research on Drone's Aerial Photography Aided Learning System Based on Deep Learning 337

Wei-Yu Chen (Chinese Culture University & Tatung University, Taiwan); Jau-Kai Hu (Chinese Culture University, Taiwan)

On June 10, 2017, the "See Taiwan Ⅱ" documentary film crew took a helicopter ride in Hualien, Taiwan, and made an air crash, letting the aerial photography master Zeppelin pass away. At that time, scholars and experts suggested that the drone's aerial photography was so advanced, why should he take a helicopter to shoot himself? In fact, professional photography is an art that subtly reflects the "ideas" behind the shutter press. In view of this, this study collects the works of the masters of the aerial shoots and uses the deep learning technology to extract the feature values of the masters' works, so that the beginners can learn the "thinking" shot by the masters when they fly the high-altitude aerial camera. Learning and thinking about the artistic conception in the photo, recommended or assisted by the mechanism of image recognition, through which the beginner can also produce master-level photography.

Improved Progressive Secret Sharing with Priority Weight 339

Hsia Chih-Hsien (National Ilan University, Taiwan); Heri Prasetyo (Universitas Sebelas Maret, Indonesia)

This paper proposes a new technique on the Progressive Visual Secret Sharing (PVSS) with priority weight. It overcomes a slight limitation of former PVSS scheme in terms of the lossless result on the recovered secret image. The former method yields a promising result while the total number of shared images is even, however, it produces imperfect recovered secret image if the total number of shared images is odd. The proposed method achieves the lossless result on the recovered secret image while the total number of shared images is odd or even. The experimental results demonstrate the effectiveness of the proposed method compared to former schemes in the progressive secret image reconstruction.

Session E1: Smart Monitoring and Sensing Technologies

Room: evergreen hall i

Chair: Yao-Chung Chang (National Taitung University, Taiwan)

9:00 ***Graphical Patterning-Platform of Software Malfunction for Power Profile-based Side-Channel Analysis 341***

Daejin Park (Kyungpook National University (KNU), Korea); Hyeongrae Kim and Jeonghun Cho (Kyungpook National University, Korea)

Recently, many defects that are not detected in a software system have been found. This flaw is dangerous because the system cannot detect it even if it is attacked by a fault. To detect these defects, we have focused on the unique characteristic of the software system, the power consumption pattern. By comparing this unique normal operation pattern with the real-time operation pattern, we thought that we could fully detect the malfunction. This paper proposes 2-dimension graphical string patterning platform and matcher using side-channel analysis(SCA). We designed the monitoring block which is composed of matcher and pattern generator using Chipwhisperer that is open-source platform for SCA. The patterns are generated in run-time and compared with normal operation pattern. By this proposed method, we were enable to detect malfunction in run-time.

9:15 ***Indoor fall detection system for the elderly using passive RFID sensor tags 343***

Koichi Toda and Norihiko Shinomiya (Soka University, Japan)

This research aims at composing indoor fall detection system for the elderly at a nursing home. The system reduces their uncomfortable feeling by avoiding attaching sensors on the human bodies. The proposed system can detect falls of the elderly while walking with passive RFID sensor tags attached to a pair of room shoes in order to monitor their activities. This paper presents a method of data collection, feature extraction and machine learning techniques.

9:30 ***The Applications of Portable Electronic Nose for Indoor and Outdoor Air Quality Assessments 345***

Theerapat Pobkrut, Satetha Siyang, Teerakiat Kerdcharoen and Treenet Thepudom (Mahidol University, Thailand)

The objectives of this work are to demonstrate the capability of the portable electronic nose which has been developed to evaluate the smell in both outdoor and indoor environment. For indoor applications, the performance of indoor air purifier system to clean the cumulated smell in the restaurant has been evaluated by the portable electronic nose with varying the conditions of the air purifier system. For outdoor applications, the portable electronic nose is used for identifying the sources for nuisance smell from the factory which disturb the nearby communities and evaluating the performance of industrial exhaust gas and air pollutant control systems. The results from indoor and outdoor air quality assessments show that the portable electronic nose can provide the digital data of smell which is easier for the users to plan about investment and management of air pollution control systems.

9:45 ***Safety management system in staircase with passive RFID sensor tags 347***

Wattana Banno and Norihiko Shinomiya (Soka University, Japan)

This research proposes a sensor system in staircase for monitoring the abnormal behaviors of the elderly. In this system, passive RFID sensor tags are set on the handrail and the wall of the staircase. Then it can distinguish three states of the elderly such as general, walking, and abnormal ones. The system differentiates the states based on the pressure data of the tags and the Received Signal Strength Indicator (RSSI). The RSSI is the values that show how the tag responses to the antenna in the read- zone. However, the RSSI cannot provide accurate measurement of the distance of the tag. In the future, this research will focus on behaviors analysis method and develop real-time system.

10:00 ***The Efficient Data Classification using SVMcW for IoT Data Monitoring and Sensing 349***

Jin-Wei Jhuang, Tsung-Han Lee and Shih-Yun Huang (National Dong Hwa University, Taiwan); Yao-Chung Chang (Natioal Taitung University, Taiwan); Sheng-Lung Peng and Han-Chieh Chao (National Dong Hwa University, Taiwan)

The developing of the wireless network supports the high transmission data rate and low latency for UEs. Hence, extensive data and application are the main reason for enhancing the usage of IoT. With the IoT device increasing; it means that more data need to be processed and analyzed. In order to reduce the process time and power consumption, we proposed the method of the smart monitor to the director the IoT data, and the Support Vector Machine (SVM) to classify data. By this way, the data process can achieve real-time processing. Besides, to solve the disadvantage of SVM and reduce the training time, we involved the concept of weight in the feature of SVM. Finally, the simulation results show that our method can reduce the training time and guarantee the classifier accuracy.

Session E2: Artificial Intelligence Tools and Applications- I

Room: river hall

Chair: Shih-Yu Li (National Taipei University of Technology, Taiwan)

9:00 ***English learning tool for elders- design of instant fruit identification system with TensorFlow 351***

Hong-Yi Chang, Pei-Lin Liu, Wei-Chun Wang and Tung-Ching Chen (National Chiayi University, Taiwan)

This study utilizes TensorFlow to train the picture recognition model with daily fruit data and provides corresponding English words for pictures. The main purpose of this system is to assist EFL elderly people to learn English without pressure. Although many scholars have used TensorFlow to train the image recognition model to identify many things (such as: daily necessities, food, etc.), the recognition accuracy of this model is still low. Other famous image recognition models, such as Google Image Recognizer has the same problem. Therefore, this study offers a method to improve the recognition degree for better accuracy of the picture recognition model.

9:15 ***Deep Learning Method to Classification Human Protein Atlas 353***

Hong-Yi Chang and Chih-Lin Wu (National Chiayi University, Taiwan)

Image recognition and classification are extremely important tasks in the life sciences. Although machine learning, artificial intelligence, and civic science provide potential solutions to similar problems, how to analyze image data more effectively is a very important issue under the influx of large amounts of data. Now, deep learning becomes a better way to solve such problems. In this paper, some methods of deep learning are expounded, and some analysis of the dataset of human protein maps is carried out. It is hoped that deep learning can accurately identify the images under the microscope and accelerate the development of biomedicine technology.

9:30 ***Convolutional Neural Network for Premature Ventricular Contraction Detection Using Wavelet Fusion on Multi-Lead ECG 355***

Tung Hoang and Wai-Chi Fang (National Chiao Tung University, Taiwan)

Premature Ventricular Contraction (PVC) is one type of cardiac arrhythmia and is correlated with several known heart diseases that can seriously affect daily life of a large number of people. Therefore, detecting PVC using wearable devices is highly needed. In this paper, we investigate and compare two techniques of PVC classification system using ECG signals, first one appending multi wavelets ECG and second one performing a fusion image technique by merging the wavelets decomposition. In this work, we use 2-leads ECG extracted from a 12 leads ECG St. Petersburg Arrhythmia's dataset to detect PVCs. PVCs are classified using Convolutional Neural Network (CNN) and the achieved accuracy is relatively similar of about 99.16%.

Session E3: Communications and Networking Technologies for Future IoT Society- I

Room: peak hall

Chair: Kouji Hirata (Kansai University, Japan)

9:00 ***Detecting IoT Traffic Anomalies in Smart Home Environment 357***

Hung Nguyen-An, Thomas Silverston, Taku Yamazaki and Takumi Miyoshi (Shibaura Institute of Technology, Japan)

In this paper, we propose a novel approach to evaluate risks for Internet of Things (IoT). As the impact of the IoT traffic on the Internet is still largely unknown, we characterize IoT traffic in smart home environment and then generate synthetic IoT traffic in order to compare with IoT malicious traffic. This work is the first step towards understanding the properties of IoT traffic and its impact on the Internet as well as for detecting anomalies in IoT traffic.

9:15 ***User Movement and Content Placement Control with Optimization Problem for Content Delivery Services 359***

Yudai Mori and Takuji Tachibana (University of Fukui, Japan)

In this paper, we propose a control method of user's movement and content placement. In the proposed method, the optimal position of each user and the optimal placement of each content are determined with our formulated optimization problem. With the user's movement and content placement based on the solution of this optimization problem, users can obtain contents quickly and effectively. We evaluate the performance of the proposed method with simulation, and investigate the effectiveness of proposed method by comparing with other methods. Numerical examples show that with our proposed method, users can obtain contents more quickly.

9:30 ***VNF Management with Model Predictive Control for Service Chains 361***

Masaya Kumazaki (University of Fukui, Japan); Masaki Ogura (Nara Institute of Science and Technology, Japan); Takuji Tachibana (University of Fukui, Japan)

By using Network Function Virtualization (NFV), several kinds of network functions can be provided in commercial off-the-shelf (COTS) server. Such network function is called Virtual Network Function (VNF). In terms of the utilization of VNFs, an emerging technology called service chaining enables network operators to provide network services dynamically and flexibly. Here, the number of VNF instances should be managed dynamically according to the amount of traffic. In this paper, we propose a dynamic management of VNF instances with Model Predictive Control (MPC) for multiple service chains. In the proposed method, the number of VNF instances is changed dynamically according to the predicted amount of traffic. We evaluate the performance of the proposed method and threshold method with simulation. In numerical examples, it is shown that the proposed method can avoid data loss with a small number of VNF instances.

9:45 ***Optimal Task Allocation for Minimizing Total Response Time in MEC Platform 363***

Yukiko Katayama and Takuji Tachibana (University of Fukui, Japan)

In this paper, we propose a task allocation method to minimize total response time in Multi-access Edge Cloud (MEC) platform. In the proposed method, we formulate an optimization problem to minimize the total response time for all tasks and the optimal task allocation is decided by solving the optimization problem. We evaluate the performance of the proposed method with simulation and investigate the effectiveness of the proposed method. Numerical examples show that our proposed method is effective for the task allocation.

10:00 ***Evaluation of edge cloud server placement for edge computing environments 365***

Ayaka Takeda (Kansai University, Japan); Tomotaka Kimura (Doshisha University, Japan); Kouji Hirata (Kansai University, Japan)

In edge computing environments, edge cloud servers are deployed in networks in addition to centralized cloud servers to provide high quality services to users. The performance of the edge computing environments depend on where the edge cloud servers are located. This paper introduces some placement methods of edge cloud servers based on optimization problems, which take into account the network loads and the edge cloud server loads. Through numerical experiments, we compare these placement methods.

10:15 ***Estimation method of network availability with convolutional neural networks 367***

Yurina Nagasawa (Kansai University, Japan); Tomotaka Kimura (Doshisha University, Japan); Takanori Kudo (Setsunan University, Japan); Kouji Hirata (Kansai University, Japan)

This paper proposes an estimation method of network availability with convolutional neural networks (CNN). CNN is currently used in many research fields due to its great performance. The proposed method utilizes CNN to estimate the network availability, which represents the strength against link failures. In general, we need much time to calculate the network availability because we should consider all combinations of link failures. The proposed method can estimate the network availability in a short time by using weighted adjacency matrices of nodes as input data to CNN. In this paper, we demonstrate the basic performance of the proposed method through numerical experiments.

10:30 ***Static routing and spectrum allocation for mitigating crosstalk in multi-core fiber networks 369***

Hiroto Kondo (Kansai University, Japan); Tomotaka Kimura (Doshisha University, Japan); Yutaka Fukuchi (Tokyo University of Science, Japan); Kouji Hirata (Kansai University, Japan)

This paper proposes a static routing and spectrum allocation method that mitigates crosstalk, while reducing the number of frequency slots used for lightpath establishment in multi-core fiber optical networks. In the multi-core fiber optical networks, crosstalk occurs when the same frequency slot is used for lightpaths in adjacent cores. The proposed method provides a routing and spectrum allocation strategy based on an integer linear programming. Through numerical experiments, we show the effectiveness of the proposed method.

Session E4: Best Paper Competition

Room: pine hall

Chair: Jing-Ming Guo (National Taiwan University of Science and Technology, Taiwan)

9:00 ***Achieving 3GPP Fairness for LTE-U and WiFi Coexisting Networks in Unlicensed Spectrum 371***

Shuangfeng Fang, Yayu Gao, Chengwei Zhang and Xiaojun Hei (Huazhong University of Science and Technology, P.R. China)

One of the major challenges for the development of next generation mobile communications is how to meet the growing demand of high data rate with the increasingly scarce spectrum resources. In the past a few years, introducing Long Term Evolution (LTE) into the unlicensed spectrum (LTE-U) has attracted extensive attention, where a key question is how to achieve fair coexistence between LTE-U and WiFi under the unlicensed spectrum. In this paper, we study how to adaptively tune the duty cycle to maintain 3GPP fairness between LTE-U and WiFi with the LTE-U duty-cycling mechanism. Based on a unified analytical model, explicit expression of the optimal duty cycle is derived for achieving 3GPP fairness. The analysis is well verified by simulation results, which provides practical insights on LTE/WiFi coexistence issue.

9:15 ***Optimization on Unified Theory of Acceptance and Use of Technology for Driverless Car Test Behavior 373***

Chih-Cheng Tsai (National Kaohsiung Normal University, Taiwan); Li-Chen Lo (National Pingtung University, Taiwan); Yuh-Ming Cheng (Shu-Te University, Taiwan); Shi-Jer Lou (National Pingtung University of Science and Technology, Taiwan)

To demonstrate that the integrated technology acceptance model based on the keras multilayer perceptrons (MLP) has good optimization effects, and predicts the ability of the public to test the behavior of unmanned vehicles more accurately than traditional statistical methods, The training and testing of MLP and SPSS linear regression were compared under 96 valid questionnaires. The results show that when MLP modeling is completed, its MSE=1.191is significantly better than SPSS MSE=1.316, which shows that the model has good prediction effect after optimization training through deep learning.

9:30 ***Modeling and Evaluation of IoT Worm with Lifespan and Secondary Infectivity by Agent-Oriented Petri Net PN2 375***

Shingo Yamaguchi (Yamaguchi University, Japan)

In this paper, we proposed to extend IoT worm called Hajime that fights against IoT malware called Mirai by introducing lifespan and secondary infectivity (the ability to infect a device infected by Mirai). We first proposed a method for modeling the extended Hajime by agent-oriented Petri nets called PN2. This method enables us to represent a battle of Mirai and the extended Hajime as a PN2 model. Then, using the PN2 model, we evaluated the effect of the extended Hajime against Mirai. We found that (i) the higher the secondary infectivity became, the smaller Mirai's infection rate became; (ii) without the secondary infectivity, Mirai's infection rate could not be almost reduced; and (iii) when the lifespan was long, Hajime's infection rate could not be sufficiently reduced.

9:45 ***Energy Efficiency of Broadcast Wireless Channels Under Non-Gaussian Aggregate Interference 377***

Mohammad Ranjbar (University of Akron, USA); Hung Nguyen-Le (The University of Danang, Vietnam); Nghi H Tran (University of Akron, USA)

In this paper, we propose an effective method to calculate the energy efficiency (EE) of a downlink broadcast wireless channel from an access point to multiple users under Gaussian-mixture aggregate interference. The considered downlink model is realistic for future wireless networks, such as cellular and Wi-Fi networks, having multi-tier heterogeneous architectures. In particular, we exploit Kullback-Leibler divergence to evaluate the minimum energy per bit $E_b/N_0_{\min}$ for reliable communication and the wideband slope of the spectral efficiency as a function of energy per bit $E_b/N_0_{\min}$ for different input signaling schemes. The proposed method provides a more accurate baseline for the analysis and design of next generation mobile wireless networks.

10:00 ***Conversation Partner Grouping Based on Speech Contents 379***

Li-Hsien Lin, JianTao Huang, Yi-Ching Lyu and Po-Chuan Huang (Ilan University, Taiwan); Cheng-Wei Wu (National Ilan University, Taiwan)

Conversation analysis plays an important role in social psychology, interpersonal relationship management, and human-care computing. However, few of existing studies considers speech contents for effective conversation partner grouping (abbr. CPG). In this paper, we propose a new framework for conversation partner grouping based on speech contents. Under the proposed framework, we propose two novel algorithms for effective CPG, called CPG-LDA and CPG-LSI, respectively. Both of them use voice recognition tools to convert audio-based speech data into text-based speech contents, and then apply topic modeling and k-means algorithms for CPG. However, the former is based on LDA topic modeling, while the latter is LSI. The experiments show that both CPG-LDA and CPG-LSI have good performance for GPC. More impressively, the proposed CPG-LSI algorithm archives up to 95.83% recognition rate in the experiments.

10:15 ***Classification of Medical Sensitive Data based on Text Classification 381***

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

With the medical informatization, the privacy data of patients in medical big data is gradually increasing, and the sensitivity of data is increasing. Different from traditional medical sensitive data processing methods, text classification technology is proposed for medical information privacy protection, and sensitive data is classified. Experiments have shown the feasibility of using text classification techniques to classify medically sensitive data.

Session E5: Human-Centered Smart Technologies and Applications

Room: orchid hall

Chairs: Nobuo Funabiki (Okayama University, Japan), Hiroaki Nishino (Oita University, Japan)

9:00 *Web-Server Implementation of Code Completion Problem for Java Programming Learning Assistant System* 383

Htoo Htoo Sandi Kyaw, Nobuo Funabiki, Nobuya Ishihara and Minoru Kuribayashi (Okayama University, Japan); Wen-Chung Kao (National Taiwan Normal University, Taiwan)

Java Programming Learning Assistant System (JPLAS) has been developed to advance Java programming educations. JPLAS offers several types of programming exercises to cover different learning levels, including the element fill-in-blank problem (EFP) and the code completion problem (CCP). In CCP, an incomplete source code made by removing some elements is given to a student, and its completion is requested by filling in the missing elements properly. The answer is marked by comparing each statement with the corresponding one in the original code. In contrast to EFP, CCP does not show the locations of missing elements. In the trial, CCP has been implemented on offline JPLAS. Data exchange between a teacher and students in a Java programming course is made using USB memories, which takes large loads. In this paper, we implement CCP on the Web server for online JPLAS by extending the implementation of EFP. As well, the evaluations have confirmed the effectiveness of this implementation.

9:15 *Development of Instructor Support Function for Cloud-based IP Networking Practice System* 385

Seiya Hirahata, Yoshiaki Taniguchi and Nobukazu Iguchi (Kindai University, Japan)

To enable efficient practice of network exercise, we have developed a cloud-based IP networking practice system. In the system, virtual machine and cloud technologies are used so that a student can practice exercise of network construction without using actual network equipments at a remote location. However, since the system was designed for self-study purpose, a student may not resolve encountered problems by asking to an instructor. In this paper, we develop a cloud-based practice system with an instructor support function by extending our previous system. We develop a client for instructors to grasp the exercise progress of students and to provide guidance for students from a remote location. Through experimental evaluations, we confirmed that instructors can use our system to provide guidance to remote students.

9:30 *An Improved Safe Driving Training System Based on Learning of Driving Behaviors* 387

Toshiyuki Haramaki and Hiroaki Nishino (Oita University, Japan)

We propose a new safe driving training system for motorists. This system aims to provide appropriate advice to each driver by measuring the effect while continuing advice for drivers. These sensors detect the movement of the preceding vehicle and the subject vehicle, and the vital sign of the driver. The system then collects and analyzes the changed data and predicts in real time the risk of causing a traffic accident. Based on the result, the system will advise the driver's driving behavior to occur to avoid accidents. After, the system measures changes in the driver's driving behavior by advice. As a result, the system gives better advice by learning outcomes for evaluation.

9:45 *Collaboration Application for Monitoring Daily Behaviors of Older Drivers for Safer Elderly Driving* 389

Nan-Ching Tai, Keng-Ho Lin and Sih-Sian Li (National Taipei University of Technology, Taiwan)

This paper presents a design concept of a mobile collaboration application to ensure safer elderly driving. The tool engages family members to record the daily behaviors of elderly drivers on a shared platform, using the frequency of warning behaviors as an indication to alert the elderly driver whether conditions are suitable for driving.

10:00 *Development of Mobile Application to Reduce Congestion at Taipei Metro Transit Stations based on Behavioral Studies* 391

Chatsarun Aruntanavong (National Taipei University of Technology & None, Taiwan); Nan-Ching Tai (National Taipei University of Technology, Taiwan)

Recurring congestion can be observed in Taipei Metro transit stations during peak commuting hours. This study performed behavioral studies and concluded that congestions can be attributed to passengers looking for the shortest route to exit as well as a majority lining up to use the escalators and causing a slow-moving crowd. Based on the identified patterns, a mobile application that incorporates two major features was proposed to reduce the congestion. The route finder would advise passengers to board the train at specific platform gates to ensure a shortest route to the exits at the destination, while a reward system would encourage passengers to take the stairs and circumvent the delay at the escalators.

10:15 *Study on Application of Synesthesia using Smart Technology* 393

Eiji Aoki (Institute for Hyper Network Society, Japan); Miyuki Oka (Hyper Network Society Institute, Japan)

To classify human sensations, the phrase of "five senses" consisting of vision, hearing, touch, taste, and smell, has been used from olden days. This classification is triggered by the ancient Greeks. However, there are at least nine types or over twenty types of human sensory channels if the classification is considered from a practical standpoint. In the field of smart technology centered on humans, we can not fully utilize this perception. Also, perceptual phenomena that give rise to different kinds of sensations called synesthesia are unknown areas also in computer programming. In this paper, we will verify the possibility of systematization for its application.

Session E6: Advanced Computing Systems and Applications

Room: bamboo hall

Chair: Masaru Fukushi (Yamaguchi University, Japan)

9:00 *A Study on Redundant Computation of Matrix-Vector Product for Fault-Tolerant Neural Networks* 395

Len Yoshida and Haruhiko Kaneko (Tokyo Institute of Technology, Japan)

Dependable computation of matrix-vector product will become important in large-scale neural networks (NNs) used in safety critical electronics systems, e.g., self-driving cars and robot control systems. This paper examines fault-tolerant (FT) computation of matrix-vector product using error control codes defined over the set of real numbers. Simulation results show that, under a faulty computation model, NN with the FT computation provides higher accuracy

compared to NN with naive computation.

9:15 ***Setting Parameters of Inter-frame Differencing for Compressed Moving Images 397***

Tetsuya Tanaka and Yasuyuki Miura (Shonan Institute of Technology, Japan)

Security cameras are installed in cities and facilities to detect intruders, and some of them have moving-object detection. The cameras are installed in various places for various purposes, resulting in cases where moving images may have substantial coding distortion. In this paper, we show experimental results on the setting of appropriate parameters and their conditions in inter-frame differencing and in median filtering of moving images degraded by compression such as H.264.

9:30 ***A study on Inter-Board Data Transmission of FPGA 399***

Naohisa Fukase, Hironobu Handa, Akihisa Furuichi and Yasuyuki Miura (Shonan Institute of Technology, Japan)

In recent years, methods using FPGAs to improve the performance of computers have attracted attention, and configuration methods such as FPGA clusters, which is one of implementation forms, have been extensively researched and implemented. The router circuit used for the FPGA cluster does not have the specific production method, it was also the cause of the increase in research and development effort. In view of these circumstances in recent years, general purpose connection networks used for FPGA clusters are being studied. However, many methods have unique specifications in the interconnection network. Therefore, we aim to develop an interconnection network with high general versatility and extensibility by making it according to the specification of Qsys of Intel® FPGA. In this paper, we have prepared a router circuit to construct an interconnection network, and conducted the operation test. As a result, it was confirmed that it operates normally up to the operating frequency of 150 MHz

9:45 ***Performance Improvement of Region-Based Fault-Tolerant Routing Methods Based on the Passage of Fault Blocks 401***

Yota Kurokawa and Masaru Fukushi (Yamaguchi University, Japan)

Toward the realization of dependable high-end consumer electronics products, a fault-tolerant 2D mesh Network-on-Chips (NoCs) in many core processors has attracted attention. In the previous method, we proposed a new approach to improve performance of a fault-tolerant routing method; packets can pass through faulty elements. In the study, we propose a new fault-tolerant routing method applying the new approach to a fault-tolerant routing method, which exhibits capable of high resource usage rate. This study investigates effect of the approach in reducing network congestion in the NoC. Simulation result shows that our method reduces average communication latency by about 62.8%, compared with our previous method.

10:00 ***A GPU Implementation Method of Deep Neural Networks Based on Data Swapping 403***

Masaru Fukushi and Yuta Kanbara (Yamaguchi University, Japan)

Deep neural networks have attracted a great deal of research attention due to the potential of building efficient classifiers for a variety of recognition problems. The major drawbacks of deep neural networks are significant training time and memory usage. In this paper, we propose an implementation method of deep neural networks using a single GPU based on the idea of data swapping. The proposed method introduces the concept of virtual layer on a GPU and employs multiple virtual layers to reduce the overhead of data swapping between a host PC and the GPU. Experimental results showed that the proposed method reduced the memory usage by about 73% compared with the conventional method and the training time by about 33% by the triplication of virtual layers.

Session E7: Internet of Things Technology for the Next Generation Internet- I

Room: sky hall

Chair: Ming-Fong Tsai (National United University, Taiwan)

9:00 ***Remote Scheduling Control of Smart Appliances Using Internet of Things Technology 405***

Bei-Ying Chen, Nien-Shiang Chou, Ming-Fong Tsai and Yu-Cheng Lin (National United University, Taiwan)

Owing to Internet of Things technology has been widely applied in smart home appliances, remotely controlling home appliance through Android Application is now close at hand. In response to the issues of increased body temperature and falls by pregnant women, improving temperature control and fall detection through the Internet of Things is an important problem. This study utilizes Arduino to integrate infrared transmission and Wi-Fi module to realize re-mote scheduling and implement Android Application and Web Application for users to perform setting. Raspberry Pi embedded systems can combine an accelerometer module to detect fall events with a webhook to observe family members. Based on this approach, this paper presents a smart home appliance control system with remote scheduling to adjust the temperature and to detect fall problems in real time.

9:15 ***Intelligent Toilet Management System with Internet of Things Technology 407***

Wan-Zhen Cai, Nien-Shiang Chou, Ming-Fong Tsai and Yu-Cheng Lin (National United University, Taiwan)

Along with the blooming development and rapid change of Internet of Things technology, implementing its related application in everyday life can improve living quality. When people go out, they usually need to use public toilets. The hygiene would affect experience of people using toilets. To enhance user experience using toilets and reduce waiting time, this study proposes to use Internet of Things to monitor the using status of public toilets for the reference of people using these toilets. Combining Arduino with ultrasonic sensor and button module, it would report the using status of toilets to cloud management system via wireless communication so that users can re-fer to the provided information including using status and hygiene state of toilets to decide whether they want to go to these toilets. Moreover, the Raspberry Pi system is used to process the information returned by each public toilet, and to enable cleaning personnel to understand the environmental sanitation of the public toilet in order to decide whether to go to clean it.

9:30 ***AudioNet: An Audio Frequency Based Wireless Communication Scheme for Wireless Personal Area Networks 409***

Wan-Jung Chang, Yun-Tai Hsueh, Yu-Xiang Zeng, Liang-Bi Chen, Ming-Che Chen and Chao-Tang Yu (Southern Taiwan University of Science and Technology, Taiwan)

This paper proposes a wireless communication scheme, named AudioNet, which is based on the audio frequency (AF) domain modulation/demodulation techniques for wireless personal area networks (WPAN). The proposed AudioNet includes a transmitter and a receiver. The frequency modulation scheme of the transmitter adopts frequency-shift keying (FSK). The Goertzel's algorithm is used to implement the FSK demodulation in the receiver. As a result, the experimental results showed that the proposed AudioNet can be transmitted the text string messages over audio at 32bps.

9:45 ***Optimal Appliances Scheduling of Home Energy Management System Using Dynamic Programming Method for Auto Demand Response 411***

Chien-Kuo Chang, Sheng-Hung Lee, Ruay-Nan Wu and Chung-Heng Lee (National Taiwan University of Science and Technology, Taiwan)

An optimal load shedding method of home energy management system (HEMS) for auto-demand response in residential load is presented. HEMS computes a day-ahead shedding schedule of each smart plug by using dynamic programming for optimal demand reduction. Each smart plug turn-off/on load during demand response event according to the shedding schedule. A case study of 2 hours demand response is performed by using 9 interruptible loads. As result, load shedding is up to 152 WH and the total demand is lower than limitation. HEMS assists human to choose the shedding load and execute turn off and on automatically.

10:00 ***Robotic cooperation and communication control system 413***

Rung-Shiang Cheng (Overseas Chinese University, Taiwan); Chien-Jen Wang, Cyuan-Cheng Chen and Hung-wei Wu (Kun Shan University, Taiwan)

In recent years, robots and the Internet of Things have become popular, and robots and the Internet of Things have begun to slowly enter the relevant applications of smart homes. In order to meet various requirements in home applications, various home-based robots and Internet of Things appliances have emerged into daily life. These family robots are generally independent individual goods. The networked robots can control or view the robot's data status at the most. The robots can only operate independently and cannot communicate, because the Internet of Things means comprehensive. Sexual integration, this study uses iRobot Create2 and YASKAWA DX100 as the basis for the development of intelligent robot control and communication research, and testing feasibility and development.

Tuesday, May 21 10:30 - 10:50

Coffee Break
(Break Area)

Tuesday, May 21 10:50 - 11:50

Keynote Speech II (Raymond Pao)

Room: evergreen hall i

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

Tuesday, May 21 11:50 - 13:00

Lunch
(Lunch Area)

Tuesday, May 21 13:00 - 14:30

Poster Session C

Room: poster area

Chairs: Shih-Lun Chen (Chung Yuan Christian University, Taiwan), Yen-Lin Chen (National Taipei University of Technology, Taiwan)

Chroma subsampling with modifications on luminance and chrominance values 415

Jian-Syuan Tu, I-Hsiu Yu, Bang-Hao Liu, Yih-Shyh Chiou and Shih-Lun Chen (Chung Yuan Christian University, Taiwan); Szu-Yin Lin (National Ilan University, Taiwan); Ting-Lan Lin (National Taipei University of Technology, Taiwan)

For existing methods on YUV420 subsampling from YUV444 image format, the Y is constrained to change the UV values, or the UVs are constrained to change the Y value. We proposed a method of chroma subsampling with changing YUV values at the same time for YUV420 images. We proposed an assumption (observation) to reduce the algorithm complexity. The experimental results show that the proposed work is better than existing state-of-the-art methods by 1.64 dB and 0.61 dB on average in CPSNR (Composite Peak Signal-to-noise Ratio).

Real-Time Face Detection Method Using Wavelet-Based for a Beautification System 417

Tan Shu and Wei-Ming Chen (National Ilan University, Taiwan)

In recently, the face detection is an emerging computer technology. It is a biometric identification that distinguishes organisms from the biological characteristics (fingerprints, palm prints, irises, etc.) of organisms (mainly humans). A real-time face detection and improve the accuracy of detection is present. We use several algorithms to identify faces will be written and we will explore the detection accuracy of the program. It uses a Haar wavelet transform to improve the beautification system to achieve real-time processing, and it adopts the face feature detection method to increase the accuracy ratio. As result, that show the verified on a captured images under several real indoor environments.

Study on the relationship between real-time heart rate variability (HRV) and autonomic nerve 419

Jian-Chiun Liou and Zhen-Xi Chen (Taipei Medical University, Taiwan)

Multi-channel physiological monitoring integrated brainwave artificial intelligence prosthetic arm assistive learning system platform is observed on the cloud with mobile phone. The architecture consists of the most important and most urgently needed monitoring systems and observing the state of physical health. A year-long extension of development research, it including long-term chronic disease, kidney disease, heart disease, cardiovascular disease, and physical disabilities of the community of friends in general daily life care. The advantage of this system is that all pre-hospital prevention work can be done first.

Review and Assessment of Sensors for Wearable Sensing System in Healthcare 421

Kai-Hsiang Yen (Underwriters Laboratories Taiwan Co., Ltd., Taiwan)

A variety of wearable sensing prototypes and commercial products have been produced in the course of recent years, which aim at providing real-time feedback information about one's health condition. Especially, sensor is the key component of wearable sensing systems and is in direct contact with people or even implanted, its safety, reliability, sensitivity and biocompatibility to human tissues are crucial. This study reviews the technologies of sensors and communication in order to provide the appropriate assessment of safety and performance.

Performance Analysis of Optical CDMA Systems With Code Allocation Method 423

Cheng-Yuan Chang, Tsai-Che Chen, Yu-Chia Wang, Wei-Min Yan and Yin-Chen Yen (National United University, Taiwan)

In this paper, a code allocation method is used instead of the traditional "random" allocation method in order to provide the optimal performance for optical code-division multiple-access (O-CDMA) systems. The code allocation method mainly assigns the code matrix to each user by both utilizing the coding properties of multilevel prime codes (MPCs) and following the rule which guarantees these assigned code matrices having the minimum cross-correlation value (i.e., minimize the effect of multiple-access interference (MAI) which caused by the simultaneous users in the system), thus the performance of the O-CDMA system using MPCs as the spreading codes can be improved and optimized.

Low-cost Wearable Eye Gaze Detection and Tracking System 425

Ko-Fong Lee, Yen-Lin Chen, Chao-Wei Yu, Cheng-Han Wu and Chia-Yu Hsiao (National Taipei University of Technology, Taiwan)

This study use headset is adaptable by integration of the elastic mechanism design. This proposed system can effectively extract and estimate pupil ellipse from few camera-captured samples of an eye, and compute the corresponding 3D eye model. Then match the later pupil ellipse to give the possible visual angle. We use multiple points calibration method to solve the related polynomial formula for future angle-to-gaze mapping. The proposed eye tracking algorithms can provide a low-complexity solution and provide high accuracy precision and speed.

High-Order Near-Infrared Image Technology within Smart Medical Care Systems 427

Jian-Chiun Liou and Zhen-Xi Chen (Taipei Medical University, Taiwan)

The human eye can feel the color change of the surrounding things. It is because when the sun shines on an object, although some of the light is absorbed, some of the light is reflected to the human eye through the surface of the object. So we can feel different colors. The part that our eyes can see is called visible light and its wavelength range is about 0.4-0.7 micrometers (μm). The high-order near-infrared wavelength range is approximately (0.76 to 0.90 μm), and imaging technology is used in smart medical care systems. It is used in hemodialysis arteriovenous fistulas, which is a vascular anastomosis operation. In addition catheter ultrasound can be used for minimally invasive cardiac catheterization. It provides a smart cloud-based minimally invasive medical mechanism and drives the research and development of related industries. Arteriovenous fistula types: There are several types of vascular access, the most common being autologous fistulas and artificial blood vessels.

The impact of using FigureNotes for young children with developmental delay on developing social interactions and physical movements 429

Liza Lee (Chaoyang University of Technology, Taiwan); Han-Ju Ho (National Taiwan Normal University, Taiwan); Xing-Dai Liao, Yi-Xiang Liao and Hung-Chi Chu (Chaoyang University of Technology, Taiwan)

Over the past 10 years, the research results of "Holistic Music Educational Approach for Young Children" (HMEAYC) have found that music is a good learning medium for improving the development of children with special needs. FigureNotes is a music teaching method that advocates the usage of music with visual graphics to promote the individual performance of pitches or rhythmic melody. It is obvious that HMEAYC and FigureNotes are both learning modes that expect learners to be able to achieve goal orientation through music expression. The purpose of the study was to explore the relationship between HMEAYC and FigureNotes for children's learning behavior. A non-profit early intervention center in central Taiwan was used as a research site. There were 132 children with developmental delay aged 40-63 months selected as research subjects, and HMEAYC was combined with FiugreNotes for the curriculum design. It was a 16-week study, with 40 minute sessions once per week in a group setting. The research results showed that HMEAYC combined with the FigureNotes method can promote the development of the social interactions and the physical movements of children with developmental delay.

Object-Based Rate Adjustment for HEVC Transrating 431

Shih-Hsuan Yang, Chih-Hung Lin and Hung-Xin Chen (National Taipei University of Technology, Taiwan)

This paper proposes an adaptive transrating algorithm for HEVC (High Efficiency Video Coding) coded videos. Higher bitrates are assigned to identified significant video object blocks and lower bitrates are assigned to the other regions to improve users' viewing quality. The depth information of CUs (Coding Units) of the original high-quality coded video is used for selecting significant video object blocks. Rate adjustment is realized by adjusting the weight of average bitrate and consequently the QP (quantization parameter) in the LCU (Largest Coding Units) level. Experimental results reveal that the proposed object identification method is sufficiently accurate. With a negligible BD-rate increase, the proposed method implemented in single frames increases the PSNR by 0.22 dB in object blocks.

Efficient Intelligent Automatic Image Annotation Method based on Machine Learning Techniques 433

Chao-Wei Yu, Yen-Lin Chen, Ko-Fong Lee and Chen-Hsiang Chen (National Taipei University of Technology, Taiwan)

This study proposes an image automatic annotation method based on machine learning techniques. The method can automatically analyze the unlabeled videos, and extract the interesting samples that the user needs. The new labeled image will be added to the training sets, and the current model will become the pretrained model for our new one, by this method we can improve the recognition performance for various machine learning models. In addition, this research provides a machine learning module interface which allow users to choose proper model, such as SVM or deep learning techniques, in different situation.

Classify contact force within mechanical mold by using film sensors and support vector machine 435

Ching-Yuan Chang and Tsung-Han Huang (National Taipei University of Technology, Taiwan)

This study presents a smart mold equipped with polyvinylidene fluoride (PVDF) and artificial intelligence, which provides structural health monitoring and preventive maintenance for blunt edge of punch. The PVDF sensing system not only provides precision measurement of contact forces between laminated workpieces and mechanical molds, but also probes service life of the mechanical mold. The piezoelectric films have been embedded into gaps between bottom die plates and die holders, retrieving compressive stress during the process of progressive stamping. Sensibility and stability of the piezoelectric films have been verified by using experiments of impact loading and progressive punching. Accuracy of the PVDF sensing system has been demonstrated based on the quantitative comparison between the experimental results measured from piezoelectric sensors and the numerical simulations obtained from finite element method. Theoretical models of feature extraction have been demonstrated and the mathematical functions have been applied to construct hyperplanes of support vector machine. Features of the measured force related to sharp and worn edges of punch and die have been used to train the algorithms of artificial intelligences. On-line services for monitoring extracted features between the punching molds and laminated workpieces have been provided by the embedded system with piezoelectric films.

Evaluation of Digital TV Receivers with Noncompliant MPEG-2 Transport Streams 437

Fabrício Izumi (INdT, Brazil); Bruno Farias (TPV Technology, Brazil); Eddie B de Lima Filho (TPV & Universidade Federal do Amazonas - UFAM, Brazil); Allan Amorim, Orlewilson Bentes Maia and Aguinaldo Silva (TPV Technology, Brazil)

Many broadcasters misconfigure their equipment and transmit wrong information, which causes operation problems in digital television receivers. This article proposes a receiver evaluation scheme based on transport streams with nonconformities, which present incorrect configuration to devices, in order to provide scenarios for robustness improvement.

A Low-Complexity Color Image Compression Algorithm Based on AMBTC 439

Shih-Lun Chen and Hsiao-Hsuan Cheng (Chung Yuan Christian University, Taiwan); Ting-Lan Lin (National Taipei University of Technology, Taiwan); Chiung-An Chen (Ming Chi University of Technology, Taiwan); Lung-Jen Lee (Army Academy, Taiwan); Yih-Shyh Chiou (Chung Yuan Christian University, Taiwan)

In this paper, a new color image compression algorithm based on Absolute Moment Block Truncation Coding (AMBTC) and entropy coding is proposed. The AMBTC improves the compression performance of Block Truncation Coding (BTC) obviously. A novel technique by using eight different types of bitmap tables is developed for the proposed algorithm. In addition, an entropy coding technique combining prediction and Huffman Coding is included in the proposed algorithm and decreased the data amount of luminance images. The experimental results show that more than 82% data amount can be compressed by using the eight different types of novel bitmap tables. Compared with previous studies, this work has better compression performance than previous 4*4 BTC, JPEG and JPEG-LS algorithms.

Applying the stimulus-organism-response model to consumer purchasing behavior in social commerce 441

Chun-Hui Wu and Wan-Ru Wang (National Formosa University, Taiwan); You-Shyang Chen (Hwa Hsia University of Technology, Taiwan); Ping-Lan Juan (National Formosa University, Taiwan)

More and more companies are relying on social media sites to interact with their consumers for building social word-of-mouth and then enhancing consumer purchase intention. As companies continue to invest substantial resources and efforts on social media sites, understanding the influencing factors of consumer purchase behavior in order to increase their performance becomes critical. Thus, this study used the stimulus-organism-response (S-O-R) as a research framework to identify the key factors influencing consumer purchasing behavior in social commerce. Research data were collected from Facebook fan page users who had shopping experience in social commerce. Collected data was analyzed with partial least squares using SmartPLS 3.0 statistical software. Research results show that online word-of-month (S) has significant positive effects on information adoption and trust (O), which, in turn, significantly affect consumer purchasing intention (R).

Applying block-chain technology for commodity authenticity verification 443

Chia-Yu Wen, Shin-Fu Shen and Sheng-Ming Wang (National Taipei University of Technology, Taiwan)

The development of online trading mechanisms has led to the new retail markets for luxury commodities. It also prompts the counterfeit market that caused disputes in the transaction. This study proposes to integrate the decentralization and incorruptible characteristics of the block-chain technology

with service design to propose an innovative service model for the authenticity verification of high-end products. The results show a solution to improve the performance of commodity authenticity verification effectively and efficiently.

Efficient CORDIC Iteration Chip Design of LiDAR Point Cloud Map Reconstruction Technology 445

Yu-Cheng Fan (National Taipei University of Technology, Taiwan); Chiao-An Chu (NTUT, Taiwan); Yi-Cheng Liu (National Taipei University of Technology, Taiwan)

Modern technology is developed very soon in recent years, the automatic driving system is changing every day. Many companies are using LiDAR (Light Detection and Ranging) scanner. Due to the increasing demand for use, this paper will adopt Velodyne LiDAR PUCK-16 (VLP-16) to retrieve data and reconstruct the point cloud maps. In addition, we use the digital chip design flow to decode the collected LiDAR packet data. Then, CORDIC (COordinate Rotation DIgital Computer) circuit is used to transfer the LiDAR packet into three-dimensional coordinates. Because the iteration times of the CORDIC circuit is too time-consuming, this paper will propose an efficient method to choose the angle. We use the angle rotation characteristics in the traditional CORDIC formula, and pre-select the required angle to reduce the number of iterations. This paper can not only reduce the number of iterations but also reduce chip area. The required computing time is also reduced.

Preliminary Study of Bi-directional Data Exchange between OneM2M and LWM2M 447

Chao-Hsien Lee and Zheng-Lin Wu (National Taipei University of Technology, Taiwan)

Most Internet of Things (IoT) platforms may let one IoT standard be able to access another IoT standard's resources. This paper would survey and discuss how to achieve bi-directional data exchange between OneM2M and LWM2M. In other words, not only OneM2M can access the LWM2M resources like the existing works or specifications, but also LWM2M can be extended to access the OneM2M resources.

Modeling of Energy Consumption for Zigbee Nodes with IEEE 802.15.4 TSCH MAC 449

Kai-Wei Ke, Ho-Ting Wu and Jun-Ying Yu (National Taipei University of Technology, Taiwan)

Most wireless sensor nodes are battery operated since they are widely deployed and not easy to have a constant and stable power supply such as AC source. When a sensor node is running out of energy, it will lose of functionalities supposed, including physical quantity sensing and data forwarding for itself and other sensor nodes. This research aimed at a sensor node follows IEEE Std. 802.15.4-2015 time-slotted channel-hopping(TSCH) MAC. The target under-examined is a TI CC2538-based sensor node (board). A specific schedule and measurement were proposed to develop mathematical models of energy dissipation for transmission, receiving, enhanced-beacon (EB) and idle slots, respectively. With the experience, the power consumption of sensor nodes and their lifetime thus can be estimated handled well in practical use.

Fault Diagnosis of Ball Bearings Using SVM Based on Artificial Fish Swarm Algorithm 451

Chih-Jer Lin, Ting-Yi Hsieh and I-Ting Chen (National Taipei University of Technology, Taiwan)

A ball bearing is a very important component for a mechanical equipment, because the performance of mechanical equipment is influenced by the healthy status of the ball bearings directly. In this study, wavelet packet transform (WPT) and support vector machine (SVM) are studied on fault diagnosis of ball bearings according to the experimental database of Case Western Reserve University Bearing Data Center. We analyze four different status of ball bearing based on the vibration signals of the motor, such as the normal condition, with defeat at the inner raceway, with failure ball elements, and with defeat at the outer raceway. First, the vibration signal is transferred by the WPT and the wavelet packet energy spectrums are used for feature extraction. Second, the SVM is used to classify the healthy status of the motor according the pattern recognition. The features obtained using wavelet packet energy spectrum are used to train the SVM for classification of the ball bearing's healthy status. To obtain the optimal parameters of the SVM, the particle swarm optimization (PSO) and (AFSA) are used to find the best parameters. Finally, external samples are input to the SVM for validation of the proposed method.

The Design of an Automatic Body Temperature Regulator 453

Hsin-Han Chiang (National Taiwan Normal University, Taiwan); Yen-Lin Chen (National Taipei University of Technology, Taiwan); Chuang Yue-Ru and Yi-Sung Chen (Fu Jen Catholic University, Taiwan)

This paper proposes a design of an automatic body temperature regulator (ABTR) with a bidirectional buck-boost converter. This system can detect the movement state of human body and the cooling mechanism will activate to lower the body temperature automatically. In contrast, the system can also operate in an opposite way to keep warm for the body temperature. In addition, the adopted bidirectional converter can provide the required power for temperature regulation from the battery, and also can charge the battery from other power source.

CoNet: Compact and Low-Cost CNN for Image Classification 455

Fattah Azzuhry Rahadian (Universitas Gadjah Mada & National Central University, Taiwan); Wahyono Wahyono and Agus Harjoko (Universitas Gadjah Mada, Indonesia); Jia-Ching Wang (National Central University, Taiwan); Chien-Yao Wang (Academia Sinica, Taiwan)

As the number of applications of Convolutional Neural Network increasing, the need for lightweight models to be able to run on embedded devices is also increasing. For that reason, a novel lightweight CNN is designed. Experiment on CIFAR-10 and CIFAR-100 shows that our method outperforms other state-of-the-art model with less parameters and FLOPs.

Implicit Identity Authentication Mechanism based on Smartphone Touch Dynamics 457

Jianzong Zhang and Dan Tao (Beijing Jiaotong University, P.R. China)

Information security has now become an important area of concern. Considering the shortcomings in traditional unlocking ways of smartphones, this paper proposes an implicit identity authentication mechanism by extracting users' touch dynamic characteristics. 86-dimensional features from two types of sensor data (e.g., acceleration and gyroscope) generated when a user unlocks a smartphone are extracted to characterize the user's behavior. Particularly, we adopt three popular classifiers: support vector machine (SVM), K-nearest neighbor (KNN) and random forest (RF) to perform training. Finally, we verify the accuracy of the classifier. Experimental results show that the RF classifier achieves an ideal accuracy rate for passwords with different levels of repetition, and the average accuracy rate is over 98%.

Design and Development of Campus Noise Detection and Rendering System based on Mobile Crowdsensing 459

Xuanwei Guo, Mingnan Wang, Xingguang Liu and Hongbin Sun (BJTU, P.R. China); Dan Tao (Beijing Jiaotong University, P.R. China)

This paper designs and develops a campus noise detection and rendering system based on mobile crowdsensing. This system is mainly divided into two parts: mobile client and server. The former implements task distribution, noise detection and noise map rendering. The latter is responsible for communicating with the mobile client, storing and managing user/task/noise data by using MySQL. A series of functional tests show that our system can realize campus noise detection and rendering easily and efficiently.

An Implicit Authentication Solution based on User's Keystroke Behavior of Smartphone Usage 461

Dawei Dai, Weitian Chen, Shengteng Jiang, Renzhong Wang and Dan Tao (Beijing Jiaotong University, P.R. China)

With the popularity of smartphones, more and more users are accustomed to storing sensitive information related to personal privacy, which puts forward higher requirements for the current authentication system. In this paper, an implicit authentication solution based on user's keystroke behavior of smartphone use is proposed. Firstly, a user's behavior data are collected by three types of built-in sensors in a smartphone. After performing smoothing and normalization processing, we extract temporal features in time domain by using statistical methods. Secondly, various classifiers are used to classify whether a user reflected by features are legal or not. Finally, we do simulations to verify the classification performances of these classifiers, and draw a conclusion that the classification performances of GentleBoost and LogitBoost classifiers are superior to those of others with our experimental dataset.

Privacy-aware Incentive Mechanism Framework for Mobile Crowdsensing 463

Shaojun Zhu and Dan Tao (Beijing Jiaotong University, P.R. China)

The large-scale deployment of mobile sensing tasks can be hindered by the lack of effective incentives for users to participate and protection of users' privacy. In this paper, we propose a novel privacy-aware incentive mechanism framework by introducing a third party as an arbitration center to separate the relevance between users and task data, and thus protect users' privacy. Finally, we evaluate the proposed solution by function verification. Extensive experimental results demonstrate the effectiveness of our solution that contribute to user privacy protection.

Session F1: Advanced Image Processing

Room: evergreen hall i

Chairs: Ting-Lan Lin (National Taipei University of Technology, Taiwan), Takahiro Ogawa (Hokkaido University, Japan)

13:00 ***Underwater Image Enhancement Based on Stepwise Estimation of Transmission and Superpixel Segmentation 465***

YiYing Lu (BeiJing Institute of Technology, ZhuHai, P.R. China)

In order to solve the problem of detail loss and color cast caused by underwater imaging, we propose a novel underwater image enhancement method. We combine a stepwise estimate of transmission with a dark channel prior to obtain more detail from dark areas in underwater images. In addition, we use superpixel segmentation to avoid DCP invalid and white balance to correct color. The experimental results show that our method not only achieves a significant visual improvement, but also has a faster speed than other methods.

13:15 ***User-Specific Visual Attention Estimation Based on Visual Similarity and Spatial Information in Images 467***

Yuya Moroto, Keisuke Maeda, Takahiro Ogawa and Miki Haseyama (Hokkaido University, Japan)

This paper presents a method for user-specific visual attention estimation based on visual similarities and spatial information in images. In order to estimate the user-specific visual attention, the proposed method calculates two kinds of saliency maps. One is constructed as a visual similarity-based saliency map, and the other is constructed by considering spatial information of objects in images. The proposed method performs a fusion of these two maps for considering visual similarities and spatial information. This is the biggest contribution of this paper. Therefore, improvement of the estimation performance of the user-specific visual attention is realized.

13:30 ***Automatic Illumination System for TOF Camera 469***

Yujie Fang (Beijing Institute of Technology & Beijing Institute of Technology Zhuhai, P.R. China); BingHua Su (Beijing Institute of Technology Zhuhai, P.R. China); Xia Wang (Beijing Institute of Technology, P.R. China); Xuedan Pei, Yu Su and Shufen Chen (Beijing Institute of Technology Zhuhai, P.R. China)

Attributed to the ability of three-dimensional scene direct acquisition in real-time, Time of flight (TOF) camera has been developed rapidly. Several products are already active in the consumer electronics market. Such as Mesa Imaging SwissRangers SR4500 and Microsofts Kinect V2. Because of the problem of low resolution and accuracy, all of them are still difficult to be widely used. If these parameters can be further improved, TOF camera will win a place in the field of automatic navigation, machine vision and so on. In this paper, the imaging accuracy error caused by measuring distance and target reflectivity is analyzed. For the problem, that the weaker returned energy from the target is, the worse the imaging accuracy is, we proposed an automatic illumination system (AIS) which includes a distance weighted average metering (DWAM). It can solve the problem of imaging accuracy decline caused by the decrease of returned light energy and improve the dynamic performance of TOF camera.

13:45 ***Convolutional Sparse Coding-based Anomalous Event Detection in Surveillance Videos 471***

Masanao Matsumoto, Naoki Saito, Takahiro Ogawa and Miki Haseyama (Hokkaido University, Japan)

This paper presents a Convolutional Sparse Coding (CSC)-based anomalous event detection method in surveillance videos. The proposed method derives new features from reconstruction errors and sparse coefficient maps obtained by CSC, and the anomalous events are detected by a multi-layer network whose inputs are the above new features. Since such events, i.e., anomalous objects, have different characteristics in the sparse coefficient maps and their corresponding reconstruction errors, successful detection can be expected. Experimental results show high detection performance of own method.

14:00 ***Peer Group and Hybrid Vector Filter for Removal of Impulse Noise in Color Images 473***

Chu Yu, Mao-Wen Chen, Jin-Yu Chen and Jia-Hong Tang (National Ilan University, Taiwan)

In this paper, we propose a peer group and hybrid vector filter for removal of impulse noise in color images. The proposed filter employs two rounds of noise detections and the image restoration. Through the processing of the proposed filter, the noises in images can be efficiently removed, but preserving the edge. When the density of the random-value impulse noise is equal to 10%, the peak signal-to-noise ratio (PSNR) is 31 dB. Although the PSNR of the restoration result is not as expected when the noise density is more than 70%, it can be still recognizable by humans compared with other existing filters. Obviously, the proposed filter can effectively remove impulse noises and preserve the edge of the image.

Session F2: Artificial Intelligence Tools and Applications- II

Room: river hall

Chair: Tu-Liang Lin (National Chiayi University, Taiwan)

13:00 ***Implementation of ransomware prediction system based on weighted-KNN and real-time isolation architecture on SDN Networks 475***

Hong-Yi Chang, Tu-Liang Lin, Tzu-Fan Hsu, Yu-Shiang Shen and Guan-Rong Li (National Chiayi University, Taiwan)

In May 2017, hackers used the ransomware WannaCry to launch large-scale attacks on 150 countries, affecting every industry. According to NTT Security's 2018 Global Threat Intelligence Report, the impact of the ransomware virus increased 350% from 2017. Therefore, detection and control of the ransomware virus has become an important issue for security experts in recent years. Recently, machine learning, deep learning, and artificial intelligence technologies have become increasingly mature. Many companies (such as Google) have introduced software-defined networking (SDN) to replace the original network architecture, traffic routing, and network configuration control management. Therefore, this paper proposes a ransomware prediction system based on weighted-K-Nearest-Neighbor. This system includes the detection and prediction of ransomware packet traffic and design and the implementation of a dynamic isolation system integrated SDN.

13:15 ***Pest and Disease Identification in the Growth of Sweet Peppers using Faster R-CNN 477***

Tu-Liang Lin, Hong-Yi Chang and Kai-Hong Chen (National Chiayi University, Taiwan)

Plant pest control is very important, especially in the early stage. If the plant pests and diseases can be identified earlier, farmers can prevent them in advance and further avoid economic losses. Earlier identification of the pest and disease types can reduce the cost of pesticides. However, correct identification of pests and diseases requires knowledge and corresponding expertise, and this knowledge takes time to accumulate. Therefore, in this study, Faster R-CNN is adopted to develop a knowledge base system that can automatically identify plant pests and diseases.

13:30 ***A Chinese Continuous Keystroke Authentication Method Using Cognitive Factors 479***

Tu-Liang Lin and Yu-Sheng Chen (National Chiayi University, Taiwan)

Everyone has different biometrics, so personal biometrics can be applied to authentication. Moreover, the biological characteristics are not easy to be copied, and the user does not need to memorize and does not need to carry extra things. Biometrics can be divided into two types: physiological characteristics and behavioral characteristics. This study belongs to behavioral characteristics and adopts dynamic keystroke behavior to verify the identity. Many dynamic keystroke authentication methods have been proposed, but most of them are only suitable for English. Only very small numbers of keystroke authentication research are designed for other language (such as Chinese). This study focuses on how to use Chinese keystrokes for continuous authentication. Different persons have different vocabulary usages. The main influence comes from different exposure to different "word frequency" during the learning process. "Word frequency" is the frequency at which words appear in a person's life. Frequency varies due to the individual's life experience. Therefore, if the user frequently enters a word, the user will be more familiar with the input of the word, so the familiarity will be related to the past learning cognition. This study treats this familiarity as a cognitive factor, and explores the impact of cognitive factors on identity verification in Chinese language. This study compares the keystroke authentication with cognitive factors and the keystroke authentication without considering cognitive factors. It is found that the former is more accurate than the latter.

13:45 ***Prediction of Rice Odor by Using an Electronic Nose and Artificial Neural Network 481***

Wandee Aunsa-Ard, Tanthip Eamsa-ard, Theerapat Pobkrut and Teerakiat Kerdcharoen (Mahidol University, Thailand)

Nowadays, artificial intelligence (AI) is the most important technology, which has increasingly gained more popularity in recent years. Most of the industries have already started using AI to gain meaningful insight from large amount of data they already had. These are manufacturing, banking and financial services, retail, energy and utilities, travel etc. In this study, an example of AI tools will be an odor detection device or electronic nose (e-nose), which works as human nose and can predict the odor of wide range of product or application. In this work, a method for prediction of rice odor will be studied by using a radial basis function neural networks (RBF) and an electronic nose. Samples of each variety of rice were analyzed with the electronic nose consisting of eight metal oxide semiconductor gas sensors. To imitates neural networks of human brain for pattern recognition of electronic nose, the artificial neural network based on the radial basis function (RBF) will be used in this study. Principal component analysis (PCA) is used to demonstrate the discrimination capability of electronic nose. Test result has shown, that RBF neural network and human prediction have nearly equivalent scores of odor level. The PCA result has shown four classified rice samples: jasmine rice, white rice, sticky rice and brown rice. In conclusion, the designed electronic nose has a detection capability to distinguish between varieties of rice.

Session F3: Communications and Networking Technologies for Future IoT Society- II

Room: peak hall

Chair: Kouji Hirata (Kansai University, Japan)

13:00 ***Adaptive Channel Selection Control Equalizing Sojourn Time of Sending Uplink and Downlink Flows in Wireless Access Networks 483***

Yosuke Tanigawa, Taku Teramura and Hideki Tode (Osaka Prefecture University, Japan)

Wireless access networks like wireless LANs have been diffused widely. However, as mobile devices and applications increase and become diverse, more devices with various packet generation rates are expected to access such wireless networks. In this paper, in wireless access networks in which wireless stations (STAs) and a base station (BS) communicate directly in a multi-channel environment, we propose novel channel selection control. This proposal adaptively switches the channel, on which each of the STAs is operating, to assign sufficient communication bandwidth to all of the STAs and the BS regardless of their packet generation rates.

13:15 ***Trajectory estimation method using sparsely deployed anchor nodes 485***

Tomotaka Kimura (Doshisha University, Japan); Akira Noguchi (Tokyo University of Science, Japan); Kouji Hirata (Kansai University, Japan); Masahiro Muraguchi (Tokyo University of Science, Japan)

In this paper, we propose a trajectory estimation method using sparsely deployed anchor nodes. Whenever mobile nodes encounter each other, they record the encounter time and ID of the encounter node. Moreover, when they encounter anchor nodes, they forward the encounter records to the anchor nodes. The anchor nodes then send the encounter records to a cloud server. In our proposed method, the cloud server estimates the trajectory of the mobile nodes based on the encounter records, the positions of the anchor nodes, and the average moving speed of the mobile nodes. Through simulation experiments, we show the effectiveness of our proposed method.

13:30 ***Clustering algorithm in vehicular communication based on Fuzzy C-Means 487***

Hai-tao Zhao, Chen He, Huiling Cheng, Xiang Ren, Xuanpei Zhu and Hongbo Zhu (Nanjing University of Posts and Telecommunications, P.R. China)

In order to ameliorate the stability of the network, this paper proposes a clustering algorithm based on fuzzy C-means for VANET (FCM-WCA). The algorithm first determines the neighbor list of the vehicle by calculating the angle between the vehicles, preventing the vehicle from erroneous clustering on the intersecting road. Then, the fuzzy C-means algorithm is used to effectively cluster the vehicle, and the cluster head is selected by using the vehicle moving direction, the weighted mobility value and the entropy as the indicators of the weighted clustering algorithm

13:45 ***An Efficient Dynamic Bandwidth Reservation Method in Content-Centric Network 489***

Fumiya Suzuki (The University of Electro-Communications, Japan); Satoshi Ohzahata (The University of Electro-Communications & Graduate School of Information Systems, Japan); Ryo Yamamoto (The University of Electro-Communications, Japan); Toshihiko Kato (University of Electro-Communications, Japan)

Currently, the Internet has been deployed widely to retrieve and distribute contents. However, since the Internet cannot efficiently deliver contents, Content Centric Network (CCN) has been proposed as new network architecture. Although communication quality control for contents delivery over CCN is also required as the same with the current Internet, the previous methods just relatively assign priority of content and cannot secure the communication quality with considering a content bit rate. In order to solve this problem, we have proposed a bandwidth reservation method of CCN. However, our previous method does not accurately calculate the bandwidth reservation. Therefore, in this paper, we propose an efficient bandwidth control method with using the DATA packet information. In evaluations, we implement the proposed method in CCNx and confirm that bandwidth of the content is guaranteed.

Session F5: Intelligent Healthcare

Room: orchid hall

Chair: Tin-Yu Wu (National Ilan University, Taiwan)

13:00 ***Low-Latency Guarantee of Wireless Body Area Networking for Fall Detection and Protection 491***

Junqing Peng (Huazhong University of Technology, P.R. China); Yayu Gao, Xiaojun Hei and Chengwei Zhang (Huazhong University of Science and Technology, P.R. China)

Falls in the elderly have always been a critical medical and social problem. In a fall detection and protection system, which aims to provide timely protection and assistance when the elderly are about to fall, low-latency communication is a highly demanding issue. In this paper, we consider an IEEE 802.15.6 Wireless Body Area Network with multiple wearable devices transmitting human-related daily flows and urgent fall-detection flows. Explicit expression of the end-to-end delay of urgent fall-detection flows is obtained, and verified by simulation results. The analysis shows that the delay performance can be guaranteed by adjusting the parameters of the IEEE 802.15.6 protocol.

13:15 ***RBAC-HDE: On the Design of a Role-based Access Control with Smart Contract for Healthcare Data Exchange 493***

Raifa Akkaoui and Xiaojun Hei (Huazhong University of Science and Technology, P.R. China); Charles Guo (CloudMinds Technologies, P.R. China); Wenqing Cheng (Huazhong University of Science and Technology, P.R. China)

Recently there have been many emerging innovated Blockchain applications in various sectors including healthcare. In this paper, we propose a role-based access control system, namely, RBAC-HDE, which harnesses the powerful features of Blockchain such as immutability and decentralization, in order to facilitate secure data exchange for healthcare. We design and implement an Ethereum-based testbed to demonstrate the basic idea. Our preliminary results have shown the feasibility and potential of this approach.

13:30 ***Enhancing Fall Detection for Elderly with Smart Helmet in a Cloud-Network-Edge Architecture 495***

Kazi Md Shahiduzzaman (Huazhong University of Science and Technology & Jatiya Kabi Kazi Nazrul Islam University, P.R.

China); Xiaojun Hei (Huazhong University of Science and Technology, P.R. China); Charles Guo (CloudMinds Technologies, P.R. China); Wenqing Cheng (Huazhong University of Science and Technology, P.R. China)

Falls are very important phenomenon to elder citizens because these can create fatal and non-fatal injuries. People with an age of 65 or elder are more risk in random and sudden fall. Due to the short coming and the feasibility of turning the research into commercial product, the existing fall detecting products in the market uses accelerometer sensor, gyroscope sensor data only. Beside, these product has their own network to support emergency call. In this paper, we are going to introduce the smart fall detection system through cloud-network-edge architecture by using data fusion from wearable camera and accelerometer.

13:45 ***Deep Learning Wi-Fi Channel State Information for Fall Detection 497***

Hanni Cheng, Jin Zhang, Yayu Gao and Xiaojun Hei (Huazhong University of Science and Technology, P.R. China)

It is common that the elderly may fall and injure severely. This problem has attracted worldwide attention and becomes a major challenge in the public health care. In the past decade, extensive studies have been conducted to detect fall using wearable sensors and cameras. Given the pervasive WiFi penetration in our daily life, behavior recognition based on the channel state information (CSI) of WiFi signals has shown its potentials in detecting falls for the elderly with less constraint compared with clumsy sensors. In this paper, we conducted a performance evaluation study of three deep learning methods on public datasets to detect falls. The experiment results show that the accuracy of the DL algorithms on Wi-Fi datasets achieves beyond 95% which may generate notable market values. Nevertheless, the long training time of DL models is likely to be the hampering factor before commercialization. Our study may stimulate further research on accelerating deep learning methods in a software/hardware co-design approach.

14:00 ***Understanding Traffic Load in Software Defined WiFi Networks for Healthcare 499***

Sohaib Manzoor, Chengwei Zhang, Xiaojun Hei and Wenqing Cheng (Huazhong University of Science and Technology, P.R. China)

Software Defined WiFi network (SD-WiFi) is a new paradigm that brings programmability into WiFi networks by introducing a centralized network control. SD-WiFi provides access to numerous internet applications such as Video, FTP, HTTP etc. The growth of wireless devices has led to enormous peaks in traffic load especially in health care sector. Understanding load and its relationship to QoS parameters at physical and MAC layers in SD-WiFi still remains an issue. This paper presents a suitable wireless load definition and analyzes the SD-WiFi performance by varying the load conditions. Extensive simulations have been performed to study the performance metrics such as packet loss and latency, through an OpenFlow enabled access point (AP), by changing packet payload and packet generation times. This study can serve as a basis to optimize SD-WiFi and configure parameters for real time applications.

Session F6: Management Decision-Making and Emerged Soft-Computing Techniques for Real-Life Applications

Room: bamboo hall

Chair: You-Shyang Chen (Hwa Hsia University of Technology, Taiwan)

13:00 ***A Theoretical Solution of Groundwater Pollution Transmission Due to Surface Infiltration 501***

Jiann-Mou Chen, Te-Man Tai and Li-Ru Chen (Hwa Hsia University of Technology, Taiwan)

Groundwater pollution is a common serious problem all over the world and an urgent problem need to be solved. Internationally, fast developing countries such as Mainland China, Vietnam, India, etc., in the process of highly industrialization, there are serious groundwater pollution due to surface pollution sources through rainfall infiltration and factories pump pollutions into unsaturated aquifer by water wells. Although many studies have explored groundwater flow pollution simulation analysis but focused on the saturated aquifer and numerical simulations. The purpose of this study is to explore the analytical solution of groundwater pollution in unsaturated aquifers caused by infiltration of surface pollution sources. The theoretical analysis model can be used to explore the scope of groundwater pollution area, which can be used as setting the range of electronic monitoring instruments for government departments to focus on serious groundwater pollution areas.

13:15 ***A Study on Using Mobile Augmented Reality to Learn Interior Design in a Deployment Layout 503***

Cheng-Wei Chiang (Ling Tung University, Taiwan); Chong-Guang Chen (Shu-Te University, Taiwan)

This paper presents an MAR application (Mobile Augmented Reality) for interior deployment layouts and interior symbols learning. Using AR technology, 3D models of virtual furniture on mobile screen can be integrated into the real world In our experiment, the system allowing the user to read interior deployment layouts with 3D models of virtual imagination and easy to recognize interior symbols. Because of this study, for most students, after using the AR learning system, there is a high data on the recognition of deployment layout imaginations and interior symbols. Finally, the participants appreciated the AR learning approach, and the system helps them to do the future works on interior design.

13:30 ***An exploration of cultural differences to learning work values in Japan 505***

Su Fen Chen (Keelung City Government, Taiwan)

The work values are affected by the culture, diversity factors and models, because this topic will affect the competence of global countries. Japan is a special esthetic; therefore, this study aims to explore the Japanese work values. This study attempts to address a number of weaknesses in the extant literature on the relationship between work values, martial, gender and ages in showing theoretical and empirical understanding of the complexes relationship for Japanese. The data came from the WVS in 2014. I limited the scope to one country: Japan. The findings largely support the reliability and content validity, and also finding that the male are more emphasis on socialization than female, married is more emphasis on socialization than unmarried and the work values are no associated with age.

13:45 *On the Study of Shortest-path Problem on Coal-transportation Networks using Dijkstra's Algorithm 507*

Hao-Yen Chang (National Taichung University of Science and Technology, Taiwan); Ping-Feng Wang (Institute for Information Industry Republic of China, Taiwan); Hon-Chan Chen (National Chin-Yi University of Technology, Taiwan); Ye-Zheng Chen and Da-Ren Chen (National Taichung University of Science and Technology, Taiwan)

In this paper, we consider the shortest problem in the coal transportation network of the thermal power plant. The assumed coal transportation network connects a dedicate ship uploaders for the power plant to each coal-fired generators. We analyze the features of existing coal transportation network and construct the minimum spanning tree. To meet the practical use, the operation modes of transportation paths along with their equipment are considered. Finally, we proposed the shortest path routing algorithm and conclude the results.

14:00 *Research on The Performance of Cloud Computing in Rendering 509*

Chia-Long Chang (National Taipei University of Education, Taiwan); Chih-Chen Chen and Ren-Guang Lue (Hwa Hsia University of Technology, Taiwan); Yu-Luen Chen (National Taipei University of Education, Taiwan)

Graphic rendering is a hardware resource hog in computer animation and computing performance can affect the rendering time and quality. If without huge devotion of computing resource, the rendering process will be time-consuming and may not yield a good result. The render farm of the National Center for High-Performance Computing provides significantly greater energy capacity to assist the domestic sectors in industry, government and research to take on high-definition analysis of virtual digital content, as well as advancing to participate in case production of international standard. This study intended to use the new "GPU render farm of R&D shared cluster" as subject to investigate the rendering performance, with result provided to cloud computing operators and users as reference. This study aimed to explore the use of cloud platform or physical host of CPU+GPU to compare the rendering performance, in which the result of the initial test was not as inferior in any respect. Therefore, industries can use the cloud computing platform to achieve the goal of cost reduction.

Session F7: Internet of Things Technology for the Next Generation Internet- II

Room: sky hall

Chair: Ming-Fong Tsai (National United University, Taiwan)

13:00 *Report payment system based on customer analysis 511*

Rung-Shiang Cheng (Overseas Chinese University, Taiwan); Chien-Jen Wang, Wei-Zhi Chen and Hung-wei Wu (Kun Shan University, Taiwan)

This paper discusses the shopping and sales of human beings. The real society needs to go out shopping by itself and evolve into shopping on the Internet. Items will be sent to the home, and the payment flow plays a very important role. The payment flow system can not only Provide consumers with online credit card, and also provide sellers to analyze the status of customers and goods. This paper also provides the profit formula for installment payment, and uses the profit formula to calculate the gross profit.

13:15 *Developing a Care Tracking System for the Elderly and Children 513*

Rung-Shiang Cheng (Overseas Chinese University, Taiwan); Chien-Jen Wang, Zhao-Jun Zhong and Hung-wei Wu (Kun Shan University, Taiwan)

With the rise of O2O, positioning technology has also received much attention and rapid development. In the past, GPS positioning technology has become quite popular. However, the interior is still not in the best condition. Therefore, the technology of indoor positioning has expanded in the academic world. This study developed an application that detects the location of a user. The application combines indoor positioning, iBeacon and GPS with a system mechanism that automatically judges. The user is not allowed to return the latitude and longitude information to eliminate the blind spot of the positioning due to the indoors.

13:30 *Energy Storage Dispatch of Home Energy Management System Using Sequent Quadratic Programming for Peak Shaving 515*

Chien-Kuo Chang, Sheng-Hung Lee, Ruay-Nan Wu and Chung-Heng Lee (National Taiwan University of Science and Technology, Taiwan)

The sequential quadratic programming (SQP) used to solve to the discharge power of energy storage system (ESS) for load factor improvement in residential consumer is presented. The load factor increases due to the peak shaving and off-peak filling of consumption profile by discharge and charge of energy storage system. A simulation of residential user (5 kW) with ESS (1.5 kW/3 kWh) shows that the consumption profile becomes flat and lower peak value. If the large amount of residential users install small energy storage, the effect of load factor improvement can help the power system overcome the problem of reserve margin shortage.

13:45 *Using People Flow Data to Analyze Retail Store Placement - Using Feng Chia University Dining Locations as Examples 517*

Yu-Ying Zhan and Chia-Hui Chou (Feng Chia University, Taiwan); Yi-Chung Chen (National Yunlin University of Science and Technology, Taiwan); Tsu-Chiang Lei and Hsin-Ping Wang (FengChia University, Taiwan); Heng-Yi Su (Feng Chia University, Taiwan)

Launching a new store is one of the most important decisions a proprietor must make, with the placement of the store making the difference between financial success and financial ruin. However, since such decisions are based on data sampling and payroll records, a fully realistic analysis is often not

feasible. Under such circumstances, a faulty analysis may lead to faulty decision-making, which in turn affects the business. In recent years, gradually maturing technology and its various applications have allowed researchers to use data about people flow to model real customer behavior. This paper discusses the analysis of this data as it pertains to the execution of a store launch. To test the efficacy of our methods, we will use the data from Feng Chia University as the basis for our analysis and discuss how to use it to determine a suitable location for the school cafeteria.

Tuesday, May 21 14:30 - 18:30

City Tour

Tuesday, May 21 18:30 - 21:00

Banquet (Evergreen Hall II, Evergreen Resort Hotel)

Wednesday, May 22

Wednesday, May 22 9:00 - 10:30

Session G1: Integrated Circuits Design- I

Room: evergreen hall i

Chair: Ching-Che Chung (National Chung Cheng University, Taiwan)

9:00 ***An Analog to Digital Converter with Divider Design for Temperature Sensors in Image Sensor Core 519***

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

The proposed a 10-bit 60-MS/s time-interleaved pipelined analog-to-digital converter (ADC) with divider by 2 injection-locked frequency divider (ILFD) is successfully designed and implemented. The temperature sensor design presents at image sensor core for 3D depth camera application.

9:15 ***A Class-C 3-phase CMOS Capacitive-Coupled VCO 521***

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

This letter presents a 3-phase class-C current reused voltage controlled oscillator (VCO). The prototype 5 GHz VCO in 0.18 μm CMOS process is implemented to generate signal with 3 output phases and it uses three identical single-ended current reused VCOs in a ring configuration. A dynamic bias circuit is used to reduce the power consumption, and the back-gate BJTs in PMOSFETs are used as a phase coupling device, the circuit oscillates from 4.48 GHz to 5.1 GHz and the power consumption is 3.53 mW at 1.0 V supply voltage. The measured phase noise is -116.52 dBc/Hz at 1 MHz offset frequency from 5.08 GHz. The VCO occupies a chip area of 1.0 × 0.72 mm2 and provides a figure of merit of -185.16 dBc/Hz.

9:30 ***Fully Ion-Implanted 1200V LDMOS with Linear P-top Technology 523***

Lavanya Bandi, Atluri Hemanth, Bhajantri Hemanth Kumar, Adhi Cahyo Wijaya and Gene Sheu (Asia University, Taiwan)

In this paper, fully ion implanted 1200V UHV LDMOS with a linear P-top device has been proposed. The epitaxy layer is replaced by a triple phosphorus ion implantation. The results achieve an on-resistance of lower than 370 mohm.cm2 while maintaining a breakdown voltage of over 1200 volts. The key feature of this device is the linear P-top based on an optimized drift doping profile according to resurf principle. It also shows the reduction of the peak electric field from 2.68e5v/cm to 2.31e5V/cm with the comparison to epitaxy layer. This device can eliminate Vth photo masking and ion implantation processes.

9:45 ***Analyzing Gate-Driven Circuit Parameters for Adding ESD Performances 525***

Shao Chang Huang (Vanguard International Semiconductor Corporation, Taiwan)

In this paper, five device parameters (resistor, capacitor, inverter PMOS transistor, inverter NMOS transistor and ESD NMOS transistor) are discussed as design parameters for acquiring good ESD performances. For the resistor parameter, ESD (Electrostatic Discharge) or I/O (Input/ Output) circuit designers often adopt PMOS transistor as the resistor (PMOS resistor) for reducing IC size. H-spice tool is used for designing the suitable PMOS resistor. However, that the architectures with PMOS resistors can obtain good ESD results, but bad gate-driven circuit characteristics (large triggering-on voltages) is observed. Hence, ESD damaging IC risks with PMOS resistor designs are proposed in this study.

10:00 ***Built-in Self-Test Circuits for All-digital Phase-Locked Loops 527***

Ching-Che Chung, Wei-Jung Chu and Yi-Ting Tsai (National Chung Cheng University, Taiwan)

This paper presents the design of an all-digital built-in self-test (BIST) circuit for all-digital phase-locked loops (ADPLLs). It measures clock jitter of the ADPLL and tests the PLL function blocks. The BIST circuit does not break the PLL loop. The jitter measurement circuit takes a frequency divider as a timing amplifier to linearly enlarge the input jitter. The vernier ring oscillator-based time-to-digital converter quantizes the jitter into digital codes, and the cycle-controlled delay line generates a self-test clock which avoiding using an external reference clock. The proposed BIST circuit for jitter measurement was implemented with standard cells and fabricated in 65nm CMOS process. The measured jitter error is about 11.32% with input frequency range 100-300MHz.

Session G2: Consumer Electronics, Systems, Software and Services for Consumer- I

Room: river hall

Chair: Chiu-Chin Chen (Zhao Qing University, P.R. China)

9:00 ***Forecasting Financial Market Trading Behavior by Physical and Market Profiles 529***

Chiu-Chin Chen and Chia-Chun Liao (Zhao Qing University, P.R. China)

This study applies the back-propagation neural network (BPNN) to compute stochastic (KD), moving average convergence-divergence (MACD), money flow index (MFI), value area rotation factor (VARF) and quantitative market profile data to extrapolate the Taiwan capitalization weighted stock index (TAIEX) futures market logic and knowledge rules. This study compares the experimental group and random trading. The experimental results show the proposed model obtains more profit than random trading. Therefore, integration of market profile and technical analysis can effectively improve forecasting performance and profitability.

9:15 ***Developing Cause-Effect Relational Evaluation Model to Approach Alarm Management System 531***

Chia-Chun Liao and Chiu-Chin Chen (Zhao Qing University, P.R. China)

In recent years, TFT-LCD industry has developed rapidly. TFT-LCD is one of the essentials in daily life, which can be used in TV, laptop and cell phones in the market. TFT-LCD is currently manufacturing process in the event of failure, if it cannot be real-time identified and treatment, will cause the company's production capacity can be reduced. Purchase of alarm management system and can real-time notify the manufacturing process failure to personnel to quickly solve the problem, so that the normal operation of manufacturing systems to play the company's largest production efficiency. This study used the cause-effect grey relational analysis (CEGRA) to analyze the reasons for alarm message, find out its relevance and correct analysis classified. Finally, through CEGRA can help companies master the problem and deal with real-time.

9:30 ***The Effect of Personal Innovativeness on Mobile Payment to Behavioral Intentions Perceived Enjoyment as a Moderator 533***

Chiu-Chin Chen and Chia-Chun Liao (Zhao Qing University, P.R. China); Hsueh-Hua Chen (National Changhua University of Education, Taiwan); Hsing-Wen Milton Wang (National ChangHua University of Education, Taiwan); Zhuo Wu-Xiong (National Changhua University of Education, Taiwan)

Recently, financial technology which becomes a hot issue utilizes into related development, especially for mobile payment. Thus, the study bases on UTAUT3 which seldom reviews before and modifies to become the research framework. In addition, the study investigates the personal innovativeness on behavioral intentions and perceived enjoyment as a moderator. The study proceeds pre-test of the questionnaire, and results show the Cronbach's α of performance expectance, effort expectancy, habit, personal innovativeness, perceived enjoyment, attitude toward using and behavior intentions are above 0.7, which means high reliability. The Cronbach's α of social influence and facilitating conditions are above 0.5, which means it can be acceptance. In short, it shows the questionnaire has the certain accurate.

9:45 ***Symbolic interaction: Customer, Lifestyle and Store APP embedded in WeChat 535***

Hsin-Pey Peng (Zhaoqing University, P.R. China)

E-commerce has been rapidly thriving into massive B2C and B2B electronic platforms in China recently, like Taobao and Jingdong. This article is to explore the current trend Chinese entrepreneurs attempt to open up a sort of mobile e-commerce based on the concept of the industry chain. This new type of mobile e-commerce is essentially introduced by a new style of the virtual store, embedded in WeChat, called 'applets'. It is important to note that WeChat, as the largest Chinese social media with advanced IT infrastructure, has new media's symbolic power to centralize most sources of the social and technology and to integrate most potential customers for its industry partners. My argument is, based on this power, WeChat acts as the specific symbolic form to exercise all possible business models created by its applets. Accordingly, the Chinese entrepreneurs are seeking for greater opportunities to combine B2C and B2B to develop a new integrative business model ushering in a new commercial age.

10:00 ***Comparative Study of LDPC Algorithms for ATSC 3.0 Physical Layer 537***

Yu-Sun Liu (National Taipei University of Technology, Taiwan); Hsien-Wei Mi (National Taipei Univ of Tech, Taiwan); Tsun-Jen Cheng and Shingchern D You (National Taipei University of Technology, Taiwan)

In this paper, we study the performance of the LDPC decoder in the ATSC 3.0 physical layer based on two kinds of likelihood estimation methods, namely, log-likelihood ratio (LLR) and maximum log-likelihood ratio (MLLR), and three decoding algorithms including sum-product algorithm (SPA), min-sum algorithm (MSA), and preferred sum-product algorithm (PSPA). The experimental results show that the performance difference between LLR and MLLR is small, but the difference between SPA and MSA is noticeable. Finally, if no numerical overflow occurs, then SPA has almost identical performance as PSPA, indicating that the overflow prevention capability of the PSPA does not degrade the decoding performance in the experiments.

Session G3: Advancements in Machine Learning Technology, Artificial Intelligence and its Applications- I

Room: peak hall

Chairs: Kathiravan Srinivasan (Vellore Institute of Technology, India), Shabbir Syed-Abdul (Taipei Medical University, Taiwan)

9:00 ***Crowd Density Estimation Using Taylor Expansion and Local Texture Feature 539***

Chih-Chin Lai and Hsien-Chun Chiu (National University of Kaohsiung, Taiwan)

As an effective way for crowd monitoring and safety control, crowd density estimation from images or videos has become an important research topic in visual surveillance applications. In this paper, we propose a crowd density estimation method based on the Taylor expansion to transform the crowd density image into a feature image, and then the most discriminate texture features are extracted from the feature image by using the block-based local binary count operator. The classification is performed by using a support vector machine. Experiments on the PETS 2009 dataset are given to illustrate the feasibility of the proposed approach.

9:15 ***Application of LSTM neural network for consumer electronics stock market*** ***541***

Karan Singh Jodha and Kathiravan Srinivasan (Vellore Institute of Technology, India)

Machine Learning and Artificial Intelligence are few of the technologies revolutionizing financial markets of consumer electronics. In this paper, we explore LSTM neural network implementation on consumer electronic stocks for prediction of future prices based on the identification of contextual dependencies present that results in better performance as compared to a general recurrent neural network. We also present the working of LSTM cell using TensorFlow library.

9:30 ***Emotion Recognition Using EEG Signal Based on Support Vector Machine and Highly Reliable Validation Set*** ***543***

Chang Yuan He (University of National Chiao Tung, Taiwan); Wai-Chi Fang (National Chiao Tung University, Taiwan)

This work aims at building robust model for classifying mental state of human by using EEG signal. We elaborated on how the reliable validation set were built for emotion detection and chose support vector machine (SVM) as the classifier. The results of classification were evaluated by the characteristics observed on the output probability curve. The average accuracy and the maximum accuracy among the subjects of the proposed model achieved 78.28% and 97.50% respectively for the binary-class task.

9:45 ***An Overview into the Aspects of Fake Product Reviews, its Manipulation, and its Effects and Monitoring*** ***545***

Mayank Choudhury (Vellore Institute of Technology (VIT), India); Kathiravan Srinivasan (Vellore Institute of Technology, India)

If you are on Amazon, you might have noticed that it is sometimes difficult to know which products you should purchase. Sometimes they all look alike. There are 500,000,000 (half a billion) product in one location, and they all compete for your attention. But the fact is that most buyers may just click on some, existing at the top of the list. For one of those spots, some sellers are willing to do anything, fake reviews, synthetic sales, even bribes, all violating Amazon rules. This article focuses on all the aspects of reviews on Amazon, like their manipulation, malpractices, effects and monitoring which might have a huge role on which product the customer purchases.

10:00 ***Intelligent Agricultural Farming System using Internet of Things*** ***547***

Vinayak Joshi (Vellore Institute of Technology (VIT), India); Kathiravan Srinivasan (Vellore Institute of Technology, India); S S Mani Vannan (VIT University, India)

In the present world, especially in our own country, farmers, if not rich, have a hard time adapting to the rising prices each day. Intelligent Agricultural Farming System envisages the harnessing of Information and Communication Technologies as an enabler of more efficient, productive, and profitable farming enterprises. Such technologies do not suffice on their own; rather they must be judiciously combined to deliver meaningful information in near real-time.

Session G4: Network Softwarization and Intellization

Room: pine hall

Chair: Chih-Chiang Wang (National Kaohsiung University of Science and Technology, Taiwan)

9:00 ***A Design of Portable Solar-Powered Air-Quality Monitor with Cloud-enabled SafetyWatch Smartphone APP*** ***549***

Chih-Chiang Wang, Ying-Chuan Lai and Chia-Chen Lin (National Kaohsiung University of Science and Technology, Taiwan); Liren Tsai and Jing-Wein Wang (National Kaohsiung University of Applied Sciences, Taiwan)

This paper presents a design of portable air-quality monitor device with a hybrid AC-/solar-powered battery module and a cloud-enabled SafetyWatch smartphone APP. The device is sufficiently lightweight to be transported by person or by bike to an outdoor area and powered solely by its own solar panels. Once started, the device automatically connects to a cloud server, then periodically collects and uploads the ambient air-quality data to the server. Meanwhile, the public can access the air-quality data at the server through SafetyWatch smartphone APP.

9:15 ***Development and Implementation of Solar-Assisted Electric Bicycle with GPS Tracking Service over Cloud*** ***551***

Chih-Chiang Wang, Chia-Chen Lin and Ying-Chuan Lai (National Kaohsiung University of Science and Technology, Taiwan); Liren Tsai and Jing-Wein Wang (National Kaohsiung University of Applied Sciences, Taiwan)

Urban air pollution due to vehicular emissions is now a major threat to the public's health. To address this problem, this paper proposes a design of solar-assisted electric bicycle with GPS tracking service over cloud . Our contribution in this work is twofold. Firstly, our design avoids costly customized devices and adopts commodity electronics and mechanical parts. Secondly, we have actually implemented a prototype of our design as proof of concept. We have also built a cloud-enabled prototype of the GPS tracker and mounted it on the bicycle so that the public can locate the bicycle's GPS coordinates through the accompanied smartphone APP.

9:30 ***RBF Neural Network Sliding Mode Control for Doubly Salient Electromagnetic Generator System*** ***553***

Weili Dai, Rushu Zhou, Yanghua Yu and Yi Zhang (Hohai University, P.R. China)

A radial basis function neural network (RBFNN) sliding mode (SM) control for doubly salient electromagnetic generator (DSEG) system is proposed in this

paper. RBFNN is utilized to approximate the function of DSEG system, the control law and coefficients are deduced based on Lyapunov stability principle. Finally, a field-circuit co-simulation model of DSEG system using RBFNN SM control is established and the simulation results show that DSEG using RBFNN SM control can acquire good steady and dynamic performance.

9:45 ***Robots Solving the Urgent Problems by Themselves: A Review 555***

Dongdong Guo, Li Fu and Lingling Wang (Beihang University, P.R. China)

Recently, more and more robots act as a substitute for humans in many tasks, such as exploring the universe and the deep-sea. In these situations, solving the urgent problems, such as failures and damages of robots, by on-site maintenance is unpractical. Therefore, it is necessary for robots to know how to deal with the urgent problems by themselves. At present, there are lots of extensive and in-deep researches on hexapod robots especially in the adaption methods of leg injury, which have reference meaning to other robots. In order to control the remaining legs of a hexapod robot with leg failure or injury, fault tolerant and artificial intelligence (AI) represented by reinforcement learning and intelligent trial-and-error algorithm were implemented. This paper analyzed the advantages and disadvantages of the two approaches. The results show that the combination of fault-tolerant methods and AI methods can make robots solve their urgent problems better.

10:00 ***Accuracy Improvement of Straight Take-off, Flying Forward and Landing of a Drone with Reinforcement Learning 557***

Jichiang Tsai (National Chung-Hsing University, Taiwan); Peng-Chen Lu and Ming-Hong Tsai (National Chung Hsing University, Taiwan)

Nowadays, drones are expected to be used in several fields, especially flying indoors to explore the surroundings. In this paper, we present a method that uses ArUco markers as a reference to improve the accuracy of a drone on straight take-off, flying forward, and landing based on reinforcement learning (RL). Particularly, the drone first detects a specific marker with its onboard cameras. Then, it calculates the position and orientation relative to the marker so as to adjust its actions for achieving better accuracy with an RL method. We perform some simulation experiments by using the Robot Operating System (ROS) and its Gazebo simulator. Simulation results show that our proposed method can efficiently improve the accuracy of the considered actions.

10:15 ***Smart Home Personalizing Services Based on Adaptive Cloud IOT Devices With Bigdata and Deep Learning Technique 559***

Jain-Shing Wu (University of Nevada, USA); Ming-shen Jian (National Formosa University, Taiwan)

Recently, in order to reduce the consummation of energy, the automation for personal services in a family become popular. Since, every members within one family have their own behaviors, for each family member, the provided services should be also different. Hence, in this paper, we use the adaptive cloud IoT devices, named Intelligent Tetris Switch (ITS), combining with the Bigdata analytics and deep learning technique for providing smart home personalizing services. First the usual energy consummation for all family members are collected. And then, we using the Bigdata analytics to find the hidden pattern in the collected data. Those patterns are used for distinguish the usages of different family members and learned by the Deep learning technique. In the experimental results, we can see the analyzing results of the collected data. At final, the learned patterns are used to predict the usages of the family members.

Session G6: Communication and Information Systems for Next Generation Internet- I

Room: bamboo hall

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

9:00 ***An Improvement of Throughput Measurement Minimization Method for Access-Point Transmission Power Minimization in Wireless Local-Area Network 561***

Md Manowarul Islam, Nobuo Funabiki, Mousumi Saha, Kwenga Ismael Munene and Rahardhita Widyatra Sudibyo (Okayama University, Japan); Wen-Chung Kao (National Taiwan Normal University, Taiwan)

For reducing the energy consumption of wireless local-area network (WLAN), we have studied the transmission power minimization of the access-points (AP). A throughput estimation model is adopted to estimate the minimum power satisfying the required performance after tuning the parameters by throughput measurement results with different powers in the network field. Then, the measurement minimization is essential to reduce labor costs in this approach. Thus, we proposed a method of minimizing host locations for measurements while maintaining the model accuracy. In this study, we present an improvement of this method by limiting measurements at two nearest locations from the AP. The experimental results for IEEE802.11n WLAN show that the number of measurements is reduced by 60 while keeping the throughput estimation error.

9:15 ***A System for Visualizing IoT Device List Based on Captured Frames in Wireless LAN 563***

Yuto Egawa, Yoshiaki Taniguchi and Nobukazu Iguchi (Kindai University, Japan)

Among Wi-Fi devices, IoT devices are less managed compared to mobile devices and they are sometimes forgotten that they have been installed. In this paper, we propose and develop an IoT device list display system for supporting management of IoT devices in a wireless LAN. Our system operates on a laptop PC. In our system, based on captured frames in wireless LAN, the list of Wi-Fi devices connected to a specific access point is automatically obtained. Then, the Wi-Fi devices are classified into mobile devices and IoT devices based on information on frame transmission. Finally, the list of IoT devices is displayed to the GUI. Through experimental evaluations, we confirmed that our system can show the list of IoT devices with high accuracy in a wireless LAN composed of up to 20 Wi-Fi devices.

9:30 ***Development of Consumer Camera-Based Pseudo High-Speed High-Resolution Capturing System Using Phase-Shift Photographing 565***

Kazuyuki Kojima and Hiroyuki Sato (Shonan Institute of Technology, Japan)

In this paper, we develop a high-speed high-resolution camera system for synchronization phenomenon. This method enables high-speed high-resolution capturing even utilizing a low-cost low-specification consumer camera. To realize this performance, we utilize phase-shift photographing technique. In this paper, firstly, we describe our system which consists of a low-cost camera, a lighting system, and a synchronous circuit. Then, we conduct experiments to capture a time-series images with a fuel injection system as an example case. After that, we synthesize an image from a plurality of the captured images. Finally, the availability of the method is confirmed in comparison to the images captured by a higher specification camera.

9:45 ***A Network Device Setting Support System Enabling Dual Check of Operation Command on Remote Site 567***

Natsuya Umegawa, Yoshiaki Taniguchi and Nobukazu Iguchi (Kindai University, Japan)

In the work of network operation management, there are cases where two network administrators are divided into a setter and a checker. The setter changes settings of network devices based on an operation procedure manual and the checker checks the settings so that a command issued to network device is dually checked. However, when the checker is located at geographically remote site, the dual check is not possible. In this paper, we developed a network device setting support system enabling dual check of operation command on remote site. Our system enables sharing of the operation procedure manual and dual checking of operation command between remote sites. Through experimental evaluations, we confirmed that the setter and the checker can change settings of network device between remote sites by using our system.

Wednesday, May 22 10:30 - 10:50

Coffee Break
(Break Area)

Wednesday, May 22 10:50 - 12:30

Session H1: Integrated Circuits Design- II

Room: evergreen hall i

Chair: Yih-Jiun Lee (Chinese Culture University, Taiwan)

10:50 ***Design of a DBN Hardware Accelerator for Handwritten Digit Recognitions 569***

Ching-Che Chung, Yi-Zeng Lee and Huai-Xiang Zhang (National Chung Cheng University, Taiwan)

With the development of artificial intelligence, researches on speech recognition and deep learning become increasingly popular. In this paper, the deep belief network (DBN) hardware accelerator for handwritten digit recognition was implemented in TSMC 90nm CMOS process. Addition, the MNIST database is used as a functional verification for the proposed hardware architecture, and the accuracy of the proposed design is 97.3%. The gate count of the proposed design is 1,160k, and power consumption is 353mW at 73.6MHz. The energy efficiency of the proposed design is 1.7337GOPs/W.

11:05 ***GaN HEMT Oscillator in Phase Locked Loop for Solar-cell and PV Unit application 571***

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

This article presents a low power consumption cross-coupled GaN HEMT oscillator in phase locked loop (PLL) and use gain-boosted charge pump structure. By gain-boosted technique can efficient to reduce the PLL reference spurs. The oscillator consists of two HEMT amplifiers with cross-coupled feedback topology for solar-cell and photovoltaics (PV) unit application.

11:20 ***Low-Power Counter-Based Delay Line Design For DPWM 573***

Cheng-Jie Yang, Ming-Jie Li and Chen-Yueh Liu (National Yunlin University of Science and Technology, Taiwan); Ming-Hwa Sheu (National Yunlin University of Science & Technology, Taiwan); Chi-Chia Sun (National Formosa University, Taiwan)

An efficient low-power counter-based digital pulse width modulation (DPWM) is presented. The architecture design has a bi-direction counter, delay cells and multiplexers. If the delay cells are unselected, they will be gated the clock input to stop their operations. By using the power gating technique, the proposed DPWM improves the power consumption. Compared to the previous digital PWM design, the proposed digital PWM achieves up to 60% power reduction. It is useful for various DC-DC converter applications.

11:35 ***Low-Cost and Fast Design of Precise Activation Functions in Neural Network 575***

Tsung-Chu Huang, Chun-Hao Chiang and Mo-Han Lin (National Changhua University of Education, Taiwan)

Sigmoidal activation functions play a key role in AI accelerators. They have been usually implemented by hyperbolic sine and cosine functions with a division since the CORDIC algorithm was proposed in 1956 and unified in 1971. From all literature it seems that people have never tried the simple algorithm proposed in this paper, in which only a half-domain exponential function is applied prior to a Booth division. More than one half of iterations and area can be reduced. From experimental results, both the area overhead and the power consumption can be reduced to only 1/3. The acceleration in backpropagation and learning rate can then be highly improved.

11:50 ***Acoustic source localization in ocean waveguide based on compressive beamforming 577***

Haiyan Song (Heilongjiang Institute of Technology, P.R. China); Gong Zhang (University of Winnipeg, Canada); Chang-Yi Yang (National Penghu University of Science and Technology, Taiwan)

Source localization in an ocean waveguide is a challenging problem because of the complexity of underwater acoustic propagation. In this paper, a new

high-resolution approach for underwater acoustic source localization is developed, which can be formulated as a sparse representation problem and further converted into a convex optimization problem with sparsity constraints. Different from other conventional Matched-Field Processing (MFP) techniques, our proposed approach makes use of the inherent sparse structure of the spatial localization problem and applies the compressive beamforming technique to the source localization in order to achieve high-resolution ability. Computer simulation indicates the superior source-location resolution of our proposed approach as compared with the conventional MFP technique.

Session H2: Consumer Electronics, Systems, Software and Services for Consumer- II

Room: river hall

Chair: Cheng-Kuang Wu (School of Computer Science and Software, Zhaoqing University, P.R. China)

10:50 ***User's Height Estimation based on Acceleration from Smartphone Sensors 579***

Yusuke Sato (Kogakuin University, Japan); Takeshi Kamiyama and Akira Fukuda (Kyushu University, Japan); Masato Oguchi (Ochanomizu University, Japan); Saneyasu Yamaguchi (Kogakuin University, Japan)

The recent advance of machine learning enabled a variety of estimation data from sensors. In this study, we investigate estimation of the heights of the users of smartphones from the sensed data for a next step of the studies of estimation based on the machine learning. We propose a method for estimating the two-classed height, which is tall or short, by the linear regression. Our evaluation shows that the proposed method estimated the height class with 92% accuracy in case of persons whose heights are far from the median height.

11:05 ***Design of IP to RF Multi-modulation Transmission Platform in Convergence Transmission Network 581***

Sang-Jung Ra (Electonics and Telecommunications Research Institute, Korea); Joon-Young Jung (ETRI, Korea); Han-Jae Im (Huton Co. Ltd, Korea)

This paper presents a transmission platform that operates in convergence broadcasting network. The platform consists of ATSC 3.0 service protocol platform for processing MMT and DASH-ROUTE processing and IP to RF multi modulation platform for supporting transmission methods required for various broadcasting services.

11:20 ***Reducing TCP Errors in Accelerated Application Test in Android OS 583***

Ryosuke Onozato (Kogakuin University, Japan); Takeshi Kamiyama and Akira Fukuda (Kyushu University, Japan); Masato Oguchi (Ochanomizu University, Japan); Saneyasu Yamaguchi (Kogakuin University, Japan)

Analysis of the behavior of smartphone applications is an important task. However, dynamic analysis including actual executions takes a significantly long time. For reducing this time, we proposed a method for accelerating analyses by increasing the speed of the time that was managed in the operating system. However, the errors of communications were not discussed in the previous work. In this paper, we compare the numbers of TCP errors with and without acceleration. We then show that the number of the errors significantly increases by the acceleration. For this issue, we propose a method for decreasing the number of TCP errors by extending retransmit timeout (RTO). We evaluate the proposed method with an actual Android device and show that the method can reduce the number of TCP errors by 63% at most.

11:35 ***A reliable integrated car anti-theft system in VANET 585***

Chin-Ling Chen and Yong-Yuan Deng (Chaoyang University of Technology, Taiwan)

The main purpose of our research is to apply the Arduino platform to design an anti-theft system that incorporates GPS satellite positioning, and use sensors to control peripheral devices in the car to reduce the risk of car theft. The anti-theft tracking allows the user's mobile phone to locate the current position of the car on the Google map immediately, and the reed switch on the door device to determine whether there is an improper external force to open the door, and the anti-theft system activates the front windshield to be completely black.

11:50 ***An intelligent wearable navigation and driving recorder system in VANET 587***

Chin-Ling Chen and Yong-Yuan Deng (Chaoyang University of Technology, Taiwan)

The system transmits the information of the base station through the wireless network device to achieve the effect of transmitting the road condition. After the device starts the driving mode, it starts to receive the road condition information sent by the base station. If the wearable smart car device receives the emergency, it will display and remind the device to remind the driver to pay more attention to the emergency. After the driver sees the warning message, he/she can change the driving behavior in advance to achieve safe driving.

12:05 ***Using Game Theory Approach for Physician Scheduling 589***

Cheng-Kuang Wu (School of Computer Science and Software, Zhaoqing University, P.R. China)

This study proposes a framework for physician scheduling that incorporates two game theory models designed to deploy physician for weekly rostering when raising three threat advisory levels. First, the interactions between a group of weekly outpatients and a physician of outpatient department are modeled as a non-cooperative game, after which an impact value of each physician for outpatient visit is de-rived from Nash equilibrium of game. Second, the impact values of all physicians are utilized for computation of the Shapely value for each physician. The deployment of physician is carried out based on their expected marginal contribution. Then, the model scheduled weekly physicians in outpatient department.

Session H3: Advancements in Machine Learning Technology, Artificial Intelligence and its Applications- II

Room: peak hall

Chairs: Kathiravan Srinivasan (Vellore Institute of Technology, India), Shabbir Syed-Abdul (Taipei Medical University, Taiwan)

10:50 ***Quantum Computing: A Brief Study 591***

Advaitva Gupta (Vellore Institute Of Technology (VIT), India); Kathiravan Srinivasan (Vellore Institute of Technology, India)

This study is specifically about how advancement in physics lead to the exponential growth of computing power and capability. The progress in quantum computing might lead to a computing capability extremely superior to the existing computing performance. Moreover, the performance, massive data processing power and extremely high computational speed of the quantum computer might also become boon for programmers, scientists, and technologists.

11:05 ***Surgical Education using Artificial Intelligence, Augmented Reality and Machine Learning: A Review 593***

Paridhi Khandelwal and Kathiravan Srinivasan (Vellore Institute of Technology, India); Sanjiban Sekar Roy (VIT, India)

The increase in computing power has helped in the advancement of augmented reality, visualization and simulation technology. Medical Sciences is one of the potential areas where AR and Mixed reality can be employed, especially in the field of surgery. The need for simulating emergency like situations to prepare surgeons better is one of the many reasons for using these technologies. Different devices such as HoloLens, Google Glass, Apple AR system and Google ARcore are used to produce such solutions. Not only Mixed Reality but Artificial Intelligence and Machine Learning is helping change medical practice in several ways. From diagnosing diseases to improving individual patient care, to provide safety of the highest level. This Review paper reflects how these three modules of Augmented Reality, Artificial Intelligence, and machine Learning be combined together to form a surgical training system.

11:20 ***Preoperative Virtual Reality Based Intelligent Approach For Minimizing Patient Anxiety Levels 595***

Raja M and Kathiravan Srinivasan (Vellore Institute of Technology, India); Shabbir Syed-Abdul (Taipei Medical University, Taiwan)

According to studies, Anxiety is quite common among the patients preparing to undergo surgery and the level of anxiety differs due to several factors which include the type of surgery to be carried out, patient's past experiences, demographic profile etc. Among all the factors that are associated with the anxiety levels of the patients, the fear of physically getting inside the operation theatre is very common. Though there are several steps taken to explain the operative procedure to patients, they still feel stranded while entering the operation theatre because of which their anxiety levels remain high. This study was carried out to evaluate whether the virtual reality-based solution could reduce patients anxiety before an operation.

11:35 ***Facial Age Estimation based on Discrete Wavelet Transform-Deep Convolutional Neural Networks 597***

Yen-Feng Chen (National Chi-Nan University, Taiwan)

Facial age estimation based on discrete-wavelet-transform deep convolutional neural networks (DWT-DCNN) is a biometric application based on deep learning. Facial age estimation obtains the range of ages of anonymous by taking his/her face images. Deep learning could be the most promising classification/ regression method for a decade. Almost all deep learning architectures including deep convolutional neural networks (DCNNs) cost millions of parameters and large time on training. With the aid of DWT-DCNN, the training period can be reduced, and the number of parameters could drop in some circumstances. Moreover, the experimental result indicates the relationship between DCNNs and traditional edge detection methods can be discovered. Adience has been chosen as the benchmarks.

11:50 ***A Study on Virtual and Augmented Reality in Real-Time Surgery 599***

Rahul K, Durai Raj Vincent PM, Kathiravan Srinivasan, Deepa N and Senthil Kumar N (Vellore Institute of Technology, India)

The development in the healthcare industry is the best happening of this decade and it is a boon for both patients and doctors. As Virtual reality (VR) being used in many applications, this could also be extended to the surgical world. This study is about the potential use of VR and Augmented Reality (AR) in the field of medicine, and how it will train the young surgeons while performing a complicated surgery.

Session H4: Artificial Intelligent and Robot

Room: pine hall

Chair: Jianjun Ni (Hohai University, P.R. China)

10:50 ***Multiple UAVs Cooperative Search Based on Potential Game Theory 601***

Jianjun Ni, Zhengpei Mo, Weidong Cao and Chengming Luo (Hohai University, P.R. China)

Multiple Unmanned Aerial Vehicles (UAVs) cooperative search is a very important and difficult issue in the field of robotic search. In this study, the cooperative search problem is modeled as a potential game, and a modified binary log linear learning algorithm is proposed to solve the mission covering problem of multiple UAVs. In addition, to avoid the UAV wandering problem around the zero utility area, a communication framework is proposed to exchange the information with neighbors. Some experiments are conducted and the results show the proposed method is more efficient.

11:05 ***A novel supervised learning approach based on ε-SVR and SSA: an example of hobbing parameters prediction 603***

Weidong Cao and Jianjun Ni (Hohai University, P.R. China)

An improved method based on ε-support vector regression (ε-SVR) and salp swarm algorithm (SSA) is proposed for the supervised learning problem with small samples. SSA is applied to adjust ε-SVR's setting parameters such as the type of kernel functions, penalty factor and relaxation variables. The feasibility of the approach can be proved by a case study of hobbing parameters optimization.

11:20 ***An immersive VR experience mode design 605***

Yanpeng Li (Jining city, Shandong & Jining Vocational Technology College, P.R. China); Junkai Zhong (Jining Vocational and

Technical College，Shandong, P.R. China)

Vertigo is the biggest problem in the current VR experience. Research shows that the alpha and focal length properties of the panorama are the most important software factors affecting vertigo. An immersive VR experience mode is proposed in this paper:transformation circle mode. Setting the alpha and focal length values with a computer formula, and reducing the mismatch between the visual input and the head movement, can greatly reduce the vertigo.

11:35 ***Design and implementation of intelligent guide system based on LBS 607***

Junkai Zhong (Jining Vocational and Technical College，Shandong, P.R. China); Yanpeng Li (Jining city, Shandong & Jining Vocational Technology College, P.R. China)

In this paper, a design and implementation scheme is proposed for an intelligent guide and positioning system based on Android. The guide system is developed with Android SDK, Baidu Map API and J2EE. Vector weighting algorithm is used to solve the problem of route selection in scenic spots. This can realize the free location of the users in the scenic area and the planning of the best tourist route. So, it can meet the needs of self-guided tourists.

11:50 ***Vehicle Type Recognition Based on Improved Capsule Network 609***

Lan Jia, Hongxia Miao, Bensheng Qi and Jianpeng Wang (Hohai University, P.R. China)

Given that the accuracy of traditional neural network recognizing the vehicle type is not high when recognizing similar type and multiple viewpoints images. A vehicle type image recognition algorithm based on improved capsule network is proposed. Firstly, the coefficients used to weight each votes between capsules of different layers in capsule network are iteratively updated using the Expectation-Maximization algorithm (EM). Then the spread loss is optimized by cross-entropy to make the training less sensitive to the initialization and hyper-parameters of the model and avoid the occurrence of gradient dispersion resulting in a slow learning rate. Finally, the Comprehensive Cars (CompCars) dataset is trained and tested. Experimental results show that the proposed method can effectively improve the recognition rate and robustness of vehicle type recognition.

Session H6: Communication and Information Systems for Next Generation Internet- II

Room: bamboo hall

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

10:50 ***A Shooting and Blending Style Ubiquitous Artwork Editor for Smartphones 611***

Hiroaki Nishino and Kenta Goto (Oita University, Japan)

Wide spread use of smartphones enables human to work, study, and even relax anytime and anywhere. If creative activities such as making artwork can be done on a smartphone just like playing an online game, the smartphone becomes an essential body part. We propose a method enabling users to smartly and easily producing aesthetically pleasing visual artwork using their preferred images. The users only need to select their preferred images taken by an embedded camera or downloaded from free archives on the Internet, and then ask the system to produce a new image with the selected ones. We elaborate the concept, design, implementation method, and preliminary evaluation of the proposed system in this paper.

11:05 ***Reconfigurable Check Node Unit Design of Dual-Standard LDPC Decoding for 60GHz Wireless Local Area Network 613***

Hsin-Hao Su, Tang-Syun Chen and Cheng-Hung Lin (Yuan Ze University, Taiwan)

With the development of multimedia technology, many products require fast data transmission and good quality, such as 4K high-definition video, Augmented Reality (AR) or Virtual Reality (VR). The recent low-density parity check (LDPC) decoder designs were designed for individual implementations of IEEE 802.11ad and IEEE 802.15.3c. In this paper, the same set of key module of LDPC decoder, i.e. check node unit (CNU), is proposed for the both standards. In IEEE 802.15.3c, the hardware usage rate achieves 100% and 90% for the rate-7/8 and rate-1/2 LDPC decoding, respectively, using the proposed CNU design. In IEEE 802.11ad, the hardware usage rate achieves 96% and 90% for the rate-13/16 and rate-1/2 LDPC decoding, respectively.

11:20 ***An Upload and Download Time Shortening Method for Multi-Cloud Content Sharing Systems 615***

Shinji Sugawara and Takumi Murakami (Chiba Institute of Technology, Japan)

This paper improves a multi-cloud content sharing system using RAID and redundancy avoidance technologies aiming at high speed data transmission and capacity efficiency, which was proposed in the previous research of us. However, there remains a room to be modified especially in further reducing of upload and download times, by not using replications of fragmented files. The effectiveness of the improvement is evaluated by numerical computing.

Wednesday, May 22 12:30 - 13:30

Lunch
(Lunch Area)

Wednesday, May 22 13:30 - 15:00

Session I1: Internet of Energy for Advanced Electric Power Consuming

Room: evergreen hall i

Chair: Hisayoshi Sugiyama (Osaka City University, Japan)

13:30 *Conversion of Artificial Neural Network to Spiking Neural Network for Hardware Implementation 617*

Chih-Cheng Lu (ITRI, Taiwan); Yi-Lun Chen and Kai-Cheung Juang (Industrial Technology Research Institute, Taiwan); Kea-Tiong Tang (National Tsing Hua University, Taiwan)

Spiking neural networks (SNNs) are potentially an efficient way to reduce the computation load as well as the power consumption on edge devices because of the sparsely activated neurons and event-driven behavior. In this paper, a continuous-valued artificial neural network (ANN) with fully connections is equivalently converted into spiking operations and the parameters are quantized to low resolution. With the proposed method, data bandwidth can be reduced and the algorithm is proved to be more useful and hardware-amenable on FPGAs. From the simulation results, the ANN with 8- and 4-bit weights received accuracy drop of 0.3% and 0.6%, respectively. The conversion of the quantized ANN to SNN received acceptable error drop within 0.15%.

13:45 *ESD-Reliability Investigation of an UHV Elliptical LDMOS-SCR by the Drain-Side Junction Replacement 619*

Po-Lin Lin, Shen-Li Chen, Pei-Lin Wu, Yu-Lin Jhou and Fan Sheng Kai (National United University, Taiwan)

In this paper, 300 V elliptical nLDMOS DUTs are used as the experimental reference group, and then an architecture of drain side SCR HVNW/HVN-Epi replacement is fabricated for studying the impact of the HVNW/HVN-Epi engineering on the ESD capability. Eventually, the HBM value can be increased from 1125 V to 2250 V as the HVNW layer was replaced with HVN-Epi under the drain-side SCR_npn arranged type. Furthermore, for the drain-side SCR_pnp arranged type, it has the highest HBM-immunity capacity of 5000V when the K value was 1 μm.

14:00 *Evaluation of Actual Radio Noise of Pulsed Power Transmission Detected by Antenna 621*

Hisayoshi Sugiyama (Osaka City University, Japan)

Radio noise intensity caused by a series of electric pulses is evaluated. The pulses are utilized in pulsed power network already proposed as one of upcoming smart grids. In contrast to the power transmission scheme with continuous sinusoidal electric current of very low frequency, pulsed power transmission may affect surrounding field with high frequency radio noises. In this paper, based on the analysis of electric field strength close to the power line, the radio noises generated by electric pulses are roughly evaluated. In contrast to the previous works, where only the peak strength of each component in noise spectrum is considered, actually measured noise strength through a dipole antenna is roughly calculated.

14:15 *Power Flow Management for Smart Grids: Considering Renewable Energy and Demand Uncertainty 623*

Saher Javaid (Japan Advanced Institute of Science and Technology (JAIST), Japan); Kaneko Mineo (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)

The increase in distributed energy resources using renewable energy such as photovoltaic and wind generation systems require new strategies for the operation and management of the electricity because of their intermittent nature, and is uncontrollable. The high proportion of distributed energy resources and uncertainty of power loads makes the power flow and energy management complex. Due to the uncontrollability of these power devices, the power imbalance between generation and consumption is an important issue to be solved. Hence, there is a need to develop sophisticated power flow control systems which can control power flows from distributed power sources to power loads in real-time. This paper presents the power flow control mechanism, which assigns power to controllable power sources and loads, and connections between them to absorb the power fluctuations caused by fluctuating power sources and loads.

14:30 *An Electrical Accommodation in Digital Grid System Using DC Sub-grid 625*

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

This paper presents a DC sub-grid for electrical accommodation in a digital grid system. The sub-grid is composed of a positive DC voltage line and a negative DC voltage line, which are connected to a couple of inverters in the digital grid router. The adaptive hysteresis current control technique is applied to control the sub-grid lines maintaining the voltage at a constant value while to accommodating the given power. The simulation results show that the proposed control algorithm yields stable responses and enable the DGRs to accommodate the given power almost exactly.

Session I2: Computer Communications and Signal Processing for Next Generation Media

Room: river hall

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

13:30 *Bilateral Tele-Rehabilitation System with Electrical Stimulation through Cloud Server 627*

Yasunori Kawai, Kenya Honda and Makoto Koshino (National Institute of Technology, Ishikawa College, Japan)

This paper presents a bilateral tele-rehabilitation system with electrical stimulation. The main contribution of this paper is to use a cloud server to communicate between the therapist and patient by applying hypertext transfer protocol (HTTP). Our tele-rehabilitation system is composed of a paddle and an electrical stimulation system. The therapist provides the force to the paddle, and the lower leg of the patient is then controlled. At the same time, the paddle angle is controlled at the same angle as that of the patient. The stability and transparency are verified experimentally with the cloud server.

13:45 *Operating characteristics of Mouse Type Haptic Device with Slant Wheel System for Haptic Communication 629*

Tsubasa Inoue (Toyohashi University of Technology & Mechanical Engineering, Japan); Takanori Miyoshi (Toyohashi University of Technology, Japan)

In this research, a slant wheel system newly developed as a compact omnidirectional mechanism is mounted on a mouse type self-propelled haptic device. It is confirmed that the motion with the STR motor is both of steering and moving motion. In addition, the slant wheel system is confirmed the omnidirectional movement through experiments. These experimental values are roughly consistent with theoretical values. However, a steering direction error due to the

initial position occurred.

14:00 ***Future Directions and Challenges in Multi-modal Communications with Olfactory and Haptic Senses 631***

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

In this paper, we focus on multi-modal communications with olfactory and haptic senses. We first introduce the challenges (i.e., problems to be solved) in the multi-modal communications. Then, we explain our solutions for the challenges by taking remote ikebana and networked balloon bursting game as examples. Finally, we discuss the future directions of the research on the communications.

14:15 ***A Perfomance evaluation of Finite Capacity Queueing Systems by Machine Learning 633***

Suguru Nii and Takashi Okuda (Aichi Prefectural University, Japan); Yutaka Ishibashi (Nagoya Institute of Technology, Japan)

This paper proposes a performance evaluation method of finite capacity queueing systems (GI/G/s(K) systems). Internet of Things (IoT) data processing systems have to handle massive and many kinds of IoT data. Therefore, it is important for designing IoT data processing systems to evaluate GI/G/s(K) systems. However, in GI/G/s(K) systems, the exact solutions do not exist. The proposed method solves the problem by machine learning.

14:30 ***Human Perception of Group Synchronization Error for Remote Learning: One-way Communication Case 635***

Hay Mar Mo Mo Lwin (University of Computer Studies Yangon, Myanmar); Yutaka Ishibashi (Nagoya Institute of Technology, Japan); Khin Mya (Spervisor, Myanmar)

This paper clarifies human perception of group synchronization error for remote learning by subjective assessment. In our assessment, each subject as a student monitors synchronization of lecture video and teacher's voice and answers whether the synchronization error is perceived or not. Assessment results show that the percentage of subjects who perceived the error starts to increase when the absolute error exceeds about 150 ms.

Session I3: Computer Vision and Applications

Room: peak hall

Chair: Fay Huang (National Ilan University, Taiwan)

13:30 ***3D Street Pole-like Object Detection and Recognition for Self-drive Car Localization 637***

Fay Huang (National Ilan University, Taiwan); Augustine Tsai (Institute for Information Industry, Taiwan); Chi-Hsuan Huang and Han-Sun Kuo (National Taiwan University, Taiwan); Chao-Yu Cheng (National Ilan University, Taiwan)

Unprecedented resources have been devoted for autonomous driving worldwide, and Taiwan is no exception. Self-drive bus trials are undergoing among major cities including Taipei, Taoyuan, Taichung and Kaoshiung. One of the most important tasks for self-drive bus navigation is to localize itself based on landmarks of pre-built 3D semantic maps. This paper investigates street pole-like object detection and recognition from the 3D point cloud data. Both traditional covariance and new AI-based deep learning techniques are used to evaluate the results.

13:45 ***Object Counting Based on its Panoramic Image Representation 639***

Fay Huang and Tzu-Chieh Chu (National Ilan University, Taiwan)

This paper proposes a new object representation using a panoramic image and addresses a SIFT- based matching approach for counting the number of this object in an image. The proposed object panoramic image records the texture information of the object from all (360- degree) directions. Using it as a reference for finding the same object in another image involves the task of feature matching between a cylindrical panoramic and a planar view of the object. The main advantage of using this object representation is that it is possible to derive the orientation information of the detected object in the image. Preliminary experiments were conducted to verify the proposed algorithm.

14:00 ***3D Virtual-Reality Interaction System 641***

Meng-Shiun Tsai, Chingchun Huang and Xin-Yu Huang (National Chung Cheng University, Taiwan)

In this paper, we proposed a system that allows users to interact with the virtual world. Users can interact with 3D virtual objects in first-person perspective through active 3D glasses and 3D screens. The system includes three core algorithms: 1) Fingertip Tracking by OpenPose and Kinect kits. 2) First-person perspective. 3) Interaction between users and virtual objects. We hope that this system can bridge the gap between humans and computers.

14:15 ***Fast Serial Approach of Object Distance Measurement based on Deep Learning and Stereo Camera 643***

Thomas Schumann and Minar Ashiq Tishan (Hochschule Darmstadt-University of Applied Sciences, Germany)

This paper proposes an approach of real time object distance measurement using stereo camera. A convolutional neural network (CNN) detects the objects. The distance to the objects is calculated from the disparity information or depth map. Experimental results show an improvement of runtime of at least 5% compared to fastest published methods.

Session I4: Energy and Environmental Engineering

Room: pine hall

Chair: Yi-Ta Wang (National ILan University, Taiwan)

13:30 ***A unified bandgap dependent model for photovoltaic performance analysis 645***

Subha Mallick (National Chiao Tung University, Taiwan); Durga Dash (National Institute of Science and Technology, India);

Tien-Chang Lu (National Chiao Tung University, Taiwan); Satya Mahato (National Institute of Science and Technology, India)

The solar cell current usually depends upon carrier lifetime, diffusion length, diffusion constant, ideality factor etc. This article proposes a model that shows direct dependency of bandgap in the solar cell current equation. Hence this model is more suitable to analyze the efficiency of multi-junction solar cells in terms of corresponding material bandgaps. It also discusses how our developed model satisfies the experimental results for different single junction and multi-junction solar cells having different bandgaps. Different optimization techniques like Gauss Newton Optimization(GNO), Levenberg Marquardt Optimization(LMO), and Differential Evolution Algorithm (DEA) are used for parameter extraction and optimization. Further result analysis is done on the basis of percentage deviation and error comparison of the model with the experimental data. Complete comprehensive study leads to Differential Evolution Algorithm (DEA) as one of the best optimization technique among all with the smallest possible value of error and minimum percentage deviation.

13:45 ***Maximum Power Point Tracking of Photovoltaic System Based on Reinforcement Learning 647***

Kuan-Yu Chou, Shu-Ting Yang, Chia-Shiou Yang and Yon-Ping Chen (National Chiao Tung University, Taiwan)

Maximum power point tracking technique is often used in photovoltaic (PV) system to extract the maximum power at any environment condition. In this paper, a reinforcement learning based variable step size maximum power point tracking (RL MPPT) method is proposed. Q-learning is used as the algorithm of the proposed methods and is implemented by constructing the Q-table (RL-QT MPPT). A Q-network approach (RL-QN MPPT) is also proposed as a more general representation of the RL MPPT method. Implementing of the algorithm doesn't require the information of the actual PV module in advance, and the proposed system is able to track the MPP offline. With smaller ripples and faster tracking speed, the experiment results of the RL-QT MPPT method and the RL-QN MPPT method are presented.

14:00 ***Performance of Bismuth Modified Carbon Nanotube Composite Titanium Electrode in Advanced Oxidation Process System 649***

Yi-Ta Wang and Yi-Chi Hsieh (National I-Lan University, Taiwan); Yue-Sheng Lin (National Taiwan University of Science and Technology, Taiwan)

Advanced Oxidation Processes (AOPs) is the emerging technology of wastewater treatment, the property of electrode plays an important role in the performance for this system. Titanium (Ti) is a suitable material to apply in Advanced Oxidation Processes because of chemical stability, the Carbon Nanotube (CNT) has good electrical conductivity and high specific surface area, and Carbon nanotube modified by Bismuth (Bi) will provide the electrode to get the function of optimization for the electrochemical property. In this study, Carbon Nanotube (CNT) with modified by Bismuth (Bi) were prepared by electrodeposition, and make composite coated on the surface of Titanium (Ti). The electrodes were prepared under different electrodeposition time to analysis the texture and electrochemical properties. Rhodamine B (Rh B) dye used as test reagent to analysis the performance in the Advanced Oxidation Processes, the experiments included: Scanning Electron Microscope (SEM), X-ray diffraction (XRD), contact angle analyzer, and the property for electrochemical was measured by cyclic voltammetry (CV). It was show that the composite electrode prepared by electrodeposition for 5 minutes, the contact angle was 21.6˚ with the best hydrophilic property. In the cyclic voltammetry test, the electrode obtained that the coefficient of electron transfer achieved to 31.6 (k'), which is 3.16 times of the Titanium electrode; As compared with the titanium electrode, the experiment for decolor the Rh B dye shows that the reaction rate can increase by 2.86 times. In summary, the Carbon nanotubes modified by Bismuth composite coated on the titanium electrode will improve the efficiency in Advanced Oxidation Processes, and the electrode has high potential for development in the future.

14:15 ***Cell Temperature and Reactant Humidification Effects on Anion Exchange Membrane Fuel Cells 651***

Hsiharng Yang (National Chung Hisng University, Taiwan)

The cell performance of an anion exchange membrane fuel cell (AEMFC) under various operating conditions including cell temperature and reactant humidification has been systematically investigated. The experimental results indicated that the AEMFC is highly sensitive to cell temperature and inlet gas humidification. The cell performance can be significantly improved by elevating cell temperature and optimizing the gas dew points. As excess inlet gas humidification at anode occurs, flooding is less severe at higher cell temperature because water transport in gas diffusion substrate (GDS) by evaporation is more effective at higher cell temperature operation. Although, the cell performance is slightly affected by oversupply of cathode humidification at higher cell temperature owing to more water consumed and transported by electro-osmotic drag effect under high current conditions, it noticeably decreases due to dehydration of AEM and water shortage for ORR with under-humidification at cathode, especially at low cell temperature. Back diffusion have a little benefit for improving cell performance. The results can provide useful insights for the development of AEMFC systems.

Session I5: Intelligent Multimedia Processing and Understanding- I

Room: orchid hall

Chairs: Li-Wei Kang (National Yunlin University of Science and Technology, Taiwan), Chih-Yang Lin (Yuan Ze University, Taiwan)

13:30 ***Deep Learning based Moving Object Detection for Video Surveillance 653***

Chih-Yang Lin (Yuan Ze University, Taiwan); Han-Yi Huang and Wei-Yang Lin (National Chung Cheng University, Taiwan); Chien-Cheng Lee (Yuan Ze University, Taiwan); Chuan-Yu Chang (National Yunlin University of Science and Technology, Taiwan)

This paper proposes a new two-stream neural network which combines the traditional background modeling method with a deep learning network to detect moving objects. The input for the deep neural network is the original image and its corresponding foreground image, while the output is the bounding boxes of the moving objects in the image. Traditional CNN methods cannot distinguish moving objects from static objects, but the method in this paper successfully solves this problem.

13:45 ***Rat grooming detection using random forest classifier 655***

Chien-Cheng Lee and Wei-Wei Gao (Yuan Ze University, Taiwan); Ping-Win Lui (Taichung Veterans General Hospital, Taiwan); Chih-Yang Lin (Yuan Ze University, Taiwan)

A rat grooming behavior detection method using video processing and random forest classifier techniques is proposed. A camera is mounted above the rat cage to capture the rat video. Video frame differences are calculated to form time series, and several time series features are extracted from the time series. Then, a random forest classifier is used to classify the grooming activities. The experiment results demonstrate that the grooming activities could be recognized with extremely high accuracy more than 96% using our proposed method.

14:00 ***Adaptive Vehicle Detection and Classification Scheme for Urban Traffic Scenes Using Convolutional Neural Network 657***

Po-Chyi Su, Dao-Wei Yang, Hsin-Tzu Wang and Yu-Jung Chen (National Central University, Taiwan)

A large number of digital cameras have been installed at intersections in urban areas to help monitor traffic conditions. Making better use of scenes captured by these traffic surveillance cameras facilitates the construction of advanced Intelligent Transportation Systems (ITS). This research aims at developing an adaptive vehicle detection and classification scheme for urban traffic scenes, which collects roadside surveillance videos from publicly available sources. The proposed scheme consists of two main phases; the first phase is to collect some traffic surveillance images for training a general model using Faster R-CNN. The second phase utilizes background subtraction to extract vehicle proposals. A sufficient number of vehicles are collected by comparing proposals with the detection results by the general model. Collected vehicles are superimposed on the constructed background in an appropriate order to achieve semi-automatic generation of annotated training data. The training data are used to acquire a second-phase adaptive model. The experimental results show that the proposed scheme performs well and can handle vehicle occlusion problems.

14:15 ***Data Embedding Technique in Encrypted Image Using Hamming Coding 659***

Yi-Hui Chen, Hsin-Pei Wu and Wei-Liang Liaw (Asia University, Taiwan)

Image encryption is a solution to prevent the personal privacy leakage in images. While the encrypted images increasingly stored in could sever, it is difficult to get the exact image because the encrypted image are meaningless. To conquer the difficulty, the queried indices are embedded into the encrypted images. After extracting hidden indices, the image can be found by searching the extracted indices.

Session I6: Computers Technology and Applied Science Education

Room: bamboo hall

Chairs: Yuh-Ming Cheng (Shu-Te University, Taiwan), Mong-Fong Horng (National Kaohsiung University of Science and Technology & National Kaohsiung University of Applied Sciences, Taiwan)

13:30 ***Exploration of usage behavioral model construction for university library electronic resources from Deep Learning Multilayer perceptron 661***

Wei-Hsiang Lin (NPUST, Taiwan); Sung-Shan Chang (Kaohsiung Medical University, Taiwan); Pomin Li, Tzu-Ting Chiu and Shi-Jer Lou (National Pingtung University of Science and Technology, Taiwan)

The main purpose of this study is to use the multilayer perception (MLP), an operation method of deep learning, to predict reader's behavior intention and the quality of use behavior generated from the electronic library service quality of the university library. A questionnaire was built based on the quality of network electronic resource services and the theoretical structure of Unified Theory of Acceptance and Use of Technology (UTAUT). Combining both public and private university students from four-year universities and two-year masters in Taiwan, 1,206 questionnaires were issued, and 1,071 valid questionnaires were collected. The predicted results of the MLP were based on Pearson coefficient, with the calculated results using SPSS statistical method. Results shown from applying calculation method using MLP can accurately predict the usage behavior of 90.75% or more. According to the practice, MLP regression models can be applied to the construction of library electronic resources, such as the addition of electronic multimedia resources, or the choice of books in the future.

13:45 ***Predicting the success rate of natural spontaneous delivery through deep learning 663***

Jen-Hsing Wang (National Kaohsiung Normal University, Taiwan); Shi-Jer Lou (National Pingtung University of Science and Technology, Taiwan)

The ability of women to give birth naturally, especially women who have never done so, is a complex problem for obstetricians and gynecologists. At present, no effective method of predicting whether natural birth for first-time lying-in women will succeed is available. In this study, we analyzed 56 first-time lying-in women in 2017 and 2018 at Antai Tian-Sheng Memorial Hospital, namely 38 women who underwent natural delivery and 18 who underwent cesarean section. We collected data on the ages, heights, weights of these women and the weights of their newborns as feature values; delivery methods, namely natural delivery and cesarean section, served as label values. In this manner, a Keras multilayer perceptron two-element prediction model was established. In this model, the accuracy of predicting the delivery method was over 90%. Thus, the preliminary analysis results obtained through deep learning to predict delivery methods among lying-in women were insightful. We intend to follow up this study by recruiting more participants and collecting more data for this model of analysis; satisfactory results are expected.

14:00 ***Deep Learning of Web Page Verification Code-taking Project for Implementation of Remedial Instruction-Technology-Base Test Website as an Example 665***

Yang-Che Chen and Min-Hua Chiang (National Kaohsiung Normal University, Taiwan); Yuh-Ming Cheng (Shu Te University, Taiwan); Shi-Jer Lou (National Pingtung University of Science and Technology, Taiwan)

This study using Python integrates tools such as Selenium, Pillow and WebDriver for Chrome, automatically logs in to the web page -Project for implementation of remedial instruction-technology-base test website to capture graphic verification code image, and uploads to Google Cloud Vision API which provide pre-trained models. The deep learning model recognizes the content and reads the text in the picture. The result is more than 80% recognition rate successfully login to the website.

14:15 ***Study on the application of deep learning to the prediction of disaster prevention literacy in technical high school civil engineering department 667***

Yuan-Min Chu and Kuang-Yi Lee (National Kaohsiung Normal University, Taiwan); Shi-Jer Lou (National Pingtung University of Science and Technology, Taiwan)

Taiwan's education authorities in order to achieve the goal of sustainable development. Promote the "Perpetual Campus Promotion Plan". Achieving a sustainable campus environment that meets the goals of ecology, environmental protection, health and energy conservation. The Sustainable Campus Promotion Program promotes disaster prevention education and campus safety by understanding campus geography, history and ecology. This research area takes a technical high school in Kaohsiung City as an example. The research method is based on the questionnaire survey method of all students in the civil engineering department and conducts related disaster prevention education surveys. Through the research results, we can understand the degree of disaster prevention literacy of students. Use deep learning MPL (Multilayer Perception Mode) to understand correlations in different facets. Study the accuracy of the prediction model and the variation effects of the analysis parameters. And compared with SPSS software analysis results. Improve students' disaster prevention and create a diverse and unique sustainable campus environment.

14:30 ***The Implementation of the 12-Year Basic Education Science and Technology New Curriculum Guidelines in the Primary School 669***

Yang-Che Chen and Min-Hua Chiang (National Kaohsiung Normal University, Taiwan); Vincent Ru-Chu Shih and Shi-Jer Lou (National Pingtung University of Science and Technology, Taiwan)

The Science and Technology is a new learning field for the 12-year Basic Education Curriculum. It includes "Living Technology" and "Information Technology" to normalize the curriculum and teaching to nurture whole-person development. Because Science and Technology field is not a domain learning curriculum in primary school. This study using literature collection and experience at the work site to explore the possible difficult when implement Science and Technology field in primary school by curriculum development, teaching implementation and teaching resources, then make recommendations.

14:45 ***Research on predicting students' learning effectiveness with deep learning mode 671***

Kuang-Yi Lee and Yuan-Min Chu (National Kaohsiung Normal University, Taiwan); Shi-Jer Lou (National Pingtung University of Science and Technology, Taiwan)

This paper builds a model using the multi-layer perceptron (MLP) of artificial intelligence "deep learning". Use the relevant family background information provided by US high school students when enrolling in school, Such as gender, race, education level of parents, economic conditions of students, whether to participate in exam preparation courses and other factors. Used to predict the effectiveness of student learning. The number of students is 1,000. Select at random 95 percent of the student data as a training group, 5 percent of the students as a group to predict. After the MLP model through training and learning. Under the standard of 100 points. Predict student achievement and actual test scores. Verification using the mean absolute deviation (MAD) commonly used to evaluate prediction accuracy. After the statistics, the average difference score was found to be less than 10 points. The results of this study show that the MLP prediction model can help teachers to find out early students who need remedial teaching. To assist students in effective learning.

Wednesday, May 22 15:00 - 15:20

Coffee Break
(Break Area)

Wednesday, May 22 15:20 - 17:00

Session J1: ICT-enabled Smart Power Electronics

Room: evergreen hall i

Chairs: Chin Hsia (National Central University, Taiwan), Yen-Chung Huang (Industrial Technology Research Institute, Taiwan)

15:20 ***Envelope Modulator Design based on GaN Switching Buck Converter using Constant-on-Time Controller 673***

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

Envelope tracking technology provides the potential for achieving high efficiency in power amplifiers for nextgeneration wireless transmitters with high peak-to-average ratio signals. Envelope modulator with high fidelity, high efficiency, and wide bandwidth are critical components for the widespread application of envelope tracking. This paper presents the design of a constant-on-time controlled envelope modulator for applications in small base-station power amplifiers. The envelope modulator employed a linear assisted switching buck converter to achieve high efficiency and wide bandwidth. The GaN-based switching buck converter was coordinated together with a wideband linear amplifier using a current-sense constant-on-time (COT) controller. For a variety of signals ranging 5 MHz to 20 MHz bandwidth and up to 8.8 dB modulation signals, the efficiency of the modulator reached larger than 75 %.

15:35 ***Channel- & Drift Region's STI-Lengths Impacts of ESD Immunity in HV 60 V nLDMOS Devices 675***

Fan Sheng Kai, Shen-Li Chen, Yu-Lin Jhou, Pei-Lin Wu and Po-Lin Lin (National United University, Taiwan)

In this paper, the channel length and drift region's STI length modulations have been realized by a TSMC 0.25-μm 60-V high voltage n-LDMOS process to evaluate its ability of ESD improvement. It can found that both the channel length and drift region's STI length modulations can improve the ESD capability of nLDMOSs. With the channel-length extension, the secondary breakdown current (It2) can be increased from 1.89A to 2.23A (improved 17.99%) compared to the reference device; and with the STI-length extension of the drift region can be upgraded the value of It2 from 1.89A in the reference group to 2.13A (improved 12.7%). It is because that the length of channel and STI increasing, the higher series resistance of this element can suppress the ESD transient current, it is also resulting in source and drain electrodes not easy to fail for the contact spiking, which makes the secondary breakdown current (It2) improved.

15:50 ***An Empirical GaN HEMT DC Model for Power Converters 677***

Ting-Chieh Lin, Chin Hsia and Deng-Fong Lu (National Central University, Taiwan)

This paper presents an empirical equation-based DC device model of GaN-on-Si high electron-mobility transistors (HEMTs), amenable for applications in high performance integrated circuit design into power converters. The output current and the derived trans-conductance based on the fitted equation coefficients were compared with the measured data of the GaN HEMT. A linear regulator design based on the investigated GaN devices was used to validate the derived model.

16:05 ***Multiple-Channel High-Voltage Power Drive Circuit for Medical Ultrasound Scanners 679***

Yen-Chung Huang, Kuo-Tso Chen and Kuan-Yi Lu (Industrial Technology Research Institute, Taiwan); Chin Hsia and Yi-Chi Hsiao (National Central University, Taiwan)

The paper presents a 4-channel power drive circuit for medical ultrasound scanners using 0.5 μm CMOS SOI technology. The power driver consists of level shifters, predriving circuits, and a high-voltage push-pull output stage. The level shifters shift the input low-level transmit signals to high positive and negative voltages to drive the output stage, while an auxiliary circuit was designed in parallel with the main power driver to help quickly return to a zero-voltage level at the output. The power driver can produce larger than 100 Vpp output pulses with rising and falling times of 25 nsec and 18 nsec, respectively, under a 1-KΩ resistance in parallel with a 220-pF capacitance load. Experimental results exhibit the capability of the designed 4-channel power drive circuit can support ultrasound scanners for a wide range of voltage operations.

16:20 ***An Integrated OTA with Complementary Slew-rate Enhancer for Doppler Ultrasound System 681***

You Ching Wu and Chin Hsia (National Central University, Taiwan)

The paper designs a linear driving circuit for medical ultrasonic probes, which can be applied to Doppler blood flow velocity sensing equipment. In order to excite the ultrasonic probe impedance up to 6 nF and achieve low static power, low harmonics and high frequency voltage output, we proposes a complementary slew-rate enhancer architecture to improve the slew-rate of a rail-to-rail two-stage trans- conductance amplifier. The proposed architecture was implemented using 0.5 μm CMOS process with a supply voltage of 5 V. The slew-rate can achieve 49 V/μsec at static power dissipation of 0.9 mW. The measured 2.5 MHz sine wave output has a total harmonic distortion of less than 5%.

Session J3: Smart Circuits and Security Systems

Room: peak hall

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

15:20 ***Hardware Implementation for Multiple Activation Functions 683***

Chih-Hsiang Chang, Hsu-Yu Kao and Shih-Hsu Huang (Chung Yuan Christian University, Taiwan)

In a neural network, the activation function defines the output of that node. In this paper, we propose a novel hardware implementation for AI hardware accelerators to support three popularly used activation functions, including Hyperbolic Tangent, Sigmoid and ReLU. Based on this hardware implementation, the users can configure the activation functions of nodes at the execution time. Therefore, a higher flexibility for AI hardware computation can be provided. Implementation results show that the proposed hardware works well in practice.

15:35 ***Machine Learning Techniques for Building and Evaluation of Routability-driven Macro Placement 685***

Wei-Kai Cheng and Chih-Shuan Wu (Chung Yuan Christian University, Taiwan)

Routability evaluation in macro placement is a very important issue in the physical synthesis of VLSI design. In this paper, we propose to use two different machine learning methods simultaneously in the evaluation process, with the goal of exploring potential connections to improve the prediction accuracy of machine learning models. The method is integrated into the physical design flow and predict routability effectively during the placement stage to avoid infeasible design in the detailed routing stage. Experiment results show that our evaluation is accurate and effective.

15:50 ***IC Camouflaging by Using Universal Gates under Timing Constraints 687***

Po-Chieh Chang and Shih-Hsu Huang (Chung Yuan Christian University, Taiwan)

IC (integrated circuit) camouflaging can increase the difficulty of reverse engineering. Previous work performs the IC camouflaging by using camouflaged NAND and NOR cells. In fact, since NAND and NOR are universal gates, we can further replace other gates by NAND or NOR cells for IC camouflaging. As a result, the difficulty of reverse engineering can be further increased. Based on that observation, in this paper, we propose an effective approach to replace other gates for IC camouflaging under timing constraints. Benchmark data consistently show that the proposed approach works well in practice.

16:05 ***Framework for Cloud Database Protection by Using Reversible Data Hiding Method*** ***689***

Guan Yu Wu and Che-Wei Lee (National Kaohsiung University of Science and Technology, Taiwan)

A new framework of data security for database numeric data by using reversible data hiding method is proposed. In the framework, reversible data hiding (RDH) methods are recommended to encode the to-be-protected numeric data in databases for hiding copyright information. Via the use of the proposed framework, not only the values of leaked numeric data are unreal but the copyright information can be extracted from the leaked numeric data to assert the ownership and disclose the illegal behavior. Furthermore, the real values of the leaked numeric data can be regained by performing the reverse process of the RDH method.

Session J4: Software Defined Networking and Network Function Virtualization

Room: pine hall

Chairs: Yeong-Sheng Chen (National Taipei University of Education, Taiwan), Yun-Shuai Yu (National Formosa University, Taiwan)

15:20 ***A Proposal of the Method for Analyzing the Stability of Virtual Distributed Systems using Haptic Communication*** ***691***

Hitoshi Watanabe (Tokyo University of Science & Faculty of Engineering, Japan); Kohei Kuroyanagi, Zemmmi Sato and Hiroki Hirado (Tokyo University of Science, Japan); Pingguo Huang (Seijoh University, Japan); Yutaka Ishibashi (Nagoya Institute of Technology, Japan)

This paper proposes a method for analyzing the stability of virtual distributed systems with haptic communication under the communication delay. In this method, we firstly describe the behavior of the system by difference differential equation, secondly estimate the operating characteristics of human being by the experiments, and then compare the theoretically predicted behavior to the actual data under the communication delay. From this series of steps, the desirable resistance parameter for stabilizing is clarified. Moreover, this paper has verified the validity of the proposed method by experiments using the games in the virtual space.

15:35 ***Basic Study on Measurement of Multiple Users' Breathing by Using Far Infrared Imaging*** ***693***

Dai Hanawa and Ryohei Takatori (Nagoya City University, Japan); Kimio Oguchi (Seikei University, Japan)

In this research, we study a method for measurement of multiple users' breathing by using far infrared (FIR) imaging. We first propose a method to discriminate the regions including each user's face. Here, FIR images were binarized and discriminant analysis was used in order to find strict boundary. By applying this process, one FIR image is divided into two sub images in which each image includes one user's face. We next apply a method to extract the regions including nasal cavity from each regions which was capturing one user's face. Here, we extract the regions including nasal cavity from each sub image which was capturing a single user's face. From the results of extraction, we calculate the temperatures in nasal cavity, and estimate qualitative flow velocity in nasal breathing. According to the result of experiments, the accuracy of the estimation was ranged from 40% to 91%.

15:50 ***Extending SDN to Edge Fields for IoT-Centric Data Forwarding on Customized Routes*** ***695***

Chih-Lin Hu, Chao-Yu Hsu and Sod-Erdene Khuukhenbaatar (National Central University, Taiwan); Yamkhin Dashdorj (School of Inf Communication Technology, MUST, Mongolia); Jiun-Yu Tu (Southern Taiwan University of Science and Technology, Taiwan)

This paper proposes an IoT-centric data forwarding mechanism based on an Edge-SDN-Cloud network architecture. SDN switches can devolve partial work to edge nodes. Edge nodes can stipulate service requirements of IoT data flows on behalf of resource-restricted IoT devices. The SDN can rapidly distinguish IoT data flows and deliver them through customized routing plans by the central controller. Thus, the proposed mechanism can apply flow control and network resource management on IoT-centric data forwarding over the SDN to the clouds. This paper also shows a simplified proof-of-concept implementation and a simple demonstration case.

16:05 ***Experimental Study on Improvement of Network Performance and Reliability in SDN Environments*** ***697***

Cheng-Feng Hung, Hsuan-Ming Feng and Chih-Heng Ke (National Quemoy University, Taiwan); Yeong-Sheng Chen (National Taipei University of Education, Taiwan)

With the continuous development of network technologies, a growing number of devices are connected to the Internet, and the reliability, availability and data transmission performance of the network have become increasingly important. Software-Defined Network (SDN) breaks the closed system of the traditional network that is formed by the tight coupling among network hardware, operating system and applications, enabling the network to be elastically adjusted based on different environments and needs. In this study, a mechanism for improving the reliability, availability and transmission performance of network was built in the SDN environment. In the proposed approach, the stochastic mechanism was applied to distribute traffic and the OpenFlow Group Tables were used to enable the automatic switch to the standby Action Bucket for uninterrupted service in case of any fault of the link so as to improve the fault tolerance and reliability of network. Experiments demonstrated that the proposed mechanism can transmit data faster and achieve more reliable network services.

16:20 ***Multipath Transmission Mechanism with P4 Switches in Software Defined Networks*** ***699***

Yeong-Sheng Chen and Wen-Yi Chen (National Taipei University of Education, Taiwan); Chih-Heng Ke (National Quemoy University, Taiwan); Yun-Shuai Yu (National Formosa University, Taiwan)

This study investigated programmed control of transmitting video and audio streaming data with P4 switches in software defined networks. When a packet is transmitted to a P4 switch, the switch checks the match actions and invokes a random function to determine which output port the packet should be sent to. Thus, the switches in the network can route the streaming data via different path according to the random function so as to provide multipath

transmission. Simulation results showed that the proposed multipath transmission mechanism can improve transmission efficiency, reliability, and network throughput.

Session J5: Intelligent Multimedia Processing and Understanding- II

Room: orchid hall

Chairs: Li-Wei Kang (National Yunlin University of Science and Technology, Taiwan), Chih-Yang Lin (Yuan Ze University, Taiwan)

15:20 ***Age Estimation via Modern Convolutional Neural Networks 701***

Kuan-Hsien Liu and Chun-Te Chang (National Taichung University of Science and Technology, Taiwan); Tsung-Jung Liu (National Chung Hsing University, Taiwan)

In this paper, we apply Xception deep convolutional neural network for age estimation on facial images. We adopt Label Distribution Learning age encoding, KLD loss function, and dropout techniques at fully connected layers. With IMDB-WIKI as pre-training dataset, APPA-REAL training set is used as finetune dataset, the final expected value on model output is the estimated age. We achieve the state-of-the-art results of MAE 3.635, 2.78, and 3.09 years on APPA-REAL, FG-NET, and MORPH-II test sets, respectively.

15:35 ***A Clothing Recommendation Dataset for Online Shopping 703***

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

In this work, we constructed a clothing dataset which contains more than one hundred thousand images labeled with brand, category, color, material and price. In recent years, Deep Neural Network makes various of computer vision tasks, such as image retrieval, age estimation [6] and multimedia quality assessment [5], reach impressive performance. However, some problem comes, training data plays an important role in the result of the deep neural networks. Generally speaking, high quality images can lead to a better outcome, and the amount of training data has huge influence on the results. So, with the rise of neural networks, more people are committed to the establishment of a database. We collected hundreds of thousands of images with higher resolution than other clothing datasets, and we provide their corresponding brands and price as attributes. Finally, we compared our dataset with some other clothing datasets.

15:50 ***Overtaking Vehicle Detection Based on Deep Learning and Headlight Recognition 705***

Jui-Chi Chen and Cheng-Hung Chuang (Asia University, Taiwan)

This study uses recorded images to detect overtaking vehicles for driving safety. The proposed method is divided into daytime and nighttime overtaking vehicle detection. When the daytime is full of light, the region-based convolutional neural networks (RCNN) is used to identify and track vehicles. However, due to the lack of light during the nighttime, the headlights are used for vehicle identification and tracking. When the detected position and driving direction of the vehicle satisfy the overtaking condition, the driver can be immediately warned that there will be an overtaking vehicle. In the experiment, the accuracy of the overtaking vehicle detection (precision) can reach more than 90%.

16:05 ***Intelligent Image Retrieval Using Texture and Color Features 707***

Jui-Chi Chen and Cheng-Hung Chuang (Asia University, Taiwan)

This study proposes an effective method for content-based texture image retrieval. We focus on the analysis of texture and color features in the Lab color space to achieve effective image retrieval. Five texture features are computed in the "L" component, i.e. coarseness, contrast, busyness, complexity and strength. In addition, two color features are extracted from the "ab" components. Experiment results show that the proposed method based on texture and color features is capable of achieving more effective image retrieval.

16:20 ***Bilingual Lexicon Learning Using Tagged Images via Graph Trilateral Filter-based Feature Refinement 709***

Yui Matsumoto (Hokkaido University, Japan); Shota Hamano (Graduate School of Information Science and Technology, Hokkaido University, Japan); Ryosuke Harakawa (Nagaoka University of Technology, Japan); Takahiro Ogawa and Miki Haseyama (Hokkaido University, Japan)

A novel method to realize bilingual lexicon learning (BLL) using tagged images is presented in this paper. Different from existing methods that require parallel corpora, the proposed method enables extraction of semantically similar words by utilizing not such corpora but tagged images on image sharing services. The main contribution of this paper is derivation of a novel framework to refine visual features of tagged images based on graph trilateral filter-based smoothing. This enables reduction of the influence of noisy tags that are irrelevant to contents of images. As a result, accurate BLL becomes feasible by nearest neighbor search using the refined visual features.