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Saturday, June 6

09:00 - 10:15

Session A1: Intelligent Multimedia Signal Processing

Room: IB-101

Chairs: Fan-Chieh Cheng (National Taipei University of Technology, Taiwan), Shih-Chia Huang (National Taipei University of Technology, Taiwan)

09:00 A Block Restriction Method Using Guided Image Filter for Local Histogram Equalization 1

Po-Hsiung Lin, Fan-Chieh Cheng, Shih-Chia Huang and Tan-Hsu Tan (National Taipei University of Technology, Taiwan); Damdinsuren Bayanduuren and Khurelbaatar Tseveenjav (Mongolian University of Science and Technology, Mongolia); Sy-Yen Kuo (National Taiwan University, Taiwan)

In this paper, we propose a novel scheme of Local Histogram Equalization (LHE) using guided image filter. The sub-blocks are segmented from the input image, after which we individually compute each local histogram used for multiple transformation functions. To further remove the block artifacts caused by LHE, we employ the input image to guide the texture information, while keeping the enhancement effect of the local contrast. Experimental results show that our proposed scheme produce the high visual effects on the enhanced images being much better than other HE-based methods.

09:15 An IR LED Production Yield Estimation Method for IP-Camera 3

Po-Hsiung Lin, Fan-Chieh Cheng and Shih-Chia Huang (National Taipei University of Technology, Taiwan)

IR LEDs are widely employed in the Internet protocol cameras to increase the imaging effects on the very dark scenes. Hence, the production yield of IR LEDs significantly affects the performance of displaying effects for IP cameras. In this paper, we propose a very efficient way to estimate the IR LED production yield based on image processing technique. Experimental results show that our method effectively improves the working efficiency of the operators on the production line.

09:30 Object-based Tilt-Shift Photography 5

Mei-Ling Chen, Chia-Jung Chou, Min-Tzu Wu and Chen-Kuo Chiang (National Chung Cheng University, Taiwan)

Tilt-Shift photography captures specific focused range by tilt-shift lens. The tilt-shift lens compensate the perspective problems by tilt and change the depth of field by shift. Using the tilt-shift lens, the viewers can pay their attention to the specific objects naturally. In this paper, we develop an automatic method to produce tilt-shift images. An energy minimization approach is proposed by considering the object property and boundary smoothness based on the Markov Random Field (MRF) framework. In this way, the weaknesses of tilt-shift lens, such as high-cost, huge and heavy can be improved. Our results are compared with other software approaches and show the effectiveness of our algorithm.

09:45 Mobile Augmented Reality As A Chinese Menu Translator 7

Dimas Arioputra and Chang Hong Lin (National Taiwan University of Science and Technology, Taiwan)

This paper presents an application on mobile phones that translates Chinese menus into a 3D model of the menu and the name of the menu in English. The system runs on an android platform mobile phone. It uses image recognition to trace and register image markers (in this paper it is a Chinese word). Then, it processed the input into a pre-processed feature database of menu items using Features from Accelerated Segment Test (FAST) implemented by Vuforia Library. The system will check the database, and after the matching it will generate the 3D model of the food using the Unity 3D game engine. It is able to trace and render up to five 3D models of the dishes in real-time.

10:00 A Computed Stereoscopic Method for Laparoscopic Surgery by using Feature Tracking 9

Min-Liang Wang (IRCAD-Taiwan, Taiwan)

This paper presents a technique that generates rough depth maps from laparoscopy camera using feature tracking techniques for depth sampling. The method is applicable to single laparoscopy video images through local motion cues to improve the inferred depth maps. The feature tracking is used to ensure temporal depth consistency, such as SURF. The results show that the proposed methods significantly improve the depth estimation for laparoscopy surgery. The technique can be used to convert a 2D laparoscopy video into stereo for 3D visualization, and it demonstrates this through a laparoscopy surgery video, including results of surgical instruments

Session A2: Multimedia Security and its Applications for Consumer Electronics

Room: IB-201

Chairs: Ainnuddin Wahid Bin Abdul Wahab (University of Malaya, Malaysia), KokSheik Wong (University of Malaya, Malaysia)

09:00 Using IP Identification for Fragmentation Resilient Data Embedding 11

Osamah Ibrahiem Abdullaziz, Vik Tor Goh and Huo-Chong Ling (Multimedia University, Malaysia); KokSheik Wong (University of Malaya, Malaysia)

In this work, we propose a fragmentation resilient IP identification based data embedding method. First, we analyze the IP identification generation in various operating systems to validate the feasibility of our proposal. Then, we put forward our proposal to embed data into IP identification field while considering data from the payload field. Results suggest that the proposed method resembles the ordinary IP identification generation pattern and can mitigate the problem of packet fragmentation.

09:15 A Comparison Study on SVD-based Features in Different Transforms for Image Splicing Detection 13

Zahra Moghaddasi (University of Malaya, Malaysia); Hamid Abdulla Jalab (Universiti Malaya, Malaysia); Rafidah Md Noor (University of Malaya, Malaysia)

Digital image forgery is becoming easier to perform because of the rapid developments of various manipulation tools. Between the various image forgery techniques, image splicing is considered as one the most prevalent technique. In this paper, a low dimensional singular value decomposition (SVD) based feature extraction method applied in steganalysis is proposed as an image splicing detection method. The SVD-based features are applied in different spatial and frequency domains to make a comprehensive comparison between these various transforms. Support vector machine is used to distinguish between authentic and spliced images. The results are encouraging and show that the detection accuracy of 77.60% is achieved for the DCT transform with only 25 dimensional feature vector.

09:30 Dual layer video stream in HEVC through information hiding 15

Yiqi Tew and KokSheik Wong (University of Malaya, Malaysia); Vishnu Monn Baskaran (Multimedia University, Malaysia)

A dual layer video streaming technique is proposed by utilizing information hiding technique. Based on the HEVC standard, our technique utilizes the coding unit size in each slice of a higher resolution video to embed a different video which is of lower resolution. Result shows that, with a perceptual quality degradation of < 1%, a higher resolution video can be simultaneously streamed with an embedded video of lower resolution.

09:45 *Reversible Multiple Messages Embedding using Reflective Blocks* 17

Sim Ying Ong and KokSheik Wong (University of Malaya, Malaysia)

This paper proposes three multiple messages embedding (MME) methods as extension for reversible data embedding using reflective blocks [1]. MME is realized by exploiting the data representation scheme in [1] while maintaining the reversibility and scalability of [1]. In particular, Method I utilizes block range to embed multiple messages while Method II utilizes bit representation to realize MME. Both of these methods can each embed a maximum of 9 messages in a host image. Method III is the hybrid of Method I and II, and it can embed up to 37 messages in a host image. Experimental results show the average embedding capacity for each individual embedding channel.

10:00 *Digital Image Forgery Detection by Edge Analysis* 19

Reza Moradi Rad and KokSheik Wong (University of Malaya, Malaysia)

The advent of user-friendly yet powerful editing softwares has cast doubt on the authenticity of digital images. Therefore, developing reliable detection techniques is of great importance to verify the originality of a given image. In this work, a forgery detection technique based on the analysis of edge information is proposed. Unlike the conventional methods, the proposed technique is not restricted to the traces left by the act of double compression, but instead it allows the input image to be singly compressed or uncompressed. Experimental results confirmed that proposed method is able to localize forged area when the forged image is not double compressed.

10:15 *Pixel Value Differencing Steganography Techniques: Analysis and Open Challenge* 21

Mehdi Hussain, Ainuddin Wahid Bin Abdul Wahab, Nor Badrul Anuar, Rosli Salleh and Rafidah Md Noor (University of Malaya, Malaysia)

Steganography is the science of secret data communication using carrier medium, such as images, videos, text, and networks. Image steganography is majorly divided into spatial and frequency domains. Pixel value differencing (PVD) considered as good steganographic algorithm due to its high payload and good visual perception in spatial domain. The purpose of this paper is two folded. First is the critical analysis of current PVD methods using evaluating parameters (payload, visual quality and resistance of attacks) and secondly it highlights the current promising directions on PVD steganographic research.

Session A3: Big Data Analytics in Signal Processing

Room: IB-202

Chairs: Yi-Chong Zeng (Institute for Information Industry, Taiwan), Mei-Chen Yeh (National Taiwan Normal University, Taiwan)

09:00 *A Back Lighting Color Image Enhancement Method Using Color Saturation and Image Fusion* 23

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

In this paper, a back lighting color image enhancement method using color saturation and image fusion is presented. First, the saturation component of color image is computed by using HSV or HSI color space. Then, two different exposed images are generated by using weighting function method. Next, the enhanced image is obtained by fusing input color image and two different exposed images. Finally, several numerical examples are demonstrated to show the effectiveness of the proposed enhancement method.

09:15 *Enhancing retailer marketing with an facial recognition integrated recommender system* 25

Chia-Chi Wu, Yi-Chong Zeng and Meng-Jung Shih (Institute for Information Industry, Taiwan)

Recommender systems, which recommend products, content, or learning resource to users, have become an important issue and received a lot of study. Existing recommender systems utilize different knowledge source to profile users, but in some application fields, such as retailer, obtaining such source can be different. In this paper, we propose a facial recognition integrated recommender system to deal with the profiling problem at a retail store. Evaluation result shows that this system makes recommendation very well.

09:30 *A Multimodality Approach to Predicting the Popularity of Sneakers* 27

Mei-Chen Yeh and Shao-Ting Yang (National Taiwan Normal University, Taiwan)

We present a computational approach for predicting the popularity score of sneakers through the analysis of growing amount of online data. Sneakers are described in several aspects based on which a popularity prediction model is constructed. In particular, we utilize the multiple kernel learning technique with customized kernels to analyze multimodal data extracted from an online sneaker magazine. The construction of a prediction model from multiple facets is not trivial—the effectiveness of each feature depends on the way we compute and combine it with the others. We examine a few design choices and study how multimodal data should be utilized to achieve practical prediction.

09:45 *Revealing Relationships between Folksonomy and Social Popularity Score in Image/Video Sharing Services* 29

Toshihiko Yamasaki and Shumpei Sano (The University of Tokyo, Japan); Tao Mei (Microsoft Research Asia, P.R. China)

In this paper, we analyze the relationships between social popularity (i.e., the numbers of views, comments, and favorites) and text tags in image/video sharing services. We also show the tags which affect social popularity in each service and discuss the characteristics of popular contents in each service by analyzing these results.

10:00 *Incorporating Color Feature on LBP-Based Image Retrieval* 31

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

The Local Binary Pattern (LBP) operator and its variants play an important role as the image feature extractor in the textural image retrieval and classification. The LBP-based operator extracts the textural information of an image by considering the neighboring pixel values. However, the LBP-based feature is not a good candidate in capturing the color information of an image, making it is less suitable for measuring the similarity of color images with rich color information. This work overcomes this problem by adding an additional color feature, namely Color Histogram Feature (CHF), along with the LBP-based feature in the image retrieval domain. Experimental result shows that the hybrid CHF and LBP-based feature presents a promising result and outperforms the existing methods over several image databases.

Session A4: Parallel and Distributed Computing and Networking

Room: IB-204

Chairs: Nobuo Funabiki (Okayama University, Japan), Yasuyuki Miura (Shonan Institute of Technology, Japan)

09:00 *Consideration of the Routing Performance Evaluation Method for Interconnection Network Based on the Probability Model* 33

Yasuyuki Miura, Junpei Sugioka and Naohisa Fukase (Shonan Institute of Technology, Japan)

In this research, we propose the evaluation scheme of interconnection network of Network on Chip (NoC) by the approach based on probability. In this paper, we focus the multistage network for simplify, and carry out the communication performance analysis on the single flit communication. As the result, the result of flit-level simulation and probability model simulation became almost same. As future work, we will consider the model with wormhole routing and virtual channel. The goal of our research is to evaluate the performance of Link-Sharing Method.

09:15 *The Examination of the Image Correction of the Moving-Object Detection for Low Illumination Video Image* 35

Yasuyuki Miura and Yuuta Fujii (Shonan Institute of Technology, Japan)

In this research, we focus low illumination video image of "below 1 lux" obtained by normal type video camera, and we consider the method of image correction for moving-object detection by inter-frame differencing. The method of this research is the combination of gamma correction and denoising as the preparation of inter-frame differencing. By

such method, the moving-object detection which have robust on the change of the illumination can realized. By the performance evaluation, it was shown that the moving object detection with low illumination becomes possible.

09:30 *An Implementation of Credibility-based Job Scheduling Method in Volunteer Computing Systems* 37

Shun-ichiro Tani and Yasuyuki Nogami (Okayama University, Japan); Masaru Fukushi (Graduate School of Science and Engineering, Yamaguchi University, Japan)

This paper addresses a job scheduling problem in Volunteer Computing (VC) systems, where some malicious participant may return incorrect results (sabotaging). Credibility-based job scheduling method, namely ENR-ECJ, is a promising approach to realize high-performance and sabotage-tolerant VC systems based on the credibility of each participant (worker). However, managing the credibility values in the management node may cause considerable performance degradation of whole the system. By implementing ENR-ECJ into a small scale VC system, this paper demonstrates the primacy of ENR-ECJ over existing methods and reveals its condition through the performance evaluation for various number of workers. The results show that ENR-EJC improves the overall performance about 10% when the access frequency of workers is less than 2 per second.

09:45 *Data Arrangement and Dimensional Compression using Vivaldi for Similarity Search on Structured Peer-to-peer Network* 39

Yoshihiro Sugaya, Koh Motoyama and Shinichiro Omachi (Tohoku University, Japan)

Peer-to-peer system is a promising solution to manage a large amount of data, but similarity search on peer-to-peer network with a restricted small number of messages is a challenging problem. Existing methods that can perform similarity search work only with low-dimensional data. We propose a method to transform the very high-dimensional data into low-dimensional vectors in order to perform similarity search.

10:00 *A Performance Evaluation of Web-based Volunteer Computing using Applications with GMP* 41

Shoma Kajitani and Yasuyuki Nogami (Okayama University, Japan); Masaru Fukushi (Graduate School of Science and Engineering, Yamaguchi University, Japan); Noriki Amano (Center for Research in General Education Saitama University, Japan)

This paper presents the performance evaluations of GMP-based applications on Web-based Volunteer Computing (VC) systems. Web-based VC is expected for attracting more volunteer participants (workers) by allowing workers to execute a computation program (job) on Web browsers. However, job execution performance in individual workers may be degraded because jobs written in C/C++ are converted to executable files for Web browsers. To reveal the actual performance of Web-based VC, we convert practical applications which use GMP, an often-used library for scientific computations, and evaluate the execution performance. Experimental results show that the performance degradation is negligibly small in some cases, e.g. a short bit-length of arguments. We also show a possibility to improve the performance of Web-based VC by substituting GMP functions.

Session A5: (Poster Session) Multimedia Signal Processing

Room: 1F Lobby

Chairs: Kuei-Chung Chang (Feng Chia University, Taiwan), Chih-Hsien Hsia (Chinese Culture University, Taiwan)

09:00 *Design of real-time speed limit sign recognition and over-speed warning system on mobile device* 43

Kuei-Chung Chang and Liu Po-Kai (Feng Chia University, Taiwan)

The paper designs and implements a real-time speed limit sign recognition and over-speed warning system on android mobile devices. The proposed system can inform car drivers the current speed limit by recognizing speed limit signs. Furthermore, we also combine GPS function with speed limit sign recognition to warn car drivers in over-speed condition which can avoid car drivers to get punished tickets and put their lives at risk. The experimental results show the accuracy of recognition of speed limit signs is over 87%, and our system can assist car drivers for safe driving with their android mobile devices easily.

09:05 *Design and Implementation of a Door Lock Control Based on a Near Field Communication of a Smartphone* 45

Chi-Huang Hung, Y. W. Bai and Je-Hong Ren (Fu Jen Catholic University, Taiwan)

In this paper we propose an integration design of a near field communication (NFC) reader and a smartphone for a door access system. This design includes both a smartphone and a door lock system (DLS). A smartphone application provides the interface and numeric keypad (NK) interface. This interface includes a "smartphone ID", and provides a numeric keypad; the user can use the numeric keypad to enter the required password in order to open the door. The door lock system hardware includes a micro control unit (MCU), an NFC reader module, a magnetic lock, and a real time clock module. The MCU is used to identify "numeric password (NP)" and the timestamp at a specific door. The NFC reader module is responsible for obtaining both the "numeric password" and the "smartphone ID". The real time clock module provides the timestamp.

09:10 *Estimation of Gazing Points in Environment Using Eye Tracker and Omnidirectional Camera* 47

Shun Chiba, Tomo Miyazaki, Yoshihiro Sugaya and Shinichiro Omachi (Tohoku University, Japan)

In this work, we propose a method for estimating the user's gazing point in the environment using images taken by an eye tracker and an omnidirectional camera. The proposed method estimates the eye position in environment by mapping the gazing point obtained by the eye tracker in the omnidirectional camera image. However, matching the omnidirectional image and the eye tracker image is difficult because the omnidirectional image is distorted by equirectangular projection. Therefore, we propose a method for estimating eye location in the omnidirectional image by matching the eye tracker image to the omnidirectional image with considering the distortion. Specifically, this method repeats image matching and image conversion using the matching results.

09:15 *Performance Improvement Using Two level Branch Predictor on the Mobile Processor* 49

Nam Gon Kim, Chang Min Eun and Ok Hyun Jeong (Sogang University, Korea)

In the last few years, the microprocessor of mobile device has been developed into multi-core, multi-issue, and deep pipeline for high-performance. But maximizing the parallelism of a pipeline and deepening pipeline cause more penalties so that branch predictor is more and more important. One of the efficient ways to improve its performance is generally to increase the size of the branch predictor. However, increasing the size of branch predictor necessarily involves the increase of memory indexing time and power consumption. Therefore, to improve the performance of branch predictor considering the mobile environment, we have studied the effect on performance improvement by changing the other factors while remaining the size of the memory fixed with 2-level branch predictor. We experimented to investigate the performance improvement by modifying the associativity of Branch Target Buffer (BTB) and the size of Branch History Register (BHR). The simulation was performed using SimpleScalar 3.0 based on ARM Cortex-A15 and benchmarks from SPEC CPU2000. As a result, in the 2-level branch predictor structure, when reducing the length of BHR in 8 bit, the increase of Instruction Per Cycle (IPC) is the highest as 0.599%. Therefore, we concluded that to modify the length of BHR of branch predictor is most effective way to improve the performance of the processor.

09:20 *Accuracy versus Complexity of MARG-based Filters for Remote Control Pointing Devices* 51

Miguel Rasteiro (Instituto Politécnico de Leiria/ Polytechnic Institute of Leiria, Portugal); Pedro A. Amado Assuncao (Instituto de Telecomunicacoes / Polytechnic Institute of Leiria, Portugal); Hugo Costelha (School of Technology and Management, Polytechnic Institute of Leiria, Portugal); Luis Conde (Instituto Politécnico de Leiria/ Polytechnic Institute of Leiria, Portugal)

Although most current pointing devices rely on relative rotation increments, absolute orientation allows for a more intuitive interaction. However, this is difficult to implement in low-energy consumption devices since accurate fusion filters are computationally intensive. This work presents a comparative study of low-complexity filters and state-of-the-art orientation tracking systems, enabling to access complexity versus portability. A relevant set of different MARG units currently available on the market were studied under systematic tests and human subjective user analysis. Experimental results show that it is possible to obtain similar accuracy using low-complexity filters to the ones observed with state-of-the-art orientation tracking systems.

09:25 *A Novel Real-time Service Architecture based on Driver State Detecting for Improving Road Safety* 53

Jin Wang (Nanjing, P.R. China)

Many traffic accidents occur due to the driver's low vigilance and drowsiness, which causes huge economic losses and human life casualty. In this paper we propose a novel real-time service architecture for detecting driver's state and ensuring driving safety. Some automatic state detection services are also given inside the system architecture.

09:30 *Fuzzy-based obstacle avoidance for a mobile robot navigation in indoor environment* 55

Dang Zih Yang and Jiann-Der Lee (Chang Gung University, Taiwan)

This paper presents a real-time automatic obstacle avoidance system using the depth map provided by a RGBD sensor mounted on a mobile robot. A set of intelligent fuzzy rules are designed to construct a safe path to avoid obstacles in the unknown environment. According to the experimental results, this system has good performance while compared with the previous approaches and can work in dark environment.

09:35 *Movement imitation underlying coaching platform for children with ASD* 57

Xiaofeng Liu (Hohai University & College of IoT Engineering, Taiwan); Ce Liu, Xu Zhou, Xiaoqin Zhou and Aimin Jiang (Hohai University, P.R. China)

This paper presents a movement imitation platform which offers a natural way for coaching children with autism spectrum disorder (ASD). The system is built up by a NAO humanoid robot that mimics the upper limb movement, and a depth camera that captures the action of human. We use skeleton tracking data of upper limb with SDK, and then calculate the joint angles and positions of the upper limbs; The posture parameters of upper limb are scaled and then transformed into those of the NAO robot' joints. The tests on both normal adults and children with ASD show that the system performs robust for upper limb imitation

09:40 *A Simulation Study of Passive Sunlight Collection and Emission for Solar Lighting* 59

Hong-Cheng Huang and Hong-Yih Yeh (Associate Researcher, Taiwan)

This research involves a simple and high concentration simulation design for a passive solar lighting system. This system incorporates the technology and optical design that are required for the collection and emission of sunlight for solar lighting. Several pieces of Plano-convex lens are placed in a specific geometric arrangement, so that without a solar tracking system, parallel light emitted by the sun at different times can be collected. The light can then be focused via lenses and internally transmitted through optical fibers and ultimately be transmitted to the emission element. This system is expected to be used as a reference for sufficient lighting for indoor rooms and toilets in a building whether in the morning or afternoon on a sunny day.

09:45 *Power-Saving Dynamic Allocation Strategy for Clouding Server* 61

Trong-Yen Lee, Kuang-Hua Chang, Chi-Han Huang, Cheng-Hsiu Kang and Min-Jea Liu (National Taipei University of Technology, Taiwan)

Energy cost is the fastest-rising expense for today's cloud data centers. Power consumption is one of the top concerns for managers of cloud data centers. In such strong demands for cloud services, cloud data center is growing but lead to a lot of concerns about energy consumption. This work proposes a method to control cloud data center power consumption by Out-of-Band server hardware management tool to dynamic reallocate virtual machines and on-and-off physical server machines. The threshold defined by status of system power consumption and/or major factors which data center manager concerned. The method need not involve end user's operating system that won't cause concern of information security. From experiment result, the proposed method can reduce maximum 61.5% on power consumption which is compared with load-balancing method.

09:50 *An Indoor Positioning Method Based on Virtual Reference RFID Tags* 63

Jin Wang (Nanjing, P.R. China)

In order to calculate the RSSI of the virtual reference tags accurately, this paper proposes a method that based on log-distance path loss model. Add some real reference tags in the original layout, read the RSSI of real reference tags twice in a short time interval to calculate the path loss exponent and the average environmental impact value nearby tags by using the model. The virtual reference tags will choose the exponent and the impact value of the nearest real tag to calculate the RSSI. Experimental result shows that compared with VIRE algorithm, the proposed method provides a higher accuracy.

09:55 *Analysis of Data Replication Mechanism in NoSQL Database MongoDB* 66

Jin Wang (Nanjing, P.R. China)

The replication mechanism of NoSQL database MongoDB includes Master/Slave structure and Replica Set. Write operation implement on Master, Slaves will send the synchronize data command asynchronously to Master to update its data. Read operation just implement on Master to provide the strong consistency, while read operation implement on Slave to provide the eventual consistency. Replica set is a group of servers which run Mongod and store the copy of the same data with automatic failover and automatic recovery of member nodes.

10:00 *A Three-Tiers Service Architecture based on Outdoor Monitoring for Epilepsy Patients* 68

Jin Wang (Nanjing, P.R. China)

In this paper we present a three-tier service architecture to seizure detection and prediction based on cloud computing technology. This architecture is used for outdoor monitoring. We also propose a two-way security mechanism to protect user privacy for epilepsy patients.

10:05 *Analysis of Data Storage Mechanism in NoSQL Database MongoDB* 70

Jin Wang (Nanjing, P.R. China)

MongoDB is one of the typical NoSQL database. The database mechanisms of MongoDB about document-oriented storage, GridFS for storing files of any size. The data storage structure of MongoDB is given, which uses BSON as the data storage and network transfer format for documents, simple and fast in query and easy in horizontal scalability with low cost.

10:10 *Towards an Evaluation Strategy for Consumer Electronic Products using Primitive Cognitive Network Process* 72

Kevin Kam Fung Yuen (Xi'an Jiaotong-Liverpool University, P.R. China)

There are diverse alternatives in the competitive market when a consumer would like to purchase an electronic product; however, choosing a suitable electronic product is a challenging problem considering multiple criteria such as price attractiveness, brand, functionality, usability, performance and warranty. To address this issue, this paper proposes the Primitive Cognitive Network Process (PCNP) for the consumer electronic product evaluation with respect to the multiple criteria.

10:15 *Ultra-low power CMOS multiple voltage reference with 3.9 ppm/°C temperature coefficient* 74

Yongquan Li (Shenzhen University & College of Information and Engineering, P.R. China); Mei Jiang and Liangwei Cai (Shenzhen University, P.R. China)

A voltage reference with low temperature coefficient (TC), multipliable outputs and low power consumption is presented in this paper. The proposed reference circuit with all transistors biased in the subthreshold region can provide reference voltage of 342 mV. The number of output also can be multipliable to two or three, such as 684 and 1025 mV which are depended on the requirement of system and the supply voltage. Subthreshold MOSFET design allows the circuit to work on a supply voltage as low as 0.8 V with an average current consumption of 6.4 nA at room temperature. The power supply rejection ratio (PSRR) with a 500f F capacitor load of 342 mV output voltage simulated at 100 Hz and 10 MHz is over than 51.9 dB and 42.2 dB, respectively. Monte Carlo simulation shows a mean TC is 3.9 ppm/°C with a standard deviation of 1 ppm/°C over a set of 500 samples, in a temperature range from -30 °C to 100 °C. The active area of the presented voltage reference is 0.0015 mm².

Saturday, June 6

10:15 - 10:40

B1: Coffee Break

Room: Break/Lunch Area

10:40 - 10:50

O1: Opening Remarks Prof. Jing-Ming Guo and Prof. Wen-Chung Kao

Room: IB-101

10:50 - 12:00

K1: Keynote Speech (I) Mr. Bob Frankston (IEEE Fellow and ACM Fellow) "Consumer Electronics in the age of the Internet"

Room: IB-101

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

12:00 - 13:00

L1: Lunch

Room: Break/Lunch Area

13:00 - 14:30

Session B1: Smart Wearable Technology and Application

Room: IB-101

Chair: Chi-Chia Sun (National Formosa University, Taiwan)

13:00 Ultra-low-power Voice Trigger for Wearable Devices 76

Do-Hyung Kim, Seokhwan Jo, Kiseok Kwon, Yeonbok Lee, Seungwon Lee, Young-Hwan Park, Sukjin Kim, Jaehyun Kim and Shihwa Lee (Samsung Electronics, Korea)

We introduce an ultra-low-power digital signal processor (DSP) solution for wearable applications with high performance. It employs three-issue VLIW architecture with the major low-power techniques and implemented with 95K gates in Samsung 28LPP process and runs up to 200MHz. The experimental results demonstrate that a voice trigger application can operate at 6.1MHz under 0.15mW power consumption.

13:15 Auto-Calibration for Device-Diversity Problem in an Indoor Localization system 78

Nguyen Hung (National Kaohsiung University of Applied Sciences, Taiwan); Chingchun Huang (National Chung Cheng University, Taiwan); Hsiao Yi Lee (National Kaohsiung University of Applied Sciences, Taiwan)

Recently, the techniques for indoor localization have become more and more important and play a critical role in many mobile applications. Among them, the fingerprint-based indoor localization system has been recognized as a possible right way toward success. However, some challenges still remain. One issue should be addressed is the device diversity problem, where different devices would receive different radio signal strengths (RSS) at the same location. This problem breaks the fingerprint assumption --- each location has its singular RSS. Conventional calibration methods require manually collecting pair-wise RSS data among devices to train the calibration model. To reduce human load, we proposed a method that could automatically calibrate the device diversity problem in an efficient way.

13:30 A Region-Based Approach for RSS Indoor Localization 80

Nguyen Hung (National Kaohsiung University of Applied Sciences, Taiwan); Chingchun Huang (National Chung Cheng University, Taiwan); Hsiao Yi Lee (National Kaohsiung University of Applied Sciences, Taiwan)

In this paper, we proposed a region-based approach for indoor localization based on the fingerprint of radio signal strength (RSS). Unlike conventional fingerprint-based methods that based on point information to infer user's location, we used region information for indoor localization. Our results show that the proposed system has better positioning accuracy and more robustness to signal noise and dynamic environment.

13:45 Low-power Microcontroller Solution for Measuring HBR using single reflection SpO2 Sensor 82

Chi-Chia Sun, Chun Kai and Thanh Tu Thai (National Formosa University, Taiwan); Ya-Wen Yang (National Taiwan University Hospital Yunlin Branch, Taiwan)

In this paper, a low-power Heart Beat Rate (HBR) analyzer based on the principle of single reflective Photoplethysmography (PPG) is presented on a MCU platform. It is a non-invasive method of measuring the variation in blood volume in tissues using a light source and a light detector. The PPG signal is amplified and converted to digital format by AFE (Analog Front End) device, MCU takes the signal via SPI communication and performs HBR finding algorithm, afterward sending results to the mobile phone through the Bluetooth 4.0 wireless communication.

14:00 *Universal Wireless Controller for PWM, Analog and TRIAC Dimming* 84

Pei-Ru Wu (Industrial Technology Research Institute, Taiwan)

This paper presents a universal wireless controller for PWM, Analog and TRIAC dimming. The universal wireless controller was designed by the optimization algorithm to identify the input signal and determining the output signal of the control system. The experimentally validated that the universal wireless controller achieves high compatibility with conventional dimmers, it can convert the input signal of Analog (0~10V) or Pulse Width Modulation (PWM) or TRIAC into output signal of Analog (0~10V) or Pulse Width Modulation (PWM) or TRIAC. Therefore, there is no compatible problem with the new LED lamps. It not only can remove the process of replace the old dimmer with new, also can save the fee of the new dimmer.

14:15 *Portable and Wireless EEG Device Used in Sleep Quality Tracking* 86

Yi-Hsin Yu (NCTU, Taiwan); Sheng-Fu Chen (NHRI, Taiwan); Chih-Sheng Huang (NCTU, Taiwan); Li-Wei Ko (National Chiao Tung University, Taiwan); Chin Teng Lin (National Chiao-Tung University, Taiwan)

A portable and wireless electroencephalography (EEG) device was proposed in this study. The device had following features: (1) the use of dry and flexible electrodes made the device resilient and repetitively used on forehead without conductive gel; (2) the device was small and low power consumption which provided more comfortable wearing. It provided ordinary wireless (Bluetooth) protocol and memory cards to record EEG data. All electronic components were embedded into a portable mechanism conveniently. The device had past Electro Magnetic Compatibility (EMC), Federal Communications Commission (FCC) certifications. (3) EEG data was stored as EDF format compatible with popular EEG analysis tools. This device was good for sleeping study in general. A particular EEG signal Apps could analyze the EEG raw data and provided the sleep quality report in details.

13:00 - 14:40

Session B2: Data Mining and Its Applications

Room: IB-201

Chairs: Kai-Cheng Hu (National Sun Yat-sen University, Taiwan), Chun-Wei Tsai (National Ilan University, Taiwan)

13:00 *Efficient Data Preprocessing for Genetic-Fuzzy Mining with MapReduce* 88

Tzung-Pei Hong (National University of Kaohsiung, Taiwan); Yu-Yang Liu (National Sun Yat-Sen University, Taiwan); Min-Thai Wu (National University of Kaohsiung, Taiwan); Chun-Wei Tsai (National Ilan University, Taiwan)

Genetic-fuzzy data mining can successfully find out linguistic association rules and appropriate membership functions close to human concepts from quantitative transactions, and thus becomes a promising research field in these years. It repeatedly uses fuzzy frequent 1-itemsets to evaluate fitness values of chromosomes, which is very time-consuming. In this paper, we propose a MapReduce preprocessing approach to efficiently transform given quantitative transaction data into pairs of items and quantity lists to increase the performance of genetic-fuzzy mining. The MapReduce architecture totally fits the conversion due to its characteristics of key-value format. Experimental results also show the effect of the proposed approach.

13:15 *On the Implementation of Path Switching over SDN-enabled Network: A Prototype* 90

Pang-Wei Tsai and Pei-Ming Wu (National Cheng Kung University, Taiwan); Chien-Ting Chen (National Cheng Kung University, Department of Electrical Engineering, Taiwan); Mon-Yen Luo (National Kaohsiung University of Applied Sciences, Taiwan); Chu-Sing Yang (National Cheng Kung University, Taiwan)

Since Software-Defined Networking (SDN) technologies have been commonly used in networking components for designing Future Internet, the fault tolerance design becomes a fundamental requirement in network deployment. This paper presents a prototype of path switching method based on OpenFlow protocol. In contrast of the traditional network architecture, this implementation provides an adaptive path switching method when link failure is detected, which reducing the time of interruption.

13:30 *An Enhanced Initialization Method for Codebook Generation* 92

Kai-Cheng Hu and Chun-Hao Chen (National Sun Yat-sen University, Taiwan); Chun-Wei Tsai (National Ilan University, Taiwan); Ming-Chao Chiang (National Sun Yat-sen University, Taiwan)

Generalized Lloyd algorithm (GLA) is one of the most well-known image compression algorithms for the codebook generation problem of vector quantization. However, it is usually extremely sensitive to the initial solution. Thus, this paper presents an enhanced method that leverages the strength of two methods to create a better initial solution for the codebook generation problem. The simulation results show that the proposed method can provide a quality that is significantly better than that GLA alone can provide.

13:45 *An Intelligent Robot for Home Healthcare* 94

Guan-Ting Chen and Li-kai Huang (Chia Nan University of Pharmacy & Science, Taiwan); Chun-Wei Tsai (National Ilan University, Taiwan); Ming-Chao Chiang (National Sun Yat-sen University, Taiwan)

Intelligent robot is a promising research topic for home healthcare, especially for the elderly home healthcare because it can provide the basic life needs via material assistance. However, until now, the design and implementation of an intelligent robot for home healthcare is still a very difficult problem unless we can solve the recognition system problem of a robot, which is usually extremely sensitive to the home environment. Thus, this paper presents an intelligent robot by using the positioner of robot itself and the IP camera system. The simulation results show that the proposed method can significantly improve the accuracy rate of an automatic vehicle than the traditional robot system can provide.

14:00 *A Prototype Generation With Same Class Label Proportion Method For Nearest Neighborhood Classification* 96

Jui-Le Chen, Ko-Wei Huang, Pang-Wei Tsai and Chu-Sing Yang (National Cheng Kung University, Taiwan)

The KNN algorithm has a significant effect on classification prediction in Data Mining. In order to solve the drawbacks for KNN algorithm to reduce the costs of the calculation and increase the accuracy, this paper proposed a prototype generation method with same class label proportion for classification to ensure that each class has at least a prototype to be represented. We compare the average success rate of GA, PSO, DE and proposed method SPDE. The experimental results show that the SPDE has more opportunity to do better than others in those problems.

14:15 *Small-Angle Approximation Attack on Angle-based Many-to-One Functions for Biometric Templates* 98

Zhe Jin (Universiti Tunku Abdul Rahman, Malaysia); Bok-Min Goi (Universiti Tunku Abdul Rahman (UTAR), Malaysia); Andrew Teoh Beng Jin (Yonsei University, Korea); Yong Haur Tay (Universiti Tunku Abdul Rahman, Malaysia); Pan Zheng (Swinburne University of Technology Sarawak Campus, Malaysia)

If biometric template is compromised, invasion of user privacy is inevitable. Since human biometric is irreplaceable and irrevocable, such an invasion implies a permanent loss of user identity. As a result, many transformation methods are proposed to convert the biometric template into non-invertible version of itself. However, if the transformation functions are not carefully designed, the "non-invertible" templates are susceptible to be partially or fully invertible. In this paper, we proposed a template inversion technique, namely small-angle approximation attack, which is less studied in the literature. We reveal that the angle-based many-to-one property of the non-linear functions is highly vulnerable to small-angle approximation attack.

13:00 - 14:30

Session B3: Medical Measurements and Applications

Room: IB-202

Chairs: Shih-An Li (Tamkang University, Taiwan), Hsien-Wei Tseng (Ningde Normal University, P.R. China)

13:00 *A Novel Index of Photoplethysmography by Using Instantaneous Pulse Rate Variability During Non-stationary Condition* 100

Pei-Chen Lin, Po-Hsun Huang and Chia-Chi Chang (National Chiao-Tung University, Taiwan); Hung-Yi Hsu (Tung's Taichung Metro Harbor Hospital, Taiwan); Tzu-Chien Hsiao (National Chiao-Tung University, Taiwan)

Heart rate variability (HRV) and pulse rate variability (PRV) have been widely used as an automatic nervous system (ANS) activities observation. Based on the timescale limitation of heart beat (for HRV) and pulse waveform (for PRV), one method of instantaneous pulse rate variability (iPRV) with photoplethysmography (PPG) had been proposed as a HRV and PRV surrogate during non-stationary condition in frequency domain. In this paper, the examination in time-domain PPG during passive leg raise (PLR) trial was studied. The 24 subjects pre-experiment resulted that iPRV and HRV are positive correlation (r -value = 0.680 ± 0.099 in baseline; r -value = 0.688 ± 0.096 in PLR). Furthermore, the iPRV containing much complex intrinsic components on higher frequency bands provides more intrinsic cardiovascular information for further assessment. This proposed examination in time-domain PPG is the possible leading way to more useful indicator for healthcare application.

13:15 *Noninvasive ECG and EMG Electrode system for Health Monitoring and Science technology application* 102

Jian-Chiun Liou (National Kaohsiung University of Applied Sciences, Taiwan); Wen-Chieh Lin (Kao Yuan University, Taiwan)

This paper describes the work aimed to develop noninvasive ECG and EMG electrode system for health monitoring and science technology application. The bio-electrode can work alone to analysis bio signals recording and observing. The bio signals show the physiological status. The measurement signal results within science technology product application show that electrocardiogram (ECG) and electromyogram (EMG) are successfully measured using the implemented bio-electrode prototype.

13:30 *Eliminating Motion Artifacts in PPG* 104

Hsien-Wei Tseng (Ningde Normal University, P.R. China); Le-Pong Chin (Shih Chien University, Taiwan); Chien-Da Huang and Yang-Han Lee (TamKang University, Taiwan); Di Fang (St. John's University, Taiwan)

In this study, independent component analysis was employed to separate the independent components (i.e., PPG signals and noise) from the raw signals with motion artifacts. Subsequently, independent components containing PPG signals were selected and the locations of the PPG signal components on the frequency spectrum were analyzed. Next, the raw signals passed through a multi-bandpass filter specifically designed for this study to eliminate motion artifacts. For the experiment, motion artifacts were created using four types of finger movements: vertical finger movement, horizontal finger movement, rapid finger shaking, and random finger shaking. The study results included an independent component analysis of the independent components, the waveforms of the filtered PPG signals in the time and frequency domains, and the heart rate measurements.

13:45 *Detection and Analysis of the Designed Circuit for Ambulatory ECG Electrical Characteristic Points* 106

Hsien-Wei Tseng (Ningde Normal University, P.R. China); Yang-Han Lee and Chien-Da Huang (TamKang University, Taiwan); Hsiao-Yu Huang (St. John's University, Taiwan)

The heart is the motor of the human body, and the cessation of heartbeat signifies the end of life. Numerous cardiac pathologies such as arrhythmia, myocardial infarction, and cardiac hypertrophy occur. Electrocardiography (ECG) devices are typically required to examine the heart in hospitals. Physicians can use subtle differences in ECG signals to determine whether a patient has a heart disease. Thus, this study designed an ambulatory ECG circuit and applied software to determine the characteristic points of the QRS complex.

14:00 *Analysis of Noncontact Heartbeat Detection* 108

Yang-Han Lee (TamKang University, Taiwan); Hsien-Wei Tseng (Ningde Normal University, P.R. China); Chien-Da Huang (TamKang University, Taiwan); Yung-Wen Lee (Tamkang University, Taiwan); Chin-Shan Hung (St. John's University, Taiwan)

Heartbeat information is a crucial indicator in the clinical detection of life parameters. Current mainstream methods used for detecting heartbeats are contact detection technologies. Noncontact detection refers to using external energy to detect human physiological environment changes without contacting the human body.

14:15 *A Reliable Brain Computer Interface Implemented On FPGA For Mobile Dialing System* 110

Chih-Wei Feng, Jui-Chung Chang, Wei-Chen Chen and Wai-Chi Fang (National Chiao Tung University, Taiwan)

This paper demonstrates a high performance braincomputer interface (BCI) that allows users to dial phone numbers. The system is based on Canonical Correlation Analysis (CCA) and Steady-State Visual Evoked Potential (SSVEP). Through six buttons (9Hz, 10Hz, 11Hz, 12Hz, 13 Hz, 14Hz) displayed on the screen, subjects can choose the number by gazing at the computer interface. This proposed EEG system has been implemented in Field-Programmable Gate Arrays (FPGA) and it features high accuracy, integration density, and low cost. These features are meaningful for implementing a real time SSVEP-based BCI.

Session B4: Depth-Assisted Signal Processing for Consumer Electronics

Room: IB-204

Chairs: Huang Chao-Tsung (National Tsing Hua University, Taiwan), Chih-Hsien Hsia (Chinese Culture University, Taiwan)

13:00 *An Interactive Taiwan Sign Language Learning System Based on Depth and Color Images* 112

Shih-Hsuan Yang and Jia-Ze Gan (National Taipei University of Technology, Taiwan)

Sign language is crucial for communicating with hearing-impaired people. This study intended to develop a new interactive Taiwan sign language learning system. The Microsoft Kinect was used as an input device, with which the color image, depth image, and skeleton points of hands and body were collected. We developed algorithms for extraction and classification of hand location, hand shape, and hand motion trajectory, and the above information was integrated to decipher the sign language. Experimental results confirmed the high recognition rate of the proposed method. We also developed a user-friendly interface with various modes to facilitate the learning of Taiwan sign language.

13:15 *Sub-pixel Disparity Estimation in Continuous Space* 114

Li-De Chen, Jo-Jiun Yu, Wei-Han Cheng and Huang Chao-Tsung (National Tsing Hua University, Taiwan)

For depth-from-stereo vision applications such as driving assistance and object-size estimation, the accuracy of disparity estimation determines the precision of depth measurement. Conventional dense methods are hard to estimate disparity within a 0.1 pixel precision. In this paper, we present a novel object-based method to achieve robust and deep sub-pixel accurate disparity estimation. In our experimental system, it can provide depth measurement with less than 5% relative error within 150 m.

13:30 *Distance Estimation Based on Disparity Analysis for Vehicle Applications* 116

Saturday, June 6

Yeong-Kang Lai, Chiu-Ying Ho and Jian-Wen Li (National Chung Hsing University, Taiwan); **Thomas Schumann** (Hochschule Darmstadt-University of Applied Sciences, Germany)

Stereo vision has been used in many different applications such as robot, entertainment, and electronics for car. Disparity-based distance estimation requires a large amount of computational resources because of high block-matching computations, especially on the high-resolution image pair. In this paper, we proposed an algorithm for computing the distance between our own driving car and the front car for vehicle collision avoidance applications. Our system is designed to focus on the collision avoidance with the front end object which includes horizontal displacement. Therefore, the target of the front end of system is to find out the position and movement of these objects.

13:45 *Live Streaming Channel Recommendation Using HITS Algorithm* 118

Yu-Wen Liu (National Chiao Tung University, Taiwan); **Chen-Yi Lin** (National Taichung University of Science and Technology, Taiwan); **Jiun-Long Huang** (National Chiao Tung University, Taiwan)

Live streaming services have been developed prosperously in recent years. With live streaming services, broadcasters broadcast their videos to attract large numbers of viewers to watch. Some live streaming services also provide a platform for viewers gathering together to watch channels and interact with others. Over hundreds of videos broadcast every day, recommending channels are necessary to help viewers finding channels of interests. In this paper, we propose the hybrid HITS algorithm for Channel Recommendation (HyHITS_CR) which adopts the HITS algorithm with modification to utilize the follower-follower relationship on channel recommendation. Besides, we also observe from real logs that some viewers may focus on few particular channels. Thus, HyHITS_CR also takes advantage on such observation to further improve the accuracy of recommendation. Experimental results show that the hit rate of HyHITS_CR is around 10% higher than other prior algorithms.

14:40 - 15:40

K2: Keynote Speech (II) **Dr. Yen-Kuang Chen (IEEE Fellow) "Manageability Challenge for Internet of Things"**

Room: IB-101

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

15:40 - 16:10

B2: Coffee Break

Room: Break/Lunch Area

16:10 - 18:00

Session C1: Interactive and Network-Oriented Applications for Consumer Electronics

Room: IB-101

Chair: Hiroaki Nishino (Oita University, Japan)

16:10 *Practices of Fill-in-blank Problems in Java Programming Course* 120

Ta Na, Nobuo Funabiki and Nobuya Ishihara (Okayama University, Japan)

To assist Java programming educations, we have developed a Web-based Java Programming Learning Assistant System (JPLAS). JPLAS provides fill-in-blank problems to study the Java grammar by filling blank elements in a high-quality code that are composed of reserved words, identifiers, and control symbols. A graph-based blank element selection algorithm has been proposed to automatically select as many blanks as possible that have grammatically correct unique answers. In this paper, we show and discuss their application results to a Java programming course in our department.

16:25 *T4: A Two-tap based User Interface System using a Touch-type Device for Motor-impaired Company Employees* 122

Taishi Nomiya, Naoto Sato, Kou Yamamoto, Shigeki Matsubara and Makoto Nakashima (Oita University, Japan); **Takao Sugimoto** (Refly Corporation, Japan)

This paper presents a two-tap based user interface system (T4) to reduce the burden on motor-impaired company employees by using a touch-type device such as a tablet or smartphone. The system allows the workers to send any text to an application on a daily-use PC via a Web browser, and to customize the key layout to fit their needs. The effectiveness of the system was revealed in the preliminary experiment for the motor-impaired company employees. Due to its usefulness, they expressed an interest in implementing it at their places of business.

16:40 *Foot-Controlled Interaction Assistant Based on Visual Tracking* 124

Hiroyasu Inoue, Hiroaki Nishino and Tsuneo Kagawa (Oita University, Japan)

Whereas a mouse and a keyboard are indispensable devices for computer operation, they are totally useless for users who have upper limb disabilities. Customized devices to support these users tend to be expensive and have some functional limitations. We propose a method to effectively implement the system for assisting them based on vision tracking technology with readily-accessible consumer electronics such as a web camera and a low-cost motion sensor. In this paper, we describe the implementation method and a preliminary experiment conducted to verify the effectiveness of the proposed system.

16:55 *Log-likelihood Method to Select Initial Values of Multichannel Non-negative Matrix Factorization* 126

Fuminori Yoshiyama, Shingo Uenohara and Keisuke Nishijima (Oita University, Japan); **Yusuke Hioka** (University of Auckland, New Zealand); **Ken'ichi Furuya** (Oita University, Japan)

A multichannel extension of non-negative matrix factorization (NMF) associates the spatial property of the sources with each of the NMF bases. An initial-value selection method based on log-likelihood for multichannel non-negative matrix factorization (MNMF) is introduced to reduce the variation of the source separation performance. Experimental results showed selecting initial values that provide high log-likelihood would improve the source separation performance of MNMF depending on the sources.

17:10 *Snore Activity Detection Using Smartphone Sensors* 128

Keisuke Nishijima, Shingo Uenohara and Ken'ichi Furuya (Oita University, Japan)

In this paper, we analyze the effects of ambient noise on snore activity detection, and consider ways to improve detection performance. A smartphone is used to obtain sleep sound data, from which the acoustic features of sound pressure level (SPL) and Mel-frequency cepstrum coefficients (MFCC) are calculated. Snore activity detection is performed by machine learning using a support vector machine (SVM) with a linear kernel. The SVM is trained by the labeled acoustic features, and the trained SVM models are used to detect snore activity. Adding ambient noise recorded before sleep to the training set is expected to improve detection performance. Experimental results showed that an improvement in the detection performance from F-measure of 0.75 to 0.81 using acoustic features of SPL, from F-measure of 0.62 to 0.62 using MFCC, from F-measure of 0.69 to 0.74 using SPL and MFCC on average.

17:25 Design and Implementation of Android-Based Interactive Multimedia Presentation Platform for Multiple Users 130

Hui-Kai Su, Chun-Chia Kao, Le-Yun Chang, Yi-Feng Chen and Chi-Chia Sun (National Formosa University, Taiwan)

With the development of multimedia and embedded system technologies, it gradually becomes the part of our life. The course materials in future classrooms will be presented by interactive multimedia. It is different from the previous traditional teaching. The paper proposed two concepts about multiple users' interaction and multiple users' operating. Our system integrates cloud management system, multiple remote joysticks and android-based presentation platform. This system is divided into two parts: Interactive Multimedia Presentation Platform (IMPP) and Cloud Service Center (CSC). Our Android and Unity3D interactive library are developed for third-party users. Users can develop a multi-user interactive app on our system easily. CSC is a website, which is based on Drupal open source. The Application Store of Embedded Multimedia Network (EMNA Store) was approached. Users can download, install and delete apps on EMNA Store from IMPP. Finally, the multiple interactive presentation system with cloud services was realized.

17:40 Study on Sensor Networks for Elderly People Living Alone at Home 132

Eiji Aoki (Institute for Hyper Network Society, Japan); Shunichi Yoshitake and Masaki Kubo (AVIS Corporation, Japan)

On this study, it is rapid increase elderly people living alone due to changing social structure, how to research and development that can resolve using sensor networks. A large burden takes on family and significant national budget of social security costs take at present. Moreover there are many accidents for super-elderly at home or loneliness death happened. We pay attention to movement tracking of elderly people by several different types of sensor equipments. It focuses watch care for accident prevention like fall down in a room, corridors, and a bathroom. When we research and development, it is repeated verification for promoting efforts to practical use in the future.

Session C2: Emerging Technology for Consumer Electronics

Room: IB-201

Chairs: Shih-Lun Chen (National Chip Implementation Center (CIC), Hsinchu, Taiwan), Ting-Lan Lin (Chung Yuan Christian University, Taiwan)

16:10 Study of Dielectric Material Property Impact on Insertion Loss for Advanced Packaging Solutions 134

Bok Eng Cheah (Intel Microelectronics (M) Sdn. Bhd., Malaysia); Hungying Louis Lo (Intel Corporation, USA); Jackson Kong (Intel Microelectronics (M) Sdn. Bhd., Malaysia)

Low loss dielectric materials were implemented in the printed circuit board (PCB) design in the past to improve the electrical insertion loss performance for high-speed applications. Nonetheless, such implementation is typically not as common in the electronic package design due to substantial impedance discontinuities that limit the performance scaling. A coreless package design with metal grid array (MGA) second level interconnect (SLI) was explored in this study to enable electrical performance scaling for high-speed applications. This paper evaluates the impact of dielectric loss tangent property on electrical insertion loss performance for both conventional and coreless packaging designs up-to 100Gbps data-rate. MGA coreless package that yields minimal impedance discontinuities was observed gaining up-to 50% insertion loss improvements i.e. 20% higher compared to conventional design with dielectric loss tangent scaling from 0.03 to 0.006. The improved impedance matching at SLI junction minimizes the loss due to metal conductivity thus improving the linearity of insertion loss curve. The MGA coreless package design was found a viable option to enable high-speed I/O design scaling and/or approach to circumvent costly dielectric materials.

16:25 News Topics Categorization Using Latent Dirichlet Allocation and Sparse Representation Classifier 136

Yuan-Shan Lee and Rocky Lo (National Central University, Taiwan); Chia-Yen Chen (National University of Kaohsiung, Taiwan); Po-Chuan Lin (Tung-Fang Design University, Taiwan); Jia-Ching Wang (National Central University, Taiwan)

Recently, subscribing news from websites has become a new trend for many Internet users. In a news reading browser, it is essential all the news documents are properly categorized. For automatically categorizing the news topics, this paper presents a news categorization method using latent Dirichlet allocation (LDA) and sparse representation classifier (SRC). In our work, the LDA is used as the feature learning method. The multinomial distribution of the news topics is regarded as the feature of the document. These features are stacked as an over-complete dictionary, permitting us to perform SRC-based categorization. The experimental results show that the proposed method outperforms the traditional method.

16:40 Analysis of CFA video encoding efficiency 138

Pei-Sin Liaw (CYCU, Taiwan); Ting-Lan Lin, Tsai-Ling Ding and Shih-Lun Chen (Chung Yuan Christian University, Taiwan)

CFA (Color Filter Array) image and video compressions are discussed in this paper. Traditionally, the CFA image is demosaicked before compression. In a state-of-the-art method, the CFA is compressed before the demosaicking processed in RGB domain. In this paper, we proposed to compress the CFA video in YCbCr domain with the same amount of data as in CFA before compression. Compared with the state-of-the-art method, the proposed work improves the bitrate reduction by 37% with some CPSNR loss.

16:55 An Automatic Scoring System for Air Pistol Shooting Competition Based on Image Recognition of Target Sheets 140

Yuan-Chi Lin (Chung-Yuan Christian University, Taiwan); Shaou-Gang Miaou (Chung Yuan Christian University, Taiwan); Ying-Cheng Lin (Chung-Yuan Christian University, Taiwan); Shih-Lun Chen (Chung Yuan Christian University, Taiwan)

Traditionally, the shooting scores for air pistol competition are recognized and recorded manually. This paper proposed an automatic version. With image processing techniques, the location of a bullet hole and the serial ID number on a target sheet are identified, respectively, to calculate the score earned by the shooter with that ID number. The experimental results show that the proposed system can automatically identify scores with very high precision. Therefore, the proposed system is possible to replace the traditional scoring system.

17:10 Video quality metric model of MSE for backlight power saving 142

Xin-Cheng Li (Chung Yuan Christian University, Taiwan); Po-Yi Wu (CYCU, Taiwan); Ting-Lan Lin, Wen-Che Tsai, Chien-Hsun Chiang, Shih-Lun Chen and Chuan-Jia Wang (Chung Yuan Christian University, Taiwan)

The backlight power saving for LCD is an important research topic, since the backlight is the main source of energy consumption. Typically, the backlight power saving is done by limiting the dynamic range of the displayed pixels; the image quality will decrease. And how to maintain the image quality becomes the important issue. In this work, we propose to use a well-known video quality metric called VQM (Video Quality Metric) to measure the video quality, and proposed a VQM curve to be predicted by the MSE (Mean Square Error). This proposed curve can later be used to efficiently maintain the video quality while performing the backlight power saving.

17:25 PAW: Priority-based Adaptive Weighting for Software Defined Video Load Balancing 144

Wen-Ping Lai (Yuan-Ze University, Taiwan); En-Cheng Liou and Ping-Chi Chen (Yuan Ze University, Taiwan)

This paper presents a novel multipath load balancing algorithm called priority-based adaptive weighting (PAW) for video over software defined networks (SDN). Based on priority differentiation among video packets, PAW adopts a per-packet strategy to distribute ingress video packets over the multiple egress ports of an entry SDN-switch connecting to those output links leading to the same IP destination, where their selection weights are provided by an SDN-controller and adaptive to time varying available

multipath bandwidths. The experimental results show that PAW substantially outperforms all the non-priority-based weighting schemes for load balancing, such as adaptive weighting (AW), fixed weighting (FW) and equal weighting (EW).

Session C3: Computer Networks and Sensor Technologies (I)

Room: IB-202

Chairs: Guangjie Han (Hohai University, P.R. China), Tin-Yu Wu (National Ilan University, Taiwan)

16:10 *Stress Classification in Speech based on Stress Levels* 146

Xiao Yao (Hohai University, P.R. China); Xiaofeng Liu (Hohai University & College of IoT Engineering, Taiwan); Aimin Jiang and Ning Xu (Hohai University, P.R. China)

In this study, physical parameters are estimated to classify speech as either stressed or neutral based on a two-mass model. We focus on the discontinuity of samples distribution in the feature space because of the existence of different stress levels. The stress samples are clustered to different classes according to stress levels. The classification of speech under stress is performed using the physical parameters. Experimental results show that the performance for differentiating neutral speech from stress has been improved.

16:25 *Inclination Gradient-based Fall Detection Algorithm For Wrist-Worn Device* 148

ShengQian Zhou (Key Lab of Broadband Wireless Communication and Sensor Network Technology (NUPT), P.R. China); Jianxin Chen (Nanjing University of Posts and Telecommunications, P.R. China); Xinzhi Wang and Zhou Liang (Key Lab of Broadband Wireless Communication and Sensor Network Technology (NUPT), P.R. China); Baoyu Zheng (Nanjing University of Posts and Telecommunications, P.R. China); JingWu Cui (Nanjing University of Posts And Telecomm, P.R. China)

This paper presents an algorithm to detect falling for the elderly with one wrist-worn device. The device consists of a tri-axis accelerometer and transmits collected data to the computer through blue tooth. The algorithm has low computation complexity to determine the fall event according to the inclination gradient. Experimental results show that it performs better than another similar device with the average sensitivity and specificity of 91.67% and 99.92%, respectively.

16:40 *An Energy-Efficient Tracking Scheme for Continuous Objects in Duty-cycled Wireless Sensor Networks* 150

Jiawei Shen, Guangjie Han, Jinfang Jiang and Ning Sun (Hohai University, P.R. China); Lei Shu (Guangdong University of Petrochemical Technology, P.R. China)

This paper proposes a novel 2-layer grid-based continuous object tracking scheme (TGM-COT) in energy limited wireless sensor networks. Analysis and simulation results demonstrate that TGM-COT outperform previous protocol TG-COD on achieving a higher tracking accuracy, but without sacrificing additional energy consumption.

16:55 *dual-frequency ultrasonic washing machine for fruits and vegetables* 152

Changping Zhu, Bin Wang, Runhang Gong, Yitao Liu and Jin Zhu (Hohai University, P.R. China); Zhenbing He (Jiangsu Yibibai Environmental Protection and Technology Co., LTD, P.R. China); Qinggong Ren (Changzhou University, P.R. China); Qingbang Han (Hohai University, P.R. China)

This paper presents a fruits and vegetables washing machine using ultrasonic technology. The pesticide residues on fruits or vegetables can be peeled off by ultrasonic waves effectively. The washing machine produces two frequencies ultrasonic, 140 kHz for washing fruits or vegetables and decomposing pesticides, 80 kHz for other cleaning such as dishes. Cleaning experiment and its results are shown in this paper.

17:10 *A Novel SCNDR Rumor Propagation Model on Online Social Networks* 154

Weijun Hong and Zhipeng Gao (Beijing University of Posts and Telecommunications, P.R. China); Yuwen Hao and Xiaoxue Li (General Hospital of Chinese People's Armed Police Forces Beijing, P.R. China)

With the rapid development of online social networks, the spread of online rumors will result in serious social problems. How to correctly understand the propagation rules of online rumors, and effectively control the spread of online rumors, has very important social significance. Based on the detailed analysis of the classic epidemic spreading model, this paper divides the infected state into Credulous(C), Neutrals(N) and Denies(D) according to the characteristics of online social networks, then proposes the new SCNDR rumor propagation model on online social networks. Based on the SCNDR model, derives the dynamic differential equations and designs the algorithm for SCNDR.

17:25 *A Novel P2P Overridden API for Open Data Communications in WWW* 156

Jie Zhang (HoHai University, P.R. China); Guangjie Han and Ning Sun (Hohai University, P.R. China); Lei Shu (Guangdong University of Petrochemical Technology, P.R. China); Hwa Jong Kim (Kangwon National University, Korea)

API(Application Programming Interface) is a specification of high-level programming language to communicate hard/software or program objects. With Big Data and population of data analysis in recent years, a lot of Open API services have released by governments and enterprises to share useful data for R&D systems. In this paper, we present a P2P(Peer to Peer) Overridden API for a more invigorated Open data communication. P2P Overridden API is an approach that share overridden method and filtered URL of Open API to develop flexible and variable Open data services.

17:40 *Application of NoSQL Database MongoDB* 158

Jin Wang (Nanjing, P.R. China)

NoSQL database is the broad definition of non-relational data storage. This article gives the data storage structure and query of relational database and NoSQL database MongoDB to meteorological BBS information collection system, and the advantage and the disadvantage are listed in data structure, query and scalability. Compared to relational database, MongoDB supports schema-free, has great query performance with huge amount of data and provides easy horizontal scalability with low cost of hardware.

Session C4: Computer Networks and Sensor Technologies (II)

Room: IB-204

Chairs: Xiaofeng Liu (Test Center of Chongqing University, Hong Kong), Ming-Fong Tsai (Feng Chia University, Taiwan)

16:10 *A Wireless Location System in LTE networks* 160

Qi Liu and Yue Ma (China Unicom Company, P.R. China)

Personal location technologies are becoming important with the rapid development of Mobile Internet services. In Long Term Evolution (LTE) networks, the key problem of user location technology is that different base stations need to be synchronized. However, high precision synchronization among different base stations is difficult, especially in indoor environment. In this paper, a new wireless location system in LTE networks is proposed. It contains more than two antenna clusters. Each cluster gets time differences of Sounding Reference Signals (SRS) from different antennas. Then the location system collects those time differences and calculates the user's position. Furthermore, a new location algorithm is raised based on this location system. Finally, simulations are given to verify the efficiency of this algorithm.

16:25 *Finding Similar Users in Social Networks by Using the Depth-k Skyline Query* 162

Sheng-Min Chiu, Yi-Chung Chen, Heng-Yi Su and Yu-Liang Hsu (Feng Chia University, Taiwan)

Search algorithms designed to seek out similar users in social networking sites are a significant function of recommendation systems. Conventionally, such sub-algorithms consider all the dimensions of user data as a whole. However, as the information in various dimensions is generally independent, the conventional approaches may not be the best way to find similar users. This paper solves this problem by proposing an approach based on depth-k skyline queries that searches for similar users with multiple conditions. This paper also presented an algorithm to accelerate this process, the effectiveness of which was demonstrated in a simulation.

16:40 *An Educational/Research-Aimed Tool for Voltage Stability Analysis in Smart Grids* 164

Heng-Yi Su, Yi-Chung Chen, Qian-Hua Huang, Sheng-Min Chiu and Yu-Liang Hsu (Feng Chia University, Taiwan)

This paper presents an easy-to-use simulation tool named VSAT for voltage stability analysis in smart grids. The proposed VSAT, which is a graphical user interface (GUI) software package, is developed by means of the visualization capabilities of Matlab for both research and educational applications. A series of case studies conducted on the IEEE 14-bus and IEEE 39-bus systems is used to demonstrate the effectiveness and flexibility of the proposed tool.

16:55 *A Bicycle-borne Sensor for Monitoring Air Pollution near Roadways* 166

Xiaofeng Liu (Hohai University & College of IoT Engineering, Taiwan); Bin Li (HoHai University, P.R. China); Aimin Jiang, Shixin Qi, Chaosheng Xiang and Ning Xu (Hohai University, P.R. China)

Public bicycle share programs increase population access to bicycles and are becoming more and more popular in Europe and Asia. Because health effect attributed to exposures to near-roadway air pollutants has been concerned in recent years, here we present a bicycle-borne data collection device for monitoring air quality near roadways. The system is composed of a low-cost particulate matter sensor, an exhaust gas sensor, a Bluetooth interface, and a GPS receiver that provides both a spatial localization and time to the data collection process. The primary tests indicate this device performs well, and can be integrated into a sensor network for air pollution based on a network of shared bicycles.

17:10 *Car Together: Sharing Real-time Captured Video through Vehicles on Roads* 168

Chih-Lin Hu, Shih-Kai Wang, Ming-Ying Lu, Tzu-Ting Tseng, Cheng-Lun Lin, Yu-Feng Hsu and Pin-Chun Chiu (National Central University, Taiwan); Jiun-Long Huang (National Chiao Tung University, Taiwan)

This paper presents a system and method for enabling real-time captured video sharing services among neighboring vehicles in self-organized vehicular network environments. When vehicles are equipped with image capturing and Wi-Fi modules, they are capable of establishing local wireless networks, connecting with other peers, and fetching on-line video records from neighboring peers. This service design can offer drivers a broad range of visibility that is likely influenced by front cars, road-side obstacles, or curve roads. After prototypical development and demonstration, this paper shows that the deployment of this service on vehicles is able to assist drivers in driving safety on roads.

17:25 *A Reliable Location-based and Energy-aware Routing Protocol for Underwater Acoustic Sensor Networks* 170

Ning Sun and Guangjie Han (Hohai University, P.R. China); Jie Zhang (HoHai University, P.R. China); Jinfang Jiang (Hohai University, P.R. China); Lei Shu (Guangdong University of Petrochemical Technology, P.R. China)

In this paper, a reliable routing protocol for underwater acoustic sensor networks is proposed in this paper, which uses both the information of position and residual energy of intermediate node to make decision of data forwarding. Compared to previous vector-based routing protocol, evenly energy consumption and more reliable data transmission are provided.

17:40 *Voice Conversion Based on Empirical Conditional Distribution in Resource-limited Scenarios* 172

Ning Xu and Yibin Tang (Hohai University, P.R. China); Jingyi Bao (Changzhou Institute of Technology, P.R. China); Xiao Yao and Aimin Jiang (Hohai University, P.R. China); Xiaofeng Liu (Hohai University & College of IoT Engineering, Taiwan)

In this paper, a computationally efficient voice conversion system has been designed in order to improve the performance in resource-limited scenarios. First, mixtures of Gaussians (MoGs) at fixed locations of Mel frequencies have been used to represent the spectrum of STRAIGHT compactly. Second, the key conditional distributions for prediction are approximated by building histograms of aligned features empirically. Experiments have confirmed that our proposed method can obtain fairly good results compared to the traditional method without huge computational costs.

18:30 - 21:30

WR1: Welcome Reception & Young Professional Event (Fullon Hotel Taipei) Prof. Chang Wen Chen (IEEE Fellow) "My Personal Views on a Successful Research Career"

09:00 - 10:15

Session D1: Next Generation Multimedia and Communication System for Consumer Electronics

Room: IB-101

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

09:00 *Signal-Quality-Aware Impulsive Noise Mitigation for OFDM-based Power-line Communications* 174

[Ying-Ren Chien](#) (National I-Lan University, Taiwan); [Yi-Wu Chen](#) (National Taiwan University, Taiwan); [Hen-Wai Tsao](#) (National Taiwan University, ?)

Conventional threshold-based method, such as nulling or clipping, is simple and effective for mitigation of impulsive noise (IN) in power-line communications (PLC) environment. However, we raise two issues for the threshold-based approach. First, for orthogonal frequency division modulation (OFDM) broadband PLC systems, the high peak-to-average power ratio (PAPR) characteristics of the received OFDM signals increase the difficulty of determining the threshold in a systematic fashion; second, in the cases of absence of IN or low insertion loss, the threshold-based IN mitigation approach may fail. This paper proposes a signal-quality-aware IN mitigation method to address these two issues. By calculating the kurtosis of the received signals, we can determine whether to null the received signals or not. If the values of kurtosis are high enough, a multi-threshold-based nulling approach is applied, which significantly reduces the false alarm probability of IN detection and hence improves the resulting bit error rate (BER) performance. Based on the specification of IEEE P1901, we setup a simulation to validate the effectiveness of the proposed algorithms.

09:15 *Holographic Panorama Display System* 176

[Yu-Cheng Fan](#) (National Taipei University of Technology, Taiwan)

In this paper, we proposed a holographic panorama display system. The presented scheme uses panorama technology display a holography images on the HoloAD platform. We adopt color correction method to perform image pre-processing and then find the feature points of the input image and match with each other. Finally, images will be blent a panoramic image and then be displayed on HoloAD platform.

09:30 *Efficient Memory Management Scheme for Pipelined Shared-Memory FFT Processors* 178

[Hsin-Fu Luo](#) (National Cheng Kung University, Taiwan); [Ming-Der Shieh](#) (National Cheng-Kung University, Taiwan)

This paper presents an efficient memory management scheme for pipelined shared-memory architectures of the fast Fourier transform (FFT). A multi-path delay commutator (MDC) with a data relocation scheme is developed to merge multiple banks for lowering the area requirement and power dissipation of pipelined shared-memory FFT architectures. Moreover, a generalized memory addressing algorithm that can support mixed-radix MDC architectures is also proposed. The presented architecture outperforms conventional pipelined shared-memory FFT designs, which employ multi-bank memory structures, in terms of the area requirement and power consumption.

09:45 *A Radix-2/3/4/8 MDC Architecture for Variable-Length FFT Processors* 180

[Hsin-Fu Luo](#) (National Cheng Kung University, Taiwan); [Ming-Der Shieh](#) (National Cheng-Kung University, Taiwan); [Kun-Hsien Lee](#) (National Cheng Kung University, Taiwan)

A radix-2/3/4/8 multi-path delay commutator (MDC) architecture for pipelined shared-memory fast Fourier transform (FFT) processors is proposed. By using an effective memory addressing scheme, the original processing and control characteristics of the 2^m -point FFT processor are retained when processing 3×2^m -point FFT, where m is an integer. The proposed variable-length FFT processor can thus be implemented more efficiently.

Session D2: ICT for Biomedicine and Healthcare

Room: IB-201

Chairs: Cihun-Siyong Gong (Chang Gung University, Taiwan), Chin Hsia (National Central University, Taiwan)

09:00 *Ultrafast high quality ultrasound imaging using k-space beamforming and angular compounding with coherence factor* 182

[Chu-Yu Huang](#), [Chir-Weei Chang](#) and [Wen-Hun Cheng](#) (Industrial Technology Research Institute, Taiwan)

The high frame rate ultrasonic imaging has enabled new powerful imaging modalities such as Elastography. To achieve high frame rate, the plane-wave transmission and post-acquisition beamforming are used. However, because of lack of transmission focusing, the images obtained using plane-wave transmission suffers from low resolution and low contrast. Therefore, in this paper we proposed a way to improve the beamforming process by using k-space beamforming and angular compounding with coherence factor method. With our new method, high-quality echographic images are obtained without significantly affect the high frame rate capabilities. Tissue-mimicking phantom experimental results of the proposed method have been demonstrated. According to the experimental results, the proposed method is able to reach an image quality comparable to conventional B-mode with only 5 angles of plane-wave insonification.

09:15 *Design of a Power-less Integrated Protection Circuit for Biomedical Ultrasound Transmit/Receive* 184

[Chin Hsia](#) (National Central University, Taiwan)

This paper proposes a novel architecture of design a high-voltage protection circuit for biomedical ultrasound signal transmission and receive. The protection circuit includes a transmission element and a voltage-driven switching block. The transmission element is composed of an impedance matching circuit coupled to the input terminal of the receiver, and the voltage-driven switching block detects a voltage value at the input of the transmission element. No power source is required for the device to operate at either high voltage or low voltage level. Simulation results show that the voltage isolation between the input and output node is over 30dB and the overall insertion loss is around 0.5dB over 100 MHz bandwidth.

09:30 *Combined Novel Addressing Elements and HV-ESD Clamp Protected for Medical Ultrasound System* 186

[Jian-Chiun Liou](#) (National Kaohsiung University of Applied Sciences, Taiwan); [Chin Hsia](#) (National Central University, Taiwan); [Yen-Chung Huang](#) (Industrial Technology Research Institute, Taiwan); [Wen-Chieh Lin](#) (Kao Yuan University, Taiwan)

In this paper, HV-ESD Clamp protected ultrasound transducer topology is proposed for driving multi-channel medical ultrasound transducer array. High voltage power, low voltage logic and high voltage CMOS architecture were integrated in ultrasound chip. On-chip high voltage electrostatic discharge (HV-ESD) protection design in smart power technology of ultrasound chip is a challenging issue. Specially driving method is controlled spatially on the ultrasound transducer elements to avoid the strong interference between one and neighbor another one.

09:45 *ECG Noise Thresholding Based on Moving Average* 188

Sunday, June 7

Cheng Hsun Lin (ITRI ICL, Taiwan); **Jun Ueno** (Corporate Planning Unit, Renesas Electronics Corporation, Japan); **Huan Ke Chiu** (ITRI ICL, Taiwan); **Yi-Chun Lin** (Industrial Technology Research Institute, Taiwan); **Li Ren Huang** (ITRI ICL, Taiwan); **Cihun-Siyong Gong** (Chang Gung University, Taiwan)

Noise cancellation is very important step for ECG signal processing. For this problem, there are many methods had been applied. For example, Wavelet based de-noises, EMD based de-noise, Kalman based de-noise, etc. for resource very limited system, the above method may be not fit into the system resource. Algorithm complexity and resource requirement will be the major concern in this work. In this paper, a new processing flow is proposed. it is combined two concepts, one is moving average and another is soft-thresholding. First, we will explain the whole process. Next, the performance will be discussed. And at the last, we will talk about the possible way to improvement the flow

10:00 Application of Light Field Camera In Diabetes Intake Management 190

Yung-Sung Lan, Hsin-Yueh Sung, Chir-Weei Chang and Yen-Chang Wang (Industrial Technology Research Institute, Taiwan)

Diabetes is a group of diseases in which the body has trouble regulating blood glucose. As concern for diabetes grows, the need for automated and accurate methods to monitor nutrient intake becomes essential for managing dietary. The challenging problem of the image-based dietary assessment is how to estimate food volume from a photograph taken with a camera. We present a design with aspherical surface of micro lens array approach for the novel digital imaging system using commercial optical software ZEMAX combined algorithm by using standard mathematical software MATLAB for the joint design process.

Session D3: Intelligent Vehicle Technologies for Safety, Assistant and Convenience

Room: IB-202

Chairs: Chuen-Yau Chen (National University of Kaohsiung, Taiwan), Chung-Bin Wu (NCHU, Taiwan)

09:00 Intelligent Video-Based Drowsy Driver Detection System under Various Illuminations and Embedded Software Implementation 192

Wei-Liang Ou (National Chung Hsing University, Taiwan); **Ming-Ho Shih** (National Chung Hsing University, Taiwan); **Chien-Wei Chang, Xue-Han Yu and Chih-Peng Fan** (National Chung Hsing University, Taiwan)

An intelligent video-based drowsy driver detection system, which is unaffected by various illuminations, is developed in this study. Even if a driver wears glasses, the proposed system detects the drowsy conditions effectively. By a near-infrared-ray (NIR) camera, the proposed system is divided into two cascaded computational procedures: the driver eyes detection and the drowsy driver detection. The average open/closed eyes detection rates without/with glasses are 94% and 78%, respectively, and the accuracy of the drowsy status detection is up to 91%. By implementing on the FPGA-based embedded platform, the processing speed with the 640x480 format video is up to 16 frames per second (fps) after software optimizations.

09:15 Object-based Stereo Matching Using Adjustable-cross for Depth Estimation 194

Li-Hung Wang, Kai-Lung Tsai and Chung-Bin Wu (NCHU, Taiwan)

In this paper, we proposed object-based stereo matching using adjustable-cross for depth estimation. By eliminating the redundant background information, the desired objects are extracted. To generate the depth maps and reduce the computational complexity, we proposed an adjustable-crossed window for stereo matching. To overcome the occlusion, a depth map calibration method is also introduced. The proposed algorithm reduces about 91% complexity.

09:30 An Intelligent Personalized Traffic Information Extraction System for Road traffic safety 196

Yi Chen Lu (National Chung Hsing Uni., Taiwan); **Feng Yuan Tai and Hsiao-Ping Tsai** (National Chung Hsing University, Taiwan)

Other than some driving assistant systems that can automatically avoid accidents, providing a driver with highly relevant and real-time traffic information is useful in attracting a driver's attention and striving more reaction time to possible dangers. In this paper, we propose an intelligent traffic information extraction system that explores a vehicle's trajectories to discover its driver's movement patterns and use the discovered patterns to predict the most likely locations that the driver will go in the near future. Based on the proper locations in the near future, our system extract the top-k associated traffic messages that are situated on the proper way of the driver. To validate our design, we implement the intelligent traffic information extraction system as an Android APP and run the application on a car to test the system. The results show that as the movement routes of a driver are of high regularity, more percentage of the extracted traffic events are situated on the way of the driver.

09:45 A Project-Based Course in Autotronics System Design 198

Peng-Sheng Chen (National Chung Cheng University, Taiwan)

This paper reports the experiences of teaching a project-based course in Autotronics System Design. The course aims to increase students' interest in the issues related to autotronics systems. Its five parts comprised: basic and advanced experimental modules, keynote lectures, a field trip, and a final project. Because it is a course for graduate students in Computer Science, the experimental modules focus on vision-based autotronics systems. The overall students' responses were satisfactory.

10:00 WIFI-based Smart Car for Toxic Gas Monitoring in Large-scale Petrochemical Plants 200

Lei Shu, Junlin Zeng and Kailiang Li (Guangdong University of Petrochemical Technology, P.R. China); **Zhiqiang Huo** (China University of Geosciences Beijing, P.R. China); **Xiaoling Wu** (Guangzhou Institute of Advanced Technology (GIAT), Chinese Academy of Sciences (CAS), P.R. China); **Xianjun Wu and Huilin Sun** (Guangdong University of Petrochemical Technology, P.R. China)

Providing complete monitoring on the concentration of various toxic gases in large-scale petrochemical plants is critical, since it serious affects the safely producing activities and first line workers' lives. Safe production environment can enhance the productivity and keep high profits of enterprises. In this paper, we present a newly developed mobile car with WIFI wireless communication to smartly monitor and track the concentration of various toxic gases

Session D4: The Digital Baseband Communication Algorithm, Architecture, IC and Software Defined Radio

Room: IB-204

Chairs: Chin-Kuo Jao (National Central University, Taiwan), Chih-Feng Wu (National Penghu University of Science and Technology, Taiwan)

09:00 Design and Analyses of Joint Carrier Recovery and Fast Convergence Generalized Multi-Modulus Decision-Feedback Blind Equalizer for 1024QAM Cable Receivers 202

Kai-Wun Jheng and Chih-Peng Fan (National Chung Hsing University, Taiwan)

In this study, a joint carrier recovery (CR) and fast decision-feedback equalizer (DFE) with a two-stage generalized multilevel modulus algorithm (GMMA) and enhanced decision-directed (EDD) scheme is developed for 1024QAM cable receivers on downstream wired cable channels. At the first convergence stage, the joint GMMA and EDD equalization is applied for the fast convergence. When the convergence process reaches the steady state, the EDD scheme reduces the mean square error (MSE) further at the second stage. For the combination of the CR loop and GMMA-based equalizer, the qualitative analyses between two joint architectures are discussed. At the 1024QAM mode, the proposed joint CR and GMMA-based DFE scheme has a faster convergence speed than the previous equalizer design.

09:15 Gb/s Prototyping of 60GHz Indoor Wireless SC/OFDM Transmitter and Receiver on FPGA Demo System 204

Chih-Wei Jen and Pranav Arya (National Chiao Tung University, Taiwan)

This work presents a dual mode, single carrier (SC) and high speed interface (HSI), wireless baseband receiver which implements the IEEE standards 802.15.3c [1] and 802.11.ad [2]. The proposed architecture of the baseband receiver is designed as 8 –parallelism with feed-forward data path reducing the operating frequency and can achieve high throughput for indoor communication. Besides, our goal is to demonstrate the system on Xilinx VC707 FPGA evaluation board and achieve multi-Gb/s data speed and low bit error rate (BER). The data rates achieved by the prototype are 1.5 Gb/s and 4.5 Gb/s for QPSK and 64QAM data in HSI mode, respectively. The specified (BER) of 10⁻² has been achieved for QPSK and 64QAM data at 8.3dB and 22.6dB, respectively.

09:30 *Synchronization of Direct-RF Receiver in Software Defined Radio Platform* 206

Mingho Lu and Chitien Sun (Industrial Technology Research Institute, Taiwan)

Software defined radio is increasingly important due to its flexibility to integrate a variety of communication standards and efficiency to develop or verify system architectures and algorithms. Here we provide a general platform with hardware acceleration IPs in FPGA to speed up the routine computing jobs like filters or FFT. Meanwhile, different frequency bands need different RF modules in the past, now we can use an ultra-high-speed ADC to sample RF data and down convert them by digital RF technology. Also, we develop the acquisition-tracking method to overcome the timing and frequency offset by software to replace lots of analog hardware components and IC works.

09:45 *Design and implementation of the OFDM receiver for visible-light communication* 208

Chien-Yao Hsiao, Shu Na Guo, Chien-Hung Chiu and Tung-Yeh Hsieh (National Central University, Taiwan); Chih-Feng Wu (National Penghu University of Science and Technology, Taiwan); Muh-Tian Shiue (National Central University, Taiwan)

This paper presents a receiver design for the VLC (Visible Light Communication) system using OFDM modulation. Based on this design specification of OFDM-based system, this receiver comprises of a time and frequency domain conversion, synchronization and equalization functions. The functions of OFDM synchronization contain boundary estimation and sampling clock offset estimation and compensation. Equalization section contains the channel effect estimation and frequency domain equalizer for data recovery.

10:00 *Design of Digital Baseband Inner Receiver for PLC System Based on IEEE P1901 Specification*210

Yan Chen, Yuan-En Yu, Yu Cheng Lin and Chih Hung Hsieh (National Central University, Taiwan); Chih-Feng Wu (National Penghu University of Science and Technology, Taiwan); Muh-Tian Shiue (National Central University, Taiwan)

In this paper, we focus on the design of digital baseband inner receiver for PLC (Power Line Communication) system based on IEEE P1901 specification. The receiver include two blocks are synchronization and equalization functions. The functions of synchronization contains symbol boundary synchronization and sampling clock offset estimation and compensation. Equalization function contains the channel effect estimation and frequency domain equalizer

Session D5: (Poster Session) Interactive Digital Media and Virtual Reality Environment

Room: 1F Lobby

Chairs: David Bong (Universiti Malaysia Sarawak, Malaysia), Wai-Chi Fang (National Chiao Tung University, Taiwan)

09:00 *A Symmetry-based Forward Vehicle Detection and Collision Warning System on Android Smartphone* 212

Yu-Jie Jheng, Yu-Hua Yen and Tsung-Ying Sun (National Dong Hwa University, Taiwan)

This study proposes a symmetry-based forward vehicle detection and collision warning system (FCW) on smartphone. The proposed system identifies forward vehicle by shadow with vehicular symmetry. Through Bayes classifier tracking approach, it can reduce the error detection of image processing. And utilizing shadow detection increases the robustness of the identifying system. The detection system is migrated the FCW algorithm to Android, and employs mobile camera embedded Android smartphone to capture image of road environment. The FCW kernel processes captured images to obtain vehicle-marking of forward vehicle.

09:05 *Virtual TouchPad: Hand Gesture Recognition for Smartphone With Depth Camera* 214

Wei-Sheng Wong (National Tsing Hua University, Taiwan); Shih-Chung Hsu (National Tsing-Hua University, Taiwan); Chung-Lin Huang (National Tsing Hua University, Taiwan)

This paper presents a virtual touchpad for smartphone with depth camera such as HTC One(M8). Hand gesture recognition is used as a new human machine interface for hand-held devices. This system consists of three modules: (1) open hand extraction, (2) active fingertip detection and tracking, and (3) hand gesture recognition. We divide the hand region into three parts: arm, palm, and fingers, detect the active fingertips, and track the trajectory of the active fingertips to recognize the hand gestures.

09:10 *Function and Speed Portability of Audio Fingerprint Extraction across Computing Platforms* 216

Fu-Hai Frank Wu (National Tsing Hua University, Taiwan); Jyh-Shing Roger Jang (National Taiwan University, Taiwan)

Audio Fingerprinting (AFP) is a technology, which requests huge computing power for responsiveness, accuracy, and robustness to noise. In this study, we make efforts to improve the computing speed of fingerprint extraction in AFP system by parallelism language OpenCL. Especially, we also explore the function and speed portability across different platform. The experimental results show that the portability of function is trivial by syntax check and utilizes conservative syntax for different compilers, such as Microsoft Visual Studio and Linux GCC. On the other hand, the speed portability requests much works for optimization of different sub modules for the specified platform.

09:15 *Developing an Efficient Navigation System based on Driving Time Data Manipulation* 218

Ray Chi, Che-Ju Cheng, Shashi Prasad and Hsiu-Hsen Yao (Yuan-Ze University, Taiwan)

This study focuses on about 1,400 intersections in Taoyuan county and the connected roads to build road map (network model) to achieve route planning research, in order to develop a big driving data collection to support navigation technique. The collection and transformation of the GPS data to server-site (DW1) is performed by using telematics or device of Android platform. After the historical driving data is transformed, the data is then stored in road classic data warehouse (DW2). This study result is better while comparing this result to Google map navigation system in terms of time estimation.

09:20 *Quality Assessment For Stereoscopic Images With JPEG Compression Errors* 220

Kenny Voo and David Bong (Universiti Malaysia Sarawak, Malaysia)

In this paper a new quality assessment method for stereoscopic image with compression distortion is proposed. This method is designed based on hybrid of 2D image quality metrics and stereoscopic depth map information. The proposed metric is tested on LIVE 3D image database with JPEG and JPEG2000 (JP2K) errors. As a result, this metric has shown an improved performance in assessing perceived quality for stereoscopic images.

09:25 *An Improvement Design of a Smartphone Interface and Image Processing Methods to Reduce Uncomfortable Light from a Digital Projector* 222

Y. W. Bai and Tine-Hsueh Lin (Fu Jen Catholic University, Taiwan)

In this paper we propose an improvement design to integrate a combination of both a smartphone and a projector to reduce uncomfortable light emitting from a digital projector. The smartphone executes the face detection module, and superimposes the black mask in the position of the face to reduce all uncomfortable light shining in the speaker's eye. This design uses the skin color detection and background subtraction methods to increase the face recognition rate of the previous design. In addition, this design also provides the face detection method for multiple users, so that the projector simultaneously places multiple black masks, and each mask is superimposed for each user's face.

09:30 *Spectral Analysis of Photoplethysmography Based on EEMD Method* 224

Shang Chuang (NCTU, Taiwan); Jia-Ju Liao and Wai-Chi Fang (National Chiao Tung University, Taiwan); Chia-Chi Chang (National Chiao Tung University, Taiwan); Chia-Ching Chou (National Chiao Tung University, Taiwan)

In this paper, the proposed algorithm based on Hilbert-Huang Transform (HHT) is used to analyze the photoplethysmography (PPG). In fact, PPG is a kind of nonlinear and nonstationary signal which is analyzed by HHT method to achieve the capability of precise decomposition. The time series data are decomposed into Intrinsic Mode Function (IMF) with Ensemble Empirical Mode Decomposition (EEMD) algorithm. This study proposed a novel instantaneous PRV (iPRV) measurement based on EEMD method.

09:35 *Detection of Carotid Artery Stenosis via Electronic Stethoscope: A preliminary study with heart sound segmentation* 226

Jin-For Li (National Chung Cheng University, Taiwan); An-Bang Liu (Neuroscience Center, Hualien Tzu Chi Hospital, Taiwan); Wei-Min Liu (National Chung Cheng University, Taiwan)

Carotid stenosis is an important indicator and one of the main causes of ischemic stroke. Since the stenosis transformation is gradual, the patients usually can't be aware of abnormality immediately. Therefore a convenient non-invasive examination method is needed to help the general public monitor the status of carotid artery stenosis. In this work we used electronic stethoscope to record the sound of blood flow, and extract the systolic fragments. The experimental results reveal the approximate entropy can be used as a preliminary feature to detect carotid stenosis ($p < 0.01$).

09:40 *Heart Murmur Detection with SVM Classification* 228

Giann-Shiou Yang (University of Minnesota Duluth, USA)

This paper presents an approach to detect low frequency vibrations from the human chest and correlate them to cardiac conditions. Two different techniques (via the pressure sensor and accelerometers) of detecting a human heart murmur have been developed through the extraction of vibrations primarily in the range of 10 – 150 Hertz (Hz) on the human chest. The techniques have been tested through clinical trials with the consent of the University of Minnesota Institutional Review Board (IRB). Data was acquired digitally via these two techniques through a custom MATLAB software interface. Using the interface, the data was analyzed and classified by a Support Vector Machine (SVM) approach. The results indicate that the SVM was able to classify signals by distinguishing between normal and abnormal cardiac conditions and also between pathological and non-pathological cardiac conditions.

09:45 *Feature Genes Selection of Adult ALL Microarray Data with Affinity Propagation Clustering* 230

Jin-Tsong Jeng (National Formosa University, Taiwan); Chen-Chia Chuang (NIU, Taiwan); Yan Li, Chih-Kai Chang and Zhi Wang (National Formosa University, Taiwan)

Microarray data analysis approach has been become a widely used tool for disease detection. It uses tens of thousands of genes as input dimension that would be a huge computational problem for data analysis. In this paper, we proposed to apply affinity propagation (AP) clustering for feature genes selection of adult acute Lymphoblastic Leukemias (ALL) microarray data. That is, feature genes can be finding out according to the adjustable the number of cluster in AP clustering. AP Clustering is a new grouping method by passing messages between data points, AP clustering can to reduce dimension on each sample without known the number of cluster in advance. Finally, these results under the specific genes with AP clustering can provide learning in classification and prediction.

09:50 *Design of a quasi-logarithmically spaced multi-sine signal generator based on FPGA* 232

Yuxiang Yang (Xi'an University of Technology, P.R. China)

Low crest factor (CF) multi-sine can bring high signal-to-noise ratio for fast frequency response function (FRF) measurement. This paper synthesizes a broadband multi-sine signal which has 15 flat and quasi-logarithmically spaced spectrum and a low CF of 1.8484. The multi-sine is realized based on a field-programmable gate array (FPGA). The generated multi-sine has the fundamental frequency of 8 kHz, and spans logarithmically from 8 kHz to 800 kHz at its 15 harmonic components. This paper provides an applicable solution to synthesize and generate broadband multi-sine signals.

09:55 *Medical Augmented Reality for Craniofacial Application Using Surface Deformation Correction* 234

Hao-Che Lee and Giann-Der Lee (Chang Gung University, Taiwan); Shin-Tseng Lee and Chieh-Tsai Wu (Chang Gung Memorial Hospital, Taiwan)

The paper presents a novel scheme that uses a projector to project a corrected CT image on the craniofacial surface for augmented reality visualization. The deformation of the projected image due to curved surface can be successful recovered via homography projection correction. The experimental result that shows the superior performance of this work is also included.

10:00 *Automation Control Algorithms in Gas Mixture for Preterm Infant Oxygen Therapy* 236

Pornchai Chanyagorn and Phattaradanai Kiratiwudhikul (Mahidol University, Thailand)

Pre-term infants often suffered from immature lung development, which caused oxygen saturation (SpO₂) to be fewer than 90% (98-100% for normal infants). Oxygen therapy was an essential treatment – supply right proportional air-oxygen gas content called a fractional of inspired oxygen (FiO₂) via nasal cannula – to control SpO₂ in a range of 90-95% and to maintain life. Registered nurses (RN) were routinely responsible for adjusting FiO₂ between 21-100% according to a current SpO₂ and a doctor's order. The objective was to supply FiO₂ as low as possible while maintaining SpO₂ in a suitable range. However, manual adjustments were not in real time (normal every 20-30 minutes) which could introduce risk of either oxygen toxicity from too high SpO₂ or hypoxia from too low SpO₂. This research was to develop an automatically control of FiO₂ according to an order SpO₂ by medical doctors. The result of this research could reduce risk of blindness from oxygen toxicity as well as mortality from hypoxia in pre-term infants. The system also allowed medical doctors to use recorded data for future care plan in oxygen therapy. This research introduced two different algorithms for such purposes and described a design of such system.

10:05 *Multiple Targets Tracking in Visual Sensor Networks Based on Asymmetric Voronoi Diagram* 238

Tien-Wen Sung (Hsing Kuo University, Taiwan); Chu-Sing Yang (National Cheng Kung University, Taiwan)

This paper proposes a distributed approach for multiple-targets tracking in a visual sensor network. A geometric structure of asymmetric Voronoi diagram is constructed to make the approach be applicable to those visual sensors that sensing distances are different. The objective of the proposed approach is to improve target tracking results of a visual sensor network.

10:10 *Fever Detection & Classroom Temperature Adjustment Using Infrared Cameras* 240

Amjad Alkhayat and Nima Bagheri (University Malaya, Malaysia); Mohamad Nizam Ayub (University of Malaya, Malaysia); Nurul Fazmidar Mohd Noor (University Malaya, Malaysia)

Classrooms or closed areas in general have a higher chance of transmitting viral and bacterial diseases such as flu or influenza. In this paper we are proposing a new system that will help to prevent the spread of a viral disease in classrooms at its early stage by keeping track of the students' body temperature. The system uses multiple infrared cameras that controls the room temperature and also detects students with a temperature higher than 37°C. Once the camera detects a student with a temperature higher than 37°C it sends a report to the school nurse to take immediate action. The system also adjusts the class room temperature according to the students' body temperature by averaging the students' body temperature.

10:15 - 10:50

Sunday, June 7

B3: Coffee Break

Room: Break/Lunch Area

10:50 - 12:00

K3: Keynote Speech (III) Prof. Mark Liao (IEEE Fellow) Tactics Analysis on NBA Broadcast Videos

Room: IB-101

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

12:00 - 13:00

L2: Lunch

Room: Break/Lunch Area

13:00 - 14:30

Session E1: Advanced Spectrum Analysis Method for Multimedia Processing

Room: IB-101

Chairs: Jian-Jiun Ding (National Taiwan University, Taiwan), Jia-Ching Wang (National Central University, Taiwan)

13:00 *New Feature Extraction Methods in the Time-Frequency Plane for Chinese Tone Analysis* 242

[Jian-Jiun Ding](#) and [Ji-Tang Lee](#) (National Taiwan University, Taiwan)

Since the Chinese tone is highly related to the variation of instantaneous frequency, it is effective to use time-frequency analysis to identify the Chinese tone. In this manuscript, we find that, in addition to the change of instantaneous frequency, the variation of power, the normalized powers in the first and the second harmonics, the frequency turn, and the information of the previous tone are also useful for distinguishing the tone. We also propose a way to identify the 5th tone. In sum, we adopt 18 features and apply the technique of the support vector machine. Simulations show that the proposed algorithm can accurately identify the Chinese tone.

13:15 *Adaptive Preprocessing and Combination Techniques for Light Field Image Rendering* 244

[Jian-Jiun Ding](#) and [Shih-Chang Chuang](#) (National Taiwan University, Taiwan)

Image rendering is to construct a large image from several smaller images. It is very important for stereo image generating and light field image processing. In this paper, we propose several techniques to improve the performance of image rendering. When perform disparity estimation, higher weights are assigned for edge and corner pixels to increase their effects. When perform linear combination, the weight functions with different fractional powers are assigned for different layers. Moreover, the adaptive disparity estimation mechanism and pre-segmentation are also applied for image rendering. Simulations show that, with these techniques the performance of image rendering is much better than that of conventional methods.

13:30 *Automatic Recognition of Audio Event Using Dynamic Local Binary Patterns* 246

[Chien-Yao Wang](#) and [Yu-Hao Chin](#) (National Central University, Taiwan); [Tzu-Chiang Tai](#) (Providence University, Taiwan); [David Gunawan](#) and [Jia-Ching Wang](#) (National Central University, Taiwan)

This work proposes an automatic recognition system for recognizing audio events. First, an audio signal is converted into a spectrogram by short time Fourier transform. The acoustic background noises in the spectrogram are reduced by box filtering. The contrast of the spectrogram is then enhanced by VAR operation. With the enhanced spectrogram, this work further proposes a novel dynamic local binary pattern (DLBP) feature based on human auditory system. Finally, the DLBP features are fed to multi-class support vector machines to achieve the audio event recognition. The experimental results on 16 classes of audio events demonstrate the performance of the proposed audio event recognition system.

13:45 *A Sharpness Measure by GET operator* 248

[Min-Hung Yeh](#) (National Ilan University, Taiwan)

In this paper, a sharpness measure based upon the GET (Gradient Energy Tensor) operator is proposed. Since the proposed sharpness measure is related to the third-order differentials of images, it can stress upon the sharpness for the focused target for image.

14:00 *Sliding Fourier Transform with Generalized Triangular Windows* 250

[Peng-Hua Wang](#) (National Taipei University, Taiwan)

In this paper, we propose an algorithm to compute time-dependent Fourier transform (TDFT) with generalized triangular window. The algorithm recursively computes the TDFT at arbitrary frequency with integrated triangular windowing. A common way to compute TDFT with window is to firstly multiply the input data by the window function and then carry out the TDFT on the windowed data. In this paper, we show that the TDFT with triangular window at a given frequency satisfies a complex-coefficient second-order difference equation. To compute the TDFT, only seven complex multiplications and six additions are needed. The window can be a family of triangular functions, including the Bartlett window and the Welch window of the first order. Our result is useful for estimating single, few, or unevenly distributed frequencies.

Session E2: Devices and Technologies for Connected Vehicle

Room: IB-201

Chairs: Jiann-Jone Chen (National Taiwan University of Science and Technology, Taiwan), Syuan-Yi Chen (National Taiwan Normal University, Taiwan)

13:00 *Animated Graphical User Interface (AGUI) Model in Desktop and Mobil Computer Devices* 252

Shin-Ping Tucker (University of Wisconsin-Superior, USA); **Dennis Tucker** (Yassuo Consulting Company, USA)

Since the beginning of computers there have been many types of user interfaces. Early user interfaces were extremely limited because of the computers limited resources. As computing systems and computing power evolve, so have the user interfaces evolved. The current stage of evolution for graphical user interfaces (GUI) for most computer systems is the WIMP (Windows, Icons, Mice, Pointer). The WIMP graphical user interface design has been the standard since its conception in the 1970s. Progressing beyond the WIMP to the next level of graphical user interface has proven extremely difficult [1]. Animated Graphical User Interfaces (AGUI) are a significant improvement over windowed interfaces for some applications. The users perceived usefulness, perceived value, and perceived quality can be improved by applying an Animated Graphical User Interface to the application. Improving the users perceived usefulness, perceived value, and perceived quality can lead to a significant increase in revenue for some applications. Advertising in traditional windowed applications is not widely accepted by users making it difficult to use as a revenue source. The introduction of an Animated Graphical User Interface to an application also gives rise to the option of introducing animated advertising in the application. Animated advertising can present a new revenue source in addition to or in place of the purchase price of the application. Animated advertisements can be presented in an entertaining and passive format that users will find acceptable in applications where advertising is not normally tolerated. The Animated Graphical User Interface can also be used to bridge language barriers. Animations for the interface can be designed with a goal of language independence. The user interface and animations can be designed with intuitive animations and graphics that users can understand without using a language. Animated applications designed for language independence can be used by people all over the world without modifications for language considerations. Design innovative user Animated Graphical User Interfaces that are functional and entertaining. Use the Animated Graphical User Interface Model to increase the users perceived usefulness, perceived quality, and perceived value of the target application. Create an environment using the Animated Graphical User Interface Model that instills user tolerance for animated advertising embedded in applications. Design animations, graphics and functionalities using the Animated Graphical User Interface Model that allows language independent use of the application.

13:15 *Road conditions detection using Arduino based sensing module and smartphone* 254

Syuan-Yi Chen (National Taiwan Normal University, Taiwan); **Annie Shih** (Industry Technology Research Institute, Taiwan); **Chun-Yi Hsiao** (National Taiwan Normal University, Taiwan)

In this study, a road condition detection device (RCDD), which consists of an Arduino based sensing module and an Android smartphone based user interface, is designed and implemented for vehicles. First, the Arduino based sensing module can identify the road conditions in real-time and send the identification result with raw data to the smartphone via Bluetooth. While the smartphone receives the data from sensing module, the designed Android APP will mark the abnormal road condition position on Google Maps using the GPS of smartphone. Therefore, the specific vehicle can obtain nearby road condition information from the data shared by preceding vehicles. As a result, the drives can change the driving way for improving safety and efficiency.

13:30 *A Traffic Signal Control Mechanism in a Connected Vehicle Environment* 256

Chih-Wei Hsu (Industrial Technology Research Institute, Taiwan); **Annie Shih** (Industry Technology Research Institute, Taiwan)

In recent years, with the advances in short range communication technology, vehicles are able to communicate with each other (Vehicle-to-Vehicle, V2V) and with the Roadside (Vehicle-to-Roadside, V2R) through dedicated short range communications (DSRC) and are referred to as connected vehicles. In V2R scenario, we design and implement a Traffic Signal Control System (TSCS) for use in real-life IEEE 802.11p/1609 On-Board Units (OBUs). As this TSCS can reduce bus travel time and number of stops by employing a traffic signal priority algorithm, a reduction in bus travel times can be achieved by proper use of traffic lights.

13:45 *HMM-based Driving Behavior Recognition for In-car Control Service* 258

Chun-Fu Chuang, **Chung-Hsien Yang** and **Yu-Hui Lin** (Industrial Technology Research Institute, Taiwan)

The purpose of this study is to present an approach to analyze and recognize the driver posture. By using the wearable device, the sensing data of the driving behavior postures can be collected and calibrated. The calibrated data is as the input parameters of driving behavior modeling. Then, the Hidden Markov Model (HMM) is utilized to establish the driving behavior posture models. The HMM model can recognize 7 kinds of head postures. Moreover, the static indoor environment and dynamic in-car environment are considered in modeling process. Finally, the constructed driving behavior model can apply to in-car service to provide driver more convenient control service.

14:00 *A Peer-to-Peer Streaming CDN for Supporting OTT Video Broadcast Service in Mobile Networks* 260

Sheau-Ru Tong (National Pingtung University of Science and Technology, Taiwan); **Shau-Ting Du** (NPUST, Taiwan); **Li-Wen Chen** and **Sally Chen** (ELTA Technology Co., Ltd., Taiwan); **Eric Yeh** (ELTA Technology Co., Ltd, Taiwan)

Video broadcast is an important feature for over-the-top content providers (OTT-CPs) to disseminate video programs to a large number of Internet mobile users. This paper focuses on a self-sustained content delivery network (CDN) solution, where OTT-CP servers and mobile users collaboratively join together to form a mobile peer-to-peer streaming (MPPS) CDN to assist video broadcasting. Several unique features are introduced to address the vulnerable connectivity issue in a mobile networking environment. The simulation result show that MPPS can agilely adapt to versatile mobile networks to offer stable video broadcast service to a large number of mobile users. The system is under prototyping in a test bed operated by ELTA TV.

14:15 *A Dynamic Music Adding System Based on Cloud Computing* 262

Cloud Yu (National Dong Hua University, Taiwan); **I-Cheng Chang** (National DongHwa University, Taiwan); **Yi-Jun Lin** (National Dong Hwa University, Taiwan)

With the popularization of mobile devices and cloud storages, people tend to store photos and videos through internet. Recently many cloud systems start providing the functions which can produce a reviewing film from the stored media files. However, the background music of such film usually doesn't fit the emotion of the video because the added music is randomly selected. This work proposed an emotion-based music adding cloud service that can generate a reviewing film with the appropriate background music fitting the emotion of a reviewing video.

Session E3: Advanced VLSI Design for Consumer Electronics

Room: IB-202

Chairs: Yeong-Kang Lai (National Chung Hsing University, Taiwan), Yeong-Lin Lai (National Changhua University of Education, Taiwan)

13:00 *Active Noise Control for In-ear Headphones: Implementation and Evaluation* 264

Hong-Son Vu (Feng Chia University, Taiwan); **Kuan-Hung Chen** (Department of Electronic Engineering, Feng-Chia University, Taiwan); **Tien-Mau Fong** (Feng Chia University, Taiwan)

Active noise control (ANC) for in-ear headphones is challenging due to physical tiny volume constraint. According to the best of our survey, most of the previous papers provide only simulation results rather than physically measuring results. In this paper, the detailed experience on implementation and evaluation for ANC in-ear headphone design has been presented. Measurement results show that the proposed in-ear headphone achieves better performance than that of the conventional ANC headphones.

13:15 *Anti-ESD Impacts on 60-V P-channel LDMOS Devices as None-ODs Zone Inserting in the Bulk Region* 266

Shen-Li Chen (National United University, Taiwan)

For the reliability considerations, a 60-V power p-channel LDMOS transistor co-designed with none-OD zone in the bulk end by a 0.25- μm process will be evaluated in this paper. From the experimental data found that as the none-OD zones inserting, meanwhile the none-OD zone percentage was increased, the anti-ESD capability will be strengthened too, i.e. its It2 value is improved by using this manner. Nevertheless, as the none-OD zone ratio increased, the trigger voltage (Vt1) results of these samples are not changed so much, and all of the variation is in a range of 1 to 2-V. On the other hand, the on-resistance (Ron) result will be decreased, which can be considered as more

even conduction. Eventually, from the TLP testing data, we can find that the anti-ESD capability (It2 value) upgraded nearly 15.4%, and on-resistance (Ron) value decreased nearly 8.6% as compared with the reference sample.

13:30 *ESD Reliability Building in 0.25 um 60-V p-channel LDMOS DUTs with Different Embedded SCRs* 268

Shen-Li Chen (National United University, Taiwan)

In order to effectively improve the ESD capability of a p-channel-lateral-diffused MOS device, we aimed at the anti-ESD protection capability of the different layout types in the drain-side for the 0.25 um 60 V high voltage pLDMOS devices. Here, a drain-side pnp arranged-type in a pLDMOS-SCR parasitic structure is used to investigate the layout placement effect. At first, the layout type of P+ region is continuous extended into the drain-side. Secondly, the layout type of P+ region are changed by some discrete-distributed areas into the drain-side. From TLP experimental results, we can find that the layout type of discrete-distributed type in the drain-side have a better ESD capability than the continuous extended type, then the secondary breakdown current (It2) value can be achieved 6~7 A. However, the holding voltage (Vh) of the continuous extended type shows an escalating trend, so it can be having higher latch-up immunity.

13:45 *An ECG Front-End Circuit with Single Power Supply* 270

Hsiu-Cheng Lee, Jen-Bo Wang, Kai-Hsiang Juang, [Pippen Kuo-Ching Hsiao](#), Hsung-Bie Chang, Yeng-Ting Lu, Ching-Sung Lee and Ming-Hsueh Hsiau (Institute of Electronic Engineering, Feng Chia University, Taiwan); Qi-Ming Wan (Zhongshan Polytechnic, P.R. China); Vu Duc Thai (Thai Nguyen University of Information and Communication Technology, Vietnam); [Ching-Hua Cheng](#) (Institute of Electronic Engineering, Feng Chia University, Taiwan); [Don-Gey Liu](#) (Feng Chia University, Taiwan)

This study was aimed to design an electrocardiograph (ECG) system by the 0.35 um CMOS technology. In this study, a two-stage operational amplifier was taken as the building block for the design of instrumentation amplifier and filters. In our measurement, excellent performance was verified by the fabricated chips.

14:00 *An RFID Aquarium Sensing System* 272

[Yeong-Lin Lai](#), Li-Chih Chang and [Wei-Chung Lu](#) (National Changhua University of Education, Taiwan)

This paper presents a radio-frequency identification (RFID) aquarium sensing system in order to monitor the parameters of the environments in an aquarium. The system includes tags, readers, antennas, impedance matching circuits, and embedded sensors. The RFID tag is powered by the reader through electromagnetic waves produced from the reader. ISO 18000-6C RFID protocol is adopted. The magnetic antenna of the RFID tag is made by a magnetic stripe radiator. An omnidirectional antenna radiation pattern is achieved. An inverted-T matching circuit is designed. The sensors are embedded in the tags. The parameters of the sensors are sent to the readers. The RFID aquarium sensing system exhibits the real-time monitoring functions and provides efficient capability for the management of an aquarium.

Session E4: Best Paper Competition

Room: IB-204

Chairs: Yu-Cheng Fan (National Taipei University of Technology, Taiwan), Chi-Chia Sun (National Formosa University, Taiwan)

14:30 - 15:10

B4: Coffee Break

Room: Break/Lunch Area

15:10 - 16:40

Session F1: Emerging Technologies for Intelligent Electronics

Room: IB-101

Chairs: Kuan-Hung Chen (Department of Electronic Engineering, Feng-Chia University, Taiwan), Kun-Chih Chen (Feng-Chia University, Taiwan)

15:10 *Pedestrian Recognition Using Feature Extraction* 274

[Ching-Long Su](#), [Chang Ya-Han](#) and [Kai-Ping Chen](#) (National Yunlin University of Science and Technology, Taiwan); [Jia-Hua Wu](#) (National Yunlin University of Science & Technology, Taiwan)

As emphasis on life has raised and image processing technology has progressed in recent years, many image vehicle safety equipments are gradually applied to automotive original equipments, and pedestrian detection technology is one of the key functions. Most systems that apply cameras as sensors train pedestrian sample features with classifiers, and perform multi-class feature matching. The proposed method applies the single-lens camera as sensor, using traditional image processing technology, and distinguishing the color of pedestrian torso with color information, which combines edge detection result for pedestrian to extract the feature of each human part of the pedestrian for finding the accurate pedestrian. The proposed method can be fast realized for selecting pedestrian samples, cropping and training feature, and can adjust according to pedestrian size without performing the above-mentioned procedure repeatedly when changing lens, which can raise computation effectively and achieve real-time processing. The experiment result shows that the proposed method can be used in ordinary traffic condition, and the average computing time of detection speed can achieve 82.43fps in Intel® Core i7 processor at 3.4GHz. The detection rate is better than 88% and the false positive rate is no more than 10%.

15:25 *A Vehicle Information Security System with Self-Adaptation* 276

[Chun-Hsian Huang](#), [Huang-Yi Chen](#), [Tsong-Fu Huang](#), [Po-Wu Chen](#) and [Yao-Ying Tzeng](#) (National Taitung University, Taiwan)

To provide complete vehicle information protection mechanism, this work proposes a vehicle information security system (VISS) with self-adaptation. All its access control policies are realized by the protection matrices. Different from the traditional software-based access method, in the VISS, the access control policies are implemented as reconfigurable hardware modules. Such a specific hardware access method thus reduces the risks of illegal access of vehicle information. To not only meet real-time requirements but also enhance hardware resource utilization, the cryptographic functions in the VISS are also implemented as reconfigurable hardware modules. Through the the partial reconfiguration technology, the VISS can adapt its protection matrix and cryptographic function to different system requirements at runtime. Our experiments have also demonstrated the VISS can accelerate by up to 3.75x the processing time required by using the software solution.

15:40 *Implementing intelligent behavior tracking technique for elderly home care services* 278

[Kuei-Chung Chang](#), [Lin Hung Hsiang](#) and [Tsai Xiang-Ying](#) (Feng Chia University, Taiwan)

This paper mainly studies how to use cameras and smart phones to easily deploy a home care monitoring system. We can use cameras to capture the monitored environment picture and to make some record of the current trajectories of the elderly family member. Other family members can use mobile devices to see their elderly member from their mobile devices. In addition, the proposed system can analyze the target trajectory of their activities, and the system will give an alarm and send warning messages to his/her family members if some abnormal behaviors occurred.

15:55 *Design and Implement an AC LED Light Engine* 280

Tse-Hsu Wu and Che-Min Kung (Industrial Technology Research Institute, Taiwan)

In this paper, a prototype of AC LED light engine is implemented. This light engine is highly designed and integrated with different fields, including optical, mechanical, electrical part, control system, and safety requirement. Our light engine can directly install in different lighting fixtures like down light or spot light, which is very convenient and cost-saving for luminaries manufactures. It also can offer customized solutions about CCT, beam angle, even involved intelligent control system in the future. The specification of light engine is that the CCT is 5956K, CRI is 84, and the lm/W is 94 at 10W input power.

16:10 *Measurement for Temperature on a LED Lamp* 282

Ching Yen Ho and WC Wu (Hwa Hsia University of Technology, Taiwan)

LED demonstrates a number of benefits compared to traditional incandescent lamps and fluorescent lamps. However, the thermal problem that is brought by heat generated within the LED itself is still a bottleneck that limits the stability, reliability and lifetime of high power LED. In order to understand the temperature characteristics of the LED lamp, this paper utilized the thermocouples to measure the temperature on LED lamp. The effects of the ambient temperature on the surface temperature of the LED lamp were presented.

16:25 *Ultra-low Resolution Character Recognition System with Pruning Mutual Subspace Method* 284

Shuhei Toba, Hirotaka Kudo, Tomo Miyazaki, Yoshihiro Sugaya and Shinichiro Omachi (Tohoku University, Japan)

Improvement of character recognition technology brings us various character recognition applications for mobile camera. However, many low-resolution and poor-quality character images exist due to the performance of the camera or the influence of environment, and existing methods are not good at recognizing those low-resolution characters. Therefore, we develop a character recognition system for ultra-low resolution character images less than 20*20 pixels. The proposed system consists of three phases: increased training data with a generative learning method, creating a deblurred high-resolution image with Wiener filter and image alignment, and recognition by pruning Mutual Subspace Method.

16:40 *An AdaBoost Object Detection Design for Heterogeneous Computing with OpenCL* 286

Bing-Yang Cheng and Jui-Sheng Lee (National Chiao Tung University, Taiwan); Jiun-In Guo (National Chung-Cheng University, Taiwan)

AdaBoost classification with Haar-like features [1] is commonly adopted for object detection. Feature calculation in AdaBoost algorithm is the most time-consuming part, which occupies over 98% of the computation and cannot reach real-time processing with CPU computing only. In this paper we propose an object detection design for heterogeneous computing with OpenCL. By adopting the techniques of scale parallelizing, stage partitioning, and dynamic stage scheduling on AdaBoost algorithm, the proposed design solves load-unbalanced problems when realize in multicore CPU and GPU platform. The proposed object detection design achieves 32.5 fps at D1 resolution on an AMD A10-7850K processor.

Session F2: Signal Processing for Consumer Electronics

Room: IB-201

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

15:10 *Design of Linear-phase Two-channel Quadrature Mirror Filter Banks Using Neural Minor Component Analysis* 288

Li-Woei Chen (ROC Army Command Headquarters, Taiwan); Yue-Dar Jou (ROC Military Academy, Taiwan); Fu-Kun Chen (Southern Taiwan University of Science and Technology, Taiwan); Shu-Sheng Hao (National Defense University, Taiwan)

This paper proposes a minor component analysis-based neural learning algorithm for designing quadrature mirror filter banks in the least-squares sense. The objective function of the design problem is first formulated as an eigenvalue problem for solving an appropriate real, symmetric and positive-definite matrix. An alternative minor component algorithm based on neural learning is exploited to achieve the eigenfilter design of the quadrature mirror filter bank. Simulation results indicate that the proposed neural approach can yield good performance.

15:25 *Video Quality Assessment Method: MD-SSIM* 290

Woei-Tan Loh (Universiti Malaysia Sarawak, Malaysia); David Bong (Universiti Malaysia Sarawak, Malaysia)

In this paper, video quality assessment (VQA) for compression losses is the main focus. A new method, MD-SSIM (MSE Difference SSIM) is used for detecting the spatial distortion. For the temporal part, the differences of the SSIM scores of each frame are used for pooling of the quality scores of each frame. In addition, this method has higher computational speed and competent performance as compared to the existing algorithms.

15:40 *Recursive Relations among Maximally Flat Fractional Delay FIR Filters* 292

Peng-Hua Wang (National Taipei University, Taiwan)

In this paper we provide some analytical results of maximally flat (MF) fractional delay (FD) finite impulse response (FIR) filters. First, we represent their transfer functions in terms of the Gauss hypergeometric function. Secondly, we derive the generating function of these transfer functions. Finally, we provide recursive relations among transfer functions. The recursions are derived from the method of undetermined coefficients. In the appendix, we list some three-term recursive relations.

15:55 *Decoded Ultra-High Definition Video Display System* 294

Weihua Qiu and Yonglin Xue (Tsinghua University, P.R. China)

With the evolution from high definition (HD) to ultra-high definition (UHD), we face great challenges of increasing data rate and computational complexity. The solutions to real-time video transmission and display attract much research interest. In this paper, a hardware architecture based on field programmable gate array (FPGA) is proposed for decoded UHD video display system. In the architecture, efficient memory management and parallel processing are applied to reduce operational frequency and achieve better real-time performance. The design has been successfully implemented on Altera FPGA, whereby 4K UHD video can be displayed on one single 4K screen smoothly.

16:10 *Wireless TRIAC Controlled Technique for High Cost / Performance Ratio LED Bulb* 296

Che-Min Kung (Industrial Technology Research Institute, Taiwan)

A high cost / performance ratio LED bulb and wireless TRIAC controller are proposed in this paper. The core circuit of LED bulb is AC step driver which is using driver-on-board technology, it has the advantages of higher reliability, lower cost and compact size. This AC step driver can be dimmed by TRIAC, for smart lighting application, the wireless TRIAC controller is designed. This controller which is universal design not only can control the LED bulbs, but also can dim the tungsten lamps. Users can use the mobile device to dim the common lamps in indoor lighting. In the future, when the sensors are built in the building, it can link the smart lighting easily.

16:25 *Spatial Locality Based Supplemental Modes for Intra Prediction of HEVC* 298

[Wen Shi](#) (Tokushima University, Japan); [Xiantao Jiang](#) (University of Tokushima, Japan); [Tian Song](#) (University of Tokushima & Synthesis, Japan); [Takashi Shimamoto](#) (University of Tokushima, Japan)

The latest generation standard of video coding, High Efficiency Video Coding (HEVC) achieves the goal of requiring 50% bit-rate of the H.264/AVC at the same image quality. It adopts quad-tree based flexible coding unit structure as prediction unit (PU) sizes which are defined from 64x64 to 4x4, and plenty of intra prediction modes whose reference samples are spatially reconstructed neighboring samples which are at the bottom left, left, top left, above, above right. However, such modes may not come off well enough in high resolution video compression. This paper presents a novel prediction algorithm for intra prediction of HEVC. The proposed supplemental modes based on spatial locality can utilize the spatially neighboring referencing samples more efficient. Compared with the original HEVC, the result of coding efficiency increasing is about 8.04%.

Session F3: Internet of Things for Consumer Electronics

Room: IB-202

Chair: Shao-Yi Chien (National Taiwan University, Taiwan)

15:10 *Evaluation of LTE Access Class Barring Mechanism for IoT* 300

[Yuan-Chi Pang](#), [Guan-Yu Lin](#) and [Hung-Yu Wei](#) (National Taiwan University, Taiwan)

Bursty random access attempts from a huge number of Internet of Things (IoT) devices are potential to cause severe random access collisions and degrade the successful probability of network connection establishment. The 3GPP has provided access class barring (ACB) method for contention resolution. In this paper, we design an implementable contention detection method so that we can activate and deactivate the LTE ACB scheme accordingly. Simulation results show that by applying the proposed scheme, RACH throughput can be significantly improved.

15:25 *Context and User Behavior Aware Intelligent Home Control Using WuKong Middleware* 302

[ZhenQiu Huang](#) (University of California, Irvine, USA); [Bo-Lung Tsai](#), [Hobe Chou](#), [Chun-Yuan Chen](#) and [Ching-Chi Chuang](#) (National Taiwan University, Taiwan); [Kwei Jay Lin](#) (University of California, Irvine, USA); [Chi-Sheng Shih](#) (National Taiwan University, Taiwan)

In this work, we extend WuKong middleware to interface with context engine, to learn the context based on the history of user behaviors, and to command the devices in the system according to the context. With the enhanced WuKong framework, one can design and implement context-aware/user-behavior-aware IoT applications using FBP in WuKong middleware.

15:40 *Video Sensor Node with Distributed Video Summary for Internet-of-Things Applications* 304

[Shun-Hsing Ou](#) (National Taiwan University, Taiwan); [Chia-Han Lee](#) (Academia Sinica, Taiwan); [V S Somayazulu](#) (Intel Labs, USA); [Yen-Kuang Chen](#) (Intel Corporation, USA); [Shao-Yi Chien](#) (National Taiwan University, Taiwan)

In order to reduce the required transmission bandwidth of a video sensor network for Internet-of-Things applications, a video sensor node with distributed video summary ability is developed. The video summarization algorithm is developed based on a scene model and a frame color descriptor. Experimental results show that by exchanging information between video sensors, the required transmission bandwidth is drastically reduced. Moreover, real-time performance is achieved on an embedded platform.

15:55 *Developing A Web Information System for Traffic Light Waiting Time and Fuel Consumption Analysis*306

[Che-Ju Cheng](#), [Ray Chi](#), [Shashi Prasad](#) and [Hsiu-Hsen Yao](#) (Yuan-Ze University, Taiwan)

The purpose of this study is to develop an information system for analysis of driving time and fuel consumption waste while vehicles waiting for traffic lights. For this research purpose, we develop a data collection method, i.e., using OBD interface to get data for fuel consumption estimation, and using GPS data to obtain the vehicle location.

16:10 *Indoor Positioning through an Iterative Method in Dense Wi-Fi-Direct Networks with Wi-Fi Direct Devices* 308

[Llewellyn Liu](#) and [Wallace Wong](#) (Swinburne University of Technology Sarawak Campus, Malaysia)

An iterative algorithm that estimates the position of tracked subjects based on the estimated position of other tracked subjects nearer to the reference points is proposed. The method starts by estimating the position of all tracked subjects (client) by trilateration using Wi-Fi radio signal strength indicators (RSSI) from known Access Points. Subjects nearest to the access points will then be possibly rated as the access points for next iteration. The iteration process stops until the estimation difference between current and previous estimates is less than a threshold value. Kalman filter is added to minimize the impact of irregular RSSI. The proposed method requires sufficient number of clients in the tracked area. The method could be implemented on a mobile device within existing Wi-Fi network without the need for additional devices or infrastructure.

16:25 *Merge Prediction Algorithm for Adaptive Parallel Improvement of High Efficiency Video Coding* 310

[Xiantao Jiang](#) (University of Tokushima, Japan); [Tian Song](#) (University of Tokushima & Synthesis, Japan); [Wen Shi](#) (Tokushima University, Japan); [Lisheng Wang](#) (University of Tongji, P.R. China); [Takashi Shimamoto](#) (University of Tokushima, Japan)

The latest high efficiency video coding (HEVC) has increasing requirement to be implemented in a heterogeneous platforms or a GPU accelerators. However, due to the data dependency between neighbouring blocks merge candidate lists of neighbouring blocks cannot be generated in parallel and induce a bottleneck for parallel encoder designs. In this paper, a parallel merge mode prediction algorithm is presented, which removes the dependency of PUs within the merge estimation region and make the PU possible to do merge estimation in parallel. The obtained experimental results demonstrated that this implementation is with only 0.10% BD-rate loss, compared with the original reference software HM12.0.

Session F4: Recent Advances in Image and Video Analysis

Room: IB-204

Chairs: Chao-Yung Hsu (China Steel Corporation, Taiwan), Chia-Mu Yu (Yuan Ze University, Taiwan)

15:10 *Mark Identification of Proofed Steel Products* 312

[Chao-Chung Peng](#) (China Steel Corporation, Taiwan); [Chieh-Li Chen](#) (National Cheng Kung University, Taiwan)

A computer vision based recognition system is proposed to identify the mark of proofed steel product in this study. The identification process uses image processing with a template matching to locate and recognize marking letters and numbers. The two-dimensional Haar discrete wavelet transform (DWT) is used to achieve image pyramids, so that computational efficiency is improved significantly. The proposed auto-identification procedure can effectively adapted to different steel product according to a specified template.

15:25 *A multiclass boosting approach for integrating weak classifiers in parking space detection* 314

[Chingchun Huang](#) (National Chung Cheng University, Taiwan); [Hoang Tran Vu](#) and [Yi-Ren Chen](#) (National Kaohsiung University of Applied Sciences, Taiwan)

Recently, Huang's method [1] has proposed to use a 3D parking space representation for parking space detection. Following a generative process, the approach treats a parking lot as the collection of many parking spaces. Each space is modeled by a 3D cube. Each 3D cube is composed of multiple 3D surfaces. If projecting those 3D surfaces onto the image, many image patches of a parallelogram shape would be determined; each patch may reveal some weak information that could be used to infer the parking

status. In order to transfer the image feature into status information, the approach trained a weak classifier for each image patch. Finally, by combining these weak classifiers, this approach could well determine the parking status. However, we found that the system weights for combining the weak classifiers in Huang's method are manually selected. This might not be suitable since different classifiers usually have different class discriminative ability. To address the issue, we proposed a multiclass boosting method to incorporate these weak classifiers through a back-propagation learning process.

15:40 *Design of Matrix Second-Order Differentiator for Image Sharpening Using Discrete Sine Transform* 316

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

In this paper, the design of matrix second-order differentiator (SOD) using discrete sine transform (DST) is presented. First, the design problem of matrix filter is described. Then, the DST is applied to obtain the closed-form transfer matrix of the matrix SOD. Next, the designed matrix SOD is used to develop an image sharpening algorithm by using Laplacian operator. Finally, the performance of the proposed matrix SOD is evaluated through numerical examples.

15:55 *The Development of a Rolling Technology Development Platform* 318

Yen-Ting Chen, Yen-Liang Yeh and Ming-Fa Chen (China Steel Corporation, Taiwan)

The rolling production lines in steel industry have been rapidly updated and expanded in recent years in order to improve production capacity. To efficiently solve process problems of each production line within limited time, a rolling technology development platform was developed by China Steel Corporation (CSC). This platform has several main features to speed up rolling technology development between each production line, such as data unification, easy-to-manage database, integrated information query interface and template-based application development framework. As a result, various successful applications are achieved by using this platform and the product quality in CSC was tremendously improved.

16:10 *Integration of an Unmanned Vehicle and Its Application to Real-Time Gas Detection and Monitoring* 320

Chao-Chung Peng and Chao-Yung Hsu (China Steel Corporation, Taiwan)

A real-time aerial gas detection and monitoring system is developed for air quality control in China Steel Corporation (CSC). A gas detection module is integrated with an quadrotor and the collected gas information is going to be delivered to a ground station through wireless communication. According to the measurement data, real-time and post analyses will be applied and the results could also be passed to product line for references and other applications. Moreover, image process technology is also integrated into the flight system such that a selected target could be detected automatically during the flight task. Finally, experiments are presented to demonstrate the main concept of the prototype system.

16:25 *Application of Blast Furnace Falling Materials Trajectories Measurement Using Laser Scan Technology* 322

Yen-Ting Chen, Shan-Wen Du and Shih-Kang Kuo (China Steel Corporation, Taiwan)

An innovative method for blast furnace falling materials trajectories measurement using a laser scanner is presented in this paper. The surface profiles of the falling materials delivered from the rotary chute at various tilted angle in the filling operation of the blast furnace in China Steel Corporation (CSC) were digitized during the course of burden discharge. Based on the rigid body transformation and the invariant features, 3D image registration algorithm was applied to find out the transformation between the measurement and the blast furnace. Afterwards, the developed data processing method was employed to determine the quadratic curve representing the surface profiles of the falling materials. Consequently, the trajectories standing for the moving paths of the raw materials were evaluated to provide valuable information for preventing blast furnace wall from serious worn-out as well as establishing burden distribution strategies for better productivity and stability.

16:40 - 17:40

Session G1: Advances and Applications of Spatial-Temporal Processing for Speech Signals

Room: IB-101

Chair: Jieh-weih Hung (National Chi Nan University, Taiwan)

16:40 *A Deep Neural Network Based Approach to Mandarin Consonant/Vowel Separation* 324

Yen-Teh Liu and Yu Tsao (Research Center for Information Technology Innovation, Academia Sinica, Taiwan); **Ronald Y. Chang** (Academia Sinica, Taiwan)

In this paper, we study the problem of Mandarin consonant/vowel separation which is an integral part of many Mandarin speech applications. We propose a deep neural network (DNN) based approach and compare its performance with the support vector machine (SVM) method. Our results demonstrate an improved separation performance yielded by the proposed method, especially on consonant identification.

16:55 *Temporal Information in Tone Recognition* 326

Payton Lin (Research Center for Information Technology Innovation, Academia Sinica, Taiwan); **Syu-Siang Wang** (Research Center for Information Technology Innovation at Academia Sinica, Taiwan); **Yu Tsao** (Research Center for Information Technology Innovation, Academia Sinica, Taiwan)

Traditionally, only five components are regarded as having to do with the special characteristics of recognizing tones, while front-end processing and feature extraction have been considered essentially independent. Since mismatch between training and testing in signal-space leads to subsequent distortions in feature-space and model-space, determining whether front-end processing and feature extraction is independent or dependent will be critical for robustness.

17:10 *Magnitude Replacement of Real and Imaginary Modulation Spectrum of Acoustic Spectrograms for Noise-Robust Speech Recognition* 328

Hsin-Ju Hsieh and Jieh-weih Hung (National Chi Nan University, Taiwan)

This paper proposes to enhance the complex-valued acoustic spectrograms of speech signals via replacing the magnitude part of the corresponding modulation spectrum to produce noise-robust features for recognition. All the respective experiments carried out on the Aurora-2 database and task show that the presented method performs better than the baseline MFCC and several well-known noise-robust techniques. These results apparently reveal the capability of this novel method in promoting the noise robustness of speech features.

Session G2: Intelligent Devices and Systems for Real-life Applications

Room: IB-201

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

16:40 IoT-enabled Smart Sockets for Reconfigurable Service Provision 330

[Ching-Hu Lu](#) (National Taiwan University of Science and Technology, Taiwan)

An upcoming Internet-of-Things (IoT) and machine-to-machine (M2M) era will introduce new paradigms for designing smart-living technologies. According to Gartner's latest forecast, smart home will be the most potential field for IoT-enabled applications. Due to the increasing concern on maintaining a sustainable earth, energy savings should leverage IoT related advances for realizing next generation energy savings for a context-aware smart home, where a smart socket is one key enabler. However, most of the current smart sockets work in a standalone way and its configuration stays fixed over time. By incorporating the M2M related advancement, we implement an M2M-enabled and reconfigurable smart socket (hereafter referred to as m2mSocket) which can dynamically changes its configuration by flexibly connecting to remote smart machines to provide attentive services. This way, the system can better fulfill users' needs in a dynamic and IoT-enabled home environment.

16:55 Prediction of Postoperative Recovery Based on a Computational Rules Extractor 332

[Yi-Zeng Hsieh](#) (Southern Taiwan University of Science and Technology, Taiwan); [Chen-Hsu Wang](#) (Medical Intensive Care Unit, Cathay General Hospital, Taiwan); [Mu-Chun Su](#) (National Central University, Taiwan); [Ching-Hu Lu](#) (National Taiwan University of Science and Technology, Taiwan); [Jen-Chih Yu](#) (National Cheng Kung University, Taiwan); [Yi-Min Chiang](#) (Mediland Enterprise Corp, Taiwan)

One important factor for the patients in a postoperative recovery is hypothermia. The doctor must decide whether the patients should be sent to another place with better medical therapy. We therefore adopt the proposed PSO (particle swarm optimization) based Fuzzy classifier to retrieve the crisp rules from the postoperative given medical data from UCI machine learning database, where the rules can be used to assist in doctor diagnosis. The average correct ratio of our prediction for the postoperative recovery is about 76%.

17:10 Vision-Based Crowded Pedestrian Detection 334

[Shih-Shinh Huang](#) (National Kaohsiung First University of Science and Technology, Taiwan)

-Pedestrian detection and counting is an important topic in developing an intelligent surveillance system. In this work, we propose a vision-based system for detecting pedestrians in an image. Be robust to crowded scenes and adapt to incomplete foreground from background subtraction algorithm, expectation maximization (EM) algorithm is applied to impose the constraint of body part for achieving successful detection. A well-known dataset called CAVIAR is used to validate the effectiveness of the proposed method.

17:25 An Intelligent Dietary Planning Mobile System with Privacy-preserving Mechanism 336

[Peter Shaojui Wang](#) (CSIE, NTU, Taiwan)

We propose an intelligent dietary planning mobile system, which will suggest the diet and the amount of exercise based on mobile personal data recording. However, for avoiding the privacy concern, with the need of storing the great amount of privacy personal data in the cloud space, we also propose a data transform-based privacy-preserving method, which has been proven as fast and low impact on data analyzing.

Session G3: Inspirational 3D Researches and Applications

Room: IB-202

Chair: Chia-Yen Chen (National University of Kaohsiung, Taiwan)

16:40 A Technique For Deriving The Camera Response Function Using Image Blur 338

[Jui-Wen Huang](#), [Shih-Cheng Liang](#) and [Huei-Yung Lin](#) (National Chung Cheng University, Taiwan)

A technique for deriving the camera response function using the image blur information is presented. One or more defocused images captured by a camera are used for the parameter estimation. The proposed method takes the linear brightness change of a single captured image to estimate the camera response. Using the information provided by the RAW and JPEG file formats, the intensity conversion parameter can also be derived by the comparison of linear and nonlinear coded images. Furthermore, multiple image captures with different exposures are incorporated to increase the robustness of the camera response function estimation. The experiments have demonstrated the feasibility of the proposed technique.

16:55 Dynamic scene depth map generation method for 2d to 3d video conversion 340

[Huang Wei](#) (National Central University & Taiwan, Taiwan); [Tsung-Han Tsai](#) and [Tsung-Han Tsai](#) (National Central University, Taiwan)

To enjoy the vivid 3D video, a method converting the 2D to 3D video plays an important role. Due to the demand of 3D visualization and lack of 3D video content, a low cost and high efficiency post processing methods is presented in this paper. The presented method is dedicated on dynamic scene to generate depth information for 3D video generation.

17:10 Liver Segmentation from 3D Abdominal CT Images 342

[Pham The Bao](#) (HCMUS, Vietnam); [Tran Hong Tai](#) (University of Science, Vietnam); [Viet-Hang Duong](#) and [Jia-Ching Wang](#) (National Central University, Taiwan)

Segmentation of the whole liver region from computed tomography (CT) image is the first step in the computer-aided diagnosis for liver disease. In this paper, we propose a novel method for segmenting liver region from 3D CT images of abdomen using enhanced Otsu method. Our algorithm uses Otsu method with some improvements to construct intensity model and shape model for liver. First, the 3D CT image of abdomen is cropped, preserving only the part that contains liver. Second, the liver region in each slice of preserved part is segmented using intensity model. Finally, the segmented liver regions from all slices are post processed to increase performance and merged into a single liver region.

17:25 Structured Light 3D Face Scanning System 344

[Chia-Yen Chen](#) (National University of Kaohsiung, Taiwan); [Po-Sen Huang](#), [Sheng-Wen Huang](#) and [Jia-Hong Zhang](#) (Taiwan CareTech Corporation, Taiwan); [Bao Rong Chang](#) (National University of Kaohsiung, Taiwan)

The paper proposes the integration of a structure lighting system on a gantry to improve its flexibility, efficiency and accuracy of 3D reconstruction for face modeling. A method for the integrated system calibration to calculate the correspondences between the coordinate systems of the camera, the light source and the rotational axis is also proposed. Parameters obtained from calibration are used to calculate the 3D data from the acquired 2D images. Experiments have been performed to demonstrate the effectiveness of the proposed method when applied to the 3D reconstruction of human face. The proposed system is able to obtain more accurate 3D models of objects with reduced time.

Session G4: Advanced Sensing Technology for Industrial Application

Room: IB-204

Chairs: Hsin-Chuan Chen (St. John's University, Taiwan), Hsu Nan Yen (St. John's University, Taiwan)

16:40 Parallel Vertical Hall-Effect Device Using Amplifier Applied to Micro-Magnetic Sensor 346

[Chien-Hung Kuo](#) and [Bing-Shi Yang](#) (National Taiwan Normal University, Taiwan)

m 1P6M technology, the maximum supply-current-related sensitivity of S_I is 103.41 V/A·T and the maximum supply-voltage-related sensitivity of S_V is 0.199 V/V·T for a bias current of 2.7 mA. This paper demonstrates the use of an amplifier to strengthen the horizontal magnetic field of parallel vertical Hall-effect device (VHD). In this study, parallel VHD structure is used to reduce the cross-coupled noise. The guard ring is used to confine the conductive channel width for better device sensitivity. The sensitivity of the parallel VHD can be improved by using an amplifier, which amplifies the output voltage induced by the Hall effect with a smaller bias current. The proposed circuit is simulated by TSMC 0.18

16:55 Accuracy and Calibration of Infrared Signal-Direction Discriminator 348

Wern-Yang Shieh (St. John's University, Taiwan)

Vehicle positioning in infrared vehicle-to-infrastructure communication systems can be realized with the aid of signal-direction discrimination. The coming direction of the infrared signal can be acquired with high precision by comparing the signal strengths received by different receiving modules in the signal-direction discriminator, provided that all the receiving modules together with their amplification circuits have the same characteristics. This can be fulfilled by a careful calibration. In this paper, the results of two different calibration methods are compared in order to obtain the coming direction of the signal with high accuracy for the aforementioned application.

17:10 Control of industrial inspection modules using Kinect somatosensory technology 350

Hsu Nan Yen (St. John's University, Taiwan); **Guan-Lin Chen** and **Jui-Hsin Tsao** (St. John's University, Taiwan)

In recent years, the light, thin, short, small and multi-function demand of consumer electronic products has driven SMT manufactures to make their IC package component sizes continue to shrink. For improving production yields of the tiny package components, many manufacturers have produced and tested the tiny IC package components in a clean room. Passing in and out of the clean room is not convenient, so that many staffs often endure urine for saving time, and easily lead to chronic renal failure. This study aims the tiny chip size package (CSP) components to develop a Kinect-based inspection system. The proposed system applied Kinect sensor to perform human skeleton detection. With our developed software, the operator outside the clean room can use his hand to directly control the important inspection modules such as lighting module and translation module, which are located in the clean room, through the glass window by applying somatosensory technology.

17:25 Embedded Virtual Mouse System by Using Hand Gesture Recognition 352

Tsung-Han Tsai, **Chih-Chi Huang** and **Kung-Long Zhang** (National Central University, Taiwan)

In the digital information time, daily life is inseparable with human-computer interface (HCI). Human computer interaction has a long history to become more intuitive. For human being, hand gesture of different kind is one of the most intuitive and common communication. However, vision-based hand gesture recognition is still a challenging problem. In this paper, an embedded virtual mouse system by using hand gesture recognition is proposed. There are several techniques involved in the proposed system. Skin detection and motion detection method are used to capture the region-of-interest and distinguish the foreground/background area. Connected component labeling algorithm is used to identify the centroid of an object. The removal on arm and the convex hull algorithm are used to recognize hand area as well as the related gesture. The result shows that our system can operate well even in some harsh environment.

17:40 Resolution Extension of Counter-Based DPWM Using Self-Triggered Method 354

Hsin-Chuan Chen (St. John's University, Taiwan)

The DPWM device is an important component in many industrial applications, such as motors, robots, DC/DC converters, and so on. However, the resolution of the counter-based DPWM is directly proportional to its input reference clock, and thus the higher clock frequency is required. In this paper, by a cyclic self-trigger of monostable multivibrator, the proposed DPWM device can extend its resolution without increasing the reference clock frequency. Moreover, it also maintains as low hardware complexity as the conventional counter-based DPWM.

18:30 - 21:30

BT1: Banquet (la marée)

09:00 - 10:15

Session H1: User-Centric and Device-Centric Cloud Computing for Intelligent Consumer Electronics

Room: IB-101

Chairs: Chao-Chun Chen (Southern Taiwan University, Taiwan), Chao-Lieh Chen (National Kaohsiung First University of Science and Technology, Taiwan)

09:00 *Intelligent Wireless Transmission Ordering System for Dishes Based on Zigbee* 356

Fong-Ke Shen (Ming Chi University of Technology, Taiwan); Fu-Hsiang Tsai (National Taipei University of Technology, Taiwan); Hsi-Chao Lin and Hao-Dong Zheng (Ming Chi University of Technology, Taiwan)

In this paper, we use ZigBee CC2530 combines My SQL Server database and Visual studio C # to develop the intelligent ordering system. This system can make staff of counter easy to ordering, and it also make more efficient and more in control to serve. All the information of meals and accounts will be record in this system. And managers can get any information what they want form this system. Let catering industry attract consumers by dynamically adjusting the menu that will bring unlimited business opportunities to catering industry.

09:15 *A Fuzzy-Rough Set based Ontology for Hybrid Recommendation* 358

Hsun-Hui Huang (Tajen University, Taiwan); Horng-Chang Yang (National Taitung University, Taiwan); Eric Hsueh-Chan Lu (National Cheng Kung Univserty, Taiwan)

In the paper, a novel ontology-based recommendation model based on a fuzzy-rough hybrid mechanism is proposed. This model integrates the principles of both content-based and collaborative filtering recommender systems. The proposed model unified user profile/item characteristics profile representations in a concept level space. Hence not only the user preferences and the correlation between items, but also the information of the other users with similar preferences can be used for more precise recommendation.

09:30 *Load-Balanced Cloud Service Interface for the HiBA Mobile Cloud Environment* 360

Tzu Chao Lin and Mao-Yuan Pai (National Cheng Kung University, Taiwan); Chao-Lieh Chen (National Kaohsiung First University of Science and Technology, Taiwan); Chao-Chun Chen (National Cheng Kung University, Taiwan)

In this paper, a load-balanced cloud service interface is designed and development for coping with a great amount of users in the HiBA (Hierarchical Brokering Architecture) mobile cloud. The load-balanced cloud service interface consists of three core functional modules: the cloud service interface node (CSIN), the CSI Manager, and the CSI Allocation Table, developed to match client's requests to CSINs. We deploy the proposed cloud service interface to the Microsoft's public cloud, and conduct integrated tests to a travel application scenario, which show successful load-balanced effect in the mobile cloud environment.

09:45 *Video Sharing with Seamless Service Handoff in Mobile Device-Centric Cloud Computing Environment* 362

Chun-Ting Chen (National Kaohsiung First University of Science and Technology, Taiwan); Wei-Tsung Su (Aletheia University, Taiwan); Chao-Lieh Chen (National Kaohsiung First University of Science and Technology, Taiwan)

Video sharing traditionally is an upload-then-share process for users. Users upload videos to cloud servers such as YouTube or Facebook expecting their friends to share from these data centers. Therefore, real-time sharing is not possible since prior to the transmission, the uploading requires reformatting and transcoding the video file. This is both energy and time consuming especially that the cloud server is long-distant away while the transmission is through wireless communication. In this paper, we propose a real-time video sharing scheme based on Mobile Device-Centric Cloud (MDC2) computing to meet the requirement of User-Centric Networking (UCN). The experiment shows that video sharing is in real-time and superiorly accommodates rapid context change no matter users share videos across the Internet or not.

10:00 *Cloud Access Control in Multi-layer Cloud Networks* 364

Wei-Tsung Su (Aletheia University, Taiwan); Wo Chen Liu (National Cheng Kung University, Taiwan); Chao-Lieh Chen (National Kaohsiung First University of Science and Technology, Taiwan); Tsung-Pao Chen (Hong Yue Information Co., Ltd., Taiwan)

Multi-layer cloud network is a new paradigm of mobile cloud computing. In multi-layer cloud networks, any device could augment its resources by offloading their tasks to public clouds, private clouds, or even user devices. However, it is difficult to handle access control on data stored in different clouds which may offer various access control mechanisms. In this paper, the cloud access control (CAC) is proposed to provide a universal access control on data, no matter where the data is stored in cloud networks. Data owners could easily specify who, when, and how to access their data in cloud access control expression language (CACEL). Compared to existing expression languages, such as ORDL and XACML, CACEL is more suitable for cloud access control since it is initially designed for protecting data in cloud networks.

Session H2: Intelligent Multimedia Processing and Applications

Room: IB-201

Chairs: Guo-Shiang Lin (Da-Yeh University, Taiwan), Min-Liang Wang (IRCAD-Taiwan, Taiwan)

09:00 *An Image Quality Improvement Method Based on Visual Attention Model* 366

Guo-Shiang Lin and Xian-Wei Ji (Da-Yeh University, Taiwan)

In this paper, we proposed an image quality improvement method based on visual attention model. The proposed scheme is composed of three parts: pre-processing, visual attention model generation, and exposure correction. To extract more visual cues for visual attention model generation, a pre-processing is used to modify the input image. After pre-processing, facial and non-facial cues are measured to generate visual attention maps. Based on visual attention maps, an exposure correction algorithm is utilized to adjust the exposure level of the input image and then create several intermediate results. After fusing intermediate results, a synthesized image with good visual quality can be obtained. The experimental results demonstrate that the proposed method can deal with images with low and high exposures. The results also show that the proposed scheme outperforms existing methods.

09:15 *Toward Commercial Application of Audio Fingerprinting Technology* 368

Fu-Hai Frank Wu (National Tsing Hua University, Taiwan); Jyh-Shing Roger Jang (National Taiwan University, Taiwan)

Audio Fingerprinting is a technology commonly used in query by exact example (QBEE) music service. In order to be commercialized technology, the system performance need to meet the service quality of user experience. The paper describes the short survey of market players in order to address the factors to influence the service quality. The computing performance factors include responsiveness, database size, accuracy, anti-noise, and computing platform. Especially, the computing platforms, which comprised of GPGPU, which are enabled by OpenCL programming and gain much speed, are the advantages for all those factors. Therefore, we also report the initial result of speedup factors of the technology by GPGPU.

Monday, June 8

09:30 *Human Detection Using Non-negative Matrix Factorization* 370

Jing-Xiu Zeng (National Chung Cheng University, Taiwan); Chih-Yang Lin (Asia University, Taiwan); Wei-Yang Lin (National Chung Cheng University, Taiwan)

Currently, most of the human detection methods are based on low-level features. In this paper, we proposed a middle-level feature generation method based on non-negative matrix factorization (NMF) for human detection. We also proposed an improvement scheme to guarantee that a better middle-level feature can be achieved. The proposed scheme can be applied to a complex background and the experimental results are better than those when only the low-level feature is involved.

09:45 *A Tabletop Lecture Recording System based on Gesture Control* 372

Yong-Quan Chen, Chiung-Fang Chang and Po-Chyi Su (National Central University, Taiwan)

This research presents a lecture recording system that employs gestures and digital cameras to facilitate remote-distance teaching. The lecturer can teach in front of a desk or table, on which a Pan-Tilt-Zoom (PTZ) camera and a depth camera, i.e., Kinect, are installed. The lecturer can control the PTZ camera to record the teaching process by the gestures, which are designed as simple as possible so that the lecturer can focus more on explaining the course content, instead of the recording operations. The lecturer can write the notes easily on a paper or show the physical course material to enrich the lecture content. Digital slides can also be adopted when necessary to benefit the learning experience of students. In addition, the proposed system can help to reduce the effort/time for possible post video production.

10:00 *Multi-Camera Real-Time Breathing Guidance System for Radiotherapy* 374

Chih-Lu Lai, Hsin-Liang Chen, Yung-Chang Cheng and Zong-Cheng Li (National Chung-Cheng University, Taiwan); Yuan-Hung Wu (Taipei Veterans General Hospital, Taiwan); Wei-Min Liu (National Chung Cheng University, Taiwan)

High-energy radiation beam is used in radiotherapy to kill the pre-located cancerous cells. No matter how accurately the body is positioned, or which of the chest or abdominal breathing method is used, the cancerous site often moves with the breath. Such motion artifact is an unpredictable factor during the radiotherapy, and introduces risks in damaging surrounding normal tissue. Our previous study focused on recording the motion from abdominal breathing only. In this work we find appropriate locations to place landmarks, and integrate multiple cameras to record and trace both breathing patterns. When watching the real-time video of motion artifact, patients can control their breath depth to fit the record taken when they receive imaging check to locate cancerous area. The system can lower the risk and improve the efficacy of radiotherapy.

Session H3: Advanced Cryptography and Its Applications

Room: IB-202

Chairs: Shunsuke Araki (Kyushu Institute of Technology, Japan), Yasuyuki Nogami (Okayama University, Japan)

09:00 *Reduction of Authentication Time in an Anonymous Credential System with Proofs for Monotone Formulas on Attributes* 376

Nasima Begum (Okayama University, Japan); Toru Nakanishi (Hiroshima University, Japan); Yasuyuki Nogami (Okayama University, Japan)

An anonymous credential system allows a user to convince a service provider anonymously that he/she owns certified attributes. Previously, an anonymous credential system was proposed to prove user's attributes to satisfy a monotone formula, i.e., a logic relation with any combination of AND/OR relations. However, this system has a problem of requiring large authentication time which depends on the number of attributes in the proved formula. In this paper, we propose methods to accelerate the authentication time by reducing the exponentiation costs for the calculations of accumulator and the witness which are used in the system. We implemented the accelerated system using a fast pairing library, and measured the authentication times, while changing the size of the proved relation.

09:15 *Hybrid Inter-Organization Cryptosystem using ElGamal Cryptosystem* 378

Yasuyuki Murakami (Osaka Electro-Communication University, Japan); Masao Kasahara (Waseda University/Chuo University, Japan)

Conventional cryptosystems are supposed to be used for the personal communication. However, the secure and effective communication system is more and more required for inter-organization cryptosystem. In this paper, we define the framework of the hybrid-type inter-organization crypto system and we propose a hybrid-type inter-organization cryptosystem using ElGamal cryptosystem.

09:30 *An Implementation of Inter-Organization Cryptosystem based on RSA Cryptosystem* 380

Tatsuki Miyamoto (Osaka Electro-Communication University, Japan); Yasuyuki Murakami (Osaka Electro-Communication University / Chuo University, Japan)

Conventional cryptosystems are supposed to be used for the personal communication. However, the secure and effective communication system is more and more required for inter-organization cryptosystem. In this paper, we propose an effective implementation of inter-organization cryptosystem with simple forwarding rule. We then implemented inter-organization cryptosystem using RSA cryptosystem by using the proposed method.

09:45 *A Terminal Authentication with Transiting Nodes by SymPC on an Ad-hoc Network* 382

Hideyuki Muraoka, Yuma Oouchi, Shunsuke Araki and Ken'ichi Kakizaki (Kyushu Institute of Technology, Japan)

In this paper, we propose an one-sided authentication method by the SymPC which is a homomorphic symmetric encryption in an ad-hoc network such as a sensor network. In our protocol, a root can authorize a node and know transiting nodes between them by using secret keys of their nodes.

10:00 *Efficient Implementation of NTRU over All One Polynomial Ring with CVMA* 384

Koki Misumi and Yasuyuki Nogami (Okayama University, Japan)

It is shown that public key cryptosystems based on discrete logarithm problem can be solved if the quantum computer and Shor's algorithm are realized. Thus a new cryptosystem called "post-quantum" cryptosystem so as not to be broken by quantum computer is needed. NTRU is proposed by Hoffstein et al. in 1998. It is one of post-quantum cryptosystem. It is based on problems on lattice for which there are no efficient algorithms to solve. In NTRU, using convolution polynomial ring as $\mathbb{Z}_q[X]/(X^n-1)$. However, $(X-1)$, that is a trivial factor of X^n-1 sometimes make problems. Thus we consider a variant using a quotient polynomial ring such as $\mathbb{Z}_q[X]/(X^n+X^{n-1}+\dots+X+1)$ and CVMA: Cyclic Vector Multiplication Algorithm.

Session H4: Efficient Signal Processing Schemes and Implementations for Multimedia

Room: IB-204

Chairs: Rong-Jian Chen (National United University, Taiwan), Yin-Tsung Hwang (National Yunlin University of Science and Technology, Taiwan)

09:00 *Interframe Hole Filling for DIBR in 3D Videos* 386

Ching-Long Su (National Yunlin University of Science and Technology, Taiwan); Jia-Hua Wu (National Yunlin University of Science & Technology, Taiwan); Kai-Ping Chen (National Yunlin University of Science and Technology, Taiwan)

Depth-image-based rendering (DIBR) produces multiple views efficiently. However, its process lacks some viewpoint information. There will be holes, which influences the 3D video quality. Previous DIBR techniques were mainly applied to 3D images, so it only relied on the single view and the depth map to fill the holes, but insufficient repair information resulted in incorrect repair. In this paper, we aim to repair 3D videos by the hole filling for DIBR, which introduces the relation between frames to increase the repair

information. We apply the moving behavior and the texture similarity within interframes to assure the accuracy of the repair information. The experiment results demonstrate that compared to previous methods, the proposed method obtain better 3D video quality. The average peak signal-to-noise ratio (PSNR) increases by 1.014 dB, and the structural similarity (SSIM) index increases by 0.012, which shows that the proposed method obtains better quality than the methods that only apply the single view image information.

09:15 *Efficient Block Adaptive Point Spread Function Estimation and Out-of-Focus Image Restoration Scheme* 388

Yin-Tsung Hwang (National Chung Hsing University, Taiwan); Hung-Ruey Wen (National Chung-Shan Institute of Science & Technology, Taiwan); Bing-Chen Tsai (Himax Imaging, Taiwan)

In this paper, a blurred image restoration scheme is proposed. The blurring process is modeled as the convolution between a sharp image and a point spread function (PSF). Instead of deriving one PSF applied indiscriminately to restoring the entire image, the proposed scheme is block adaptive and distinct PSF is estimated in each block containing high frequency components, e.g. edges. Since only blurred edges are refurbished in the proposed scheme, the computing complexity can be largely reduced. After PSF estimation, the deconvolution process is performed by using Wiener Filter. Finally, a median filter is employed to mitigate the ringing artifacts. Experimental results show that the proposed scheme can enhance the PSNR value of the restored image by 2~3dB. The computing time, however, is much shorter than prior arts with similar performance.

09:30 *Multi-bit watermarking in the data stream of JPEG2000 using minimum error embedding technique* 390

Sheng-Zong Fu, Jhen-Wun Fan, Rong-Jian Chen and Yu-Cha Chen (National United University, Taiwan)

In this paper, we use a novel multi-bit minimum error replacement with flexible bit location (multi-bit MER_FBL) embedding method to perform watermarking for embedding multi-bit logo images into the JPEG2000 data stream. The novel multi-bit MER_FBL embedding method embeds multi-bit logo data into the JPEG2000 data stream after quantizing the DWT coefficients. Because the proposed embedding method has the feature of flexible bit location which enhances robustness as possible as the embedding locations closing to the MSBs of cover data. We therefore developed a multi-bit MER_FBL embedding scheme based on the proposed method and then used it to build a novel multi-bit, invisible, and blind watermarking scheme in the quantized DWT domain to evaluate its performances. Simulation results show that the proposed multi-bit MER_FBL embedding method achieves high embedding capacity, good embedding quality, and can be high robustness for watermarking application. Comparisons shows that our work has better performance than those of the other previous works.

09:45 *IP Generator of Reed Solomon Codes* 392

Chia-Chun Peng (National United University, Taiwan); Chin-Hao Liao (National Unity University, Taiwan); Rong-Jian Chen and Sheng-Zong Fu (National United University, Taiwan)

This paper presents the IP generator of Reed Solomon codec to produce ten kinds of RS codec including RS(28,24), RS(32,28), RS(36,22), RS(72,64), RS(182,172), RS(204,188), RS(207,187), RS(208,192) [1], RS(255,223) [2] and RS(255,239) for targeting various communication standards and systems which use Reed Solomon (RS) codes. The RS codec IP generator will perform the hardware design and implementation from these ten kinds of RS codec based on the parameters n , k and t of RS codes. The hardware design and implementation should be achieved high throughput, high efficiency or low power because the proposed RS codec IP generator has novel design rules to generate the corresponding design and implementation according to users' requirements such as the limitation of power consumption, the limitation of gate count, the limitation of clock rate, and/or the desired throughput.

10:00 *A Shape-Perceived Object Tracking Algorithm for Intelligent Surveillance Systems* 394

Yeong-Kang Lai and Yu-Chieh Chung (National Chung Hsing University, Taiwan)

In this paper, we present an effective algorithm design for object tracking in intelligent surveillance applications. The proposed shape-perceived algorithm uses the building-block-based matching method. This method is fast due to its use of one-pass scanning and its low-cost of object classification. Two kinds of cameras are designed for different goals, a wide-angle camera and a PTZ camera, to construct the intelligent surveillance system and to achieve behavior analysis and body recognition. Furthermore, the experimental results show that this low-cost shape-perceived object tracking architecture is feasible for intelligent surveillance systems.

Session H5: (Poster Session) Wireless and Networking

Room: 1F Lobby

Chairs: Chen-Chia Chuang (NIU, Taiwan), Wai-Chi Fang (National Chiao Tung University, Taiwan)

09:00 *Monitoring System of Patient Position Based On Wireless Body Area Sensor Network* 396

M. Udin Harun Al Rasyid (Politeknik Elektronika Negeri Surabaya (PENS) - Indonesia, Indonesia); Bih-Hwang Lee (National Taiwan University of Science and Technology, Taiwan); Amang Sudarsono and Imam Mahfud (Politeknik Elektronika Negeri Surabaya (PENS), Indonesia)

Wireless body area sensor network (WBASN) implements realtime health monitoring by outfitting patients with wireless vital sign sensors. This paper presents an application that can assist doctors / nurses to monitor any changes in the position of the patient; they do not need to see the patient directly. They can monitor the patient position at other room of the patient. This application can shows any changes in the patient's position in real-time.

09:05 *Frequency Synthesizer with Digital Calibration in a GSM Directs Conversion Application and MB-OFDM UWB Communication* 398

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

This paper presents a 0.18 μm CMOS Ultra wide band (UWB) frequency synthesizer with digital frequency calibration technique to generate all the carrier frequencies for GSM direct conversion application which can vary the tuning curve in the closest band to a target frequency, then, the technique can reduce the VCO gain KVCO and achieve better phase noise and spur performance for health care wireless communication and support wearable system for old people.

09:10 *Low-Cost Electronic Dose Counter for Pressurized Metered Dose Inhaler* 400

Chen-Chia Chen (National Applied Research Laboratories & National Chip Implementation Center, Taiwan); Yi-Jun Liu, Shao-Min Wen, Chih-Chyau Yang, Chien-Ming Wu and Chun-Ming Huang (National Chip Implementation Center, Taiwan)

One of hardest parts of controlling asthma is making sure patients are getting the right doses of medicine through their inhalers based on physicians' instructions. However, the patients, especially children and old people, frequently miss doses or even forget to use them. In this study, our proposed electronic dose counter directly attached to a pressurized metered dose inhaler without modification its original structure, that is used to record the number of doses and taken times, and is shown how much medication is left in their inhalers. The medication information automatically uploads to a smartphone, and displays in an inhaler APP. Moreover, the inhaler APP also reminds the patients when they forget to use it in medication time. Overall cost of the electronics dose counter is ~\$5. We believe that our low-cost electronics dose counter with the inhaler APP could be lowered healthcare cost and saved lives.

09:15 *A Wireless Portable SOS Device Based on All-Digital-Phase-Locked-Loop* 402

Xuejiao Zhang and Keji Cui (Fudan University, P.R. China); Zhuo Zou (KTH-The Royal Institute of Technology, Sweden); Lirong Zheng (Fudan University, P.R. China)

In this paper, we present a portable SOS device with wireless communication. This device is based on all-digital-phase-locked-loop (ADPLL). A wake-up mode is implemented for low power consumption. With extra biological sensors attached to the users, the device is awakened by abnormal signals and actively sends a SOS signal for help. Moreover, it can use those sensors to collect information from users. This information can be modulated to RF frequency and sent out along with the SOS signal. The SOS device also can be used in passive mode with a SOS button in some emergency situations.

09:20 *Surface reconstruction from endoscopic image sequence* 404

[Atul Kumar](#) (IRCAD-Taiwan & Chang Bing Show Chwan Memorial Hospital, Taiwan); [Chingchun Huang](#) (National Chung Cheng University, Taiwan); [Yen-Yu Wang](#) (National Changhua University of Education, Taiwan); [Kai-Che Liu](#) (Industrial Technology Research Institute, Taiwan); [Wan-Chi Hung](#) and [Shih-Wei Huang](#) (Chang Bing Show Chwan Memorial Hospital, Taiwan)

The current study describes a technique for reconstructing a three dimensional surface from multiple images of the (single camera) endoscopic video. A 3D shape of the scenes in each image frame of the endoscopic video was reconstructed using shape from shading technique. Characteristic feature points on the 2D images were detected using SURF algorithm and the features were matched using BRIEF and Hamming distance criteria. Matched feature points between the consecutive frames were used to find the transformation matrix to align the 3D surfaces of the consecutive video frames. Using the transformation matrix, the 3D surfaces were stitched (registered) together. The method was applied on a recorded video of the laparoscopic surgery. The reconstructed surface provides a wider view and depth information to the viewers.

09:25 *Design of Graph Filter in Ill-Posed Condition Using Tikhonov Regularization* 406

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

In this paper, the design of graph filter in ill-posed condition using Tikhonov regularization method is presented. First, the design problem of graph filter is described. Then, the Tikhonov regularization method is used to determine the filter coefficients. Because the explicit solution is obtained, it is easily computed and used in the applications. Finally, a numerical example for graph filter design of Markov chain data is illustrated to show the effectiveness of the proposed method.

09:30 *Approximation and Design Methods for Efficient Filters with Less Multiplication Requirement* 408

[Jian-Jiun Ding](#) (National Taiwan University, Taiwan)

In consumer electronics, it is very important to design a filter with very less computation loading. In this paper, I try to approximate a filter by several geometric segments, geometric polynomial segments, or rectangular segments. With the approximation, the filter can be approximated by some IIR filter and implemented in a recursive way with very less multiplication requirement. I will introduce the way to design a filter whose number of multiplications is fixed to a small constant but the approximate error can be minimized. Several examples are given to show how to design the digital filter that can well approximate the original ideal filter but the number of real multiplications is much less.

09:35 *Design and Implementation of a Smart Home Energy Saving System by Multi-Microprocessors* 410

[Ming-Tang Chen](#) (National Kaohsiung University of Applied Science, Taiwan); [Che-Min Lin](#) (National Kaohsiung University of Applied Sciences, Taiwan)

This paper proposes a home electric energy saving network which is built up by combining a smart meter and a smart plug. The smart meter can not only measure electric power parameters of a load, it can also identify the operation status of a device which is connected to the smart plug. Therefore, the standby power consumption of the device can be reduced to the minimum through the electric energy management algorithm. Besides, real time electric energy consumption and standby power information will be delivered to the assigned user through the communication network of the smart meter; so, the reliability and the effectiveness of home electric energy management can be improved. For the hardware structure, the system includes digital signal processors (DSPs), a power energy IC, a smart plugs and a communication modules. On the aspects of software development, the system is with functions of energy recording, standby power consumption management, electric billing, and monitoring and collecting power information of another electric power information. The system prototype is installed at a home, and the performance is validated by the test results.

09:40 *Design and Implementation of a Video Transcoding System in Cloud Computing* 412

[Chung-Yi Wu](#), [Jiann-Jone Chen](#), [Jing-Chen Huang](#) and [Han-Yen Yu](#) (National Taiwan University of Science and Technology, Taiwan)

With the prevalence of personal computer devices and Internet, it has to provide scalable video coding to serve users under heterogeneous network environment. We proposed to develop a cloud-based video transcoding system, which utilized hierarchical scheduling algorithm to speed up the process. The efficiency can be maintained at 98% and processing time can be reduced to 13% smaller.

09:45 *A Wireless Channel Model for the Multipaths' DOA Distribution, Assuming Directional Antennas at Transmitter and Receiver* 414

[Huiwen Luo](#) and [Yue Ivan Wu](#) (Sichuan University, P.R. China)

In this paper, the direction-of-arrival (DOA) distribution of the multipath in the wireless fading channel is analytically derived, assuming directional antennas at both transmitter and receiver. The derived DOA distribution is based on the spatial relationship between the transmitter, the receiver, and the scatterers. With scatterers uniformly distributed in the whole space, the DOA distribution is explicitly parameterized by the beamwidths of the transmitting and receiving antennas. The proposed DOA distribution is validated by fitting to the empirical data obtained in some certain measurements.

09:50 *A New Method for the Design of Variable Comb Filters* 416

[Jong-Jy Shyu](#) (National University of Kaohsiung, Taiwan)

In this paper, design of wide-range variable fractional-delay (WR-VFD) finite impulse response (FIR) digital filters is proposed and then is applied to implement comb filters. However, when it is applied to construct a variable comb filter which is an IIR system, stability constraint must be considered, and the technique of quadratic programming and a strategy of sampling points for stability constraint are used to design a stable variable comb filter.

09:55 *SIDNFF: Source Identification Network Forensics Framework for Cloud Computing* 418

[Suleman Khan](#), [Abdullah Gani](#), [Ainuddin Wahid Bin Abdul Wahab](#) and [Bagiwa Mustapha](#) (University of Malaya, Malaysia)

This paper presents a novel framework for network forensics in cloud computing (CC). The framework investigates malicious activities performed by an intruder while affecting virtual machine on same or another cloud resource (CR). Moreover, it investigate malicious activities of intruders by determining its source while keeps privacy for cloud users with out losing their data confidentiality. Our proposed framework provides initial foundations to create real network forensics model for CC in a right essence.

10:00 *Remote Cloud Data Center Backup Using HBase and Cassandra with User-Friendly GUI* 420

[Bao Rong Chang](#) (National University of Kaohsiung, Taiwan); [Hsiu-Fen Tsai](#) (Shu Te University, Taiwan); [Cin-Long Guo](#) and [Chia-Yen Chen](#) (National University of Kaohsiung, Taiwan)

This paper aims to realize high efficient remote cloud data center backup using HBase and Cassandra with user-friendly graphical user interface. The binary communications protocol technology from Apache Thrift is employed to establish graphical user interface instead of using command line interface, enabling cross-platform operations on large amounts of data like data read/write and secondary indexing. In terms of cost-performance ratio, the proposed HBase approach outperforms the others for the implementation of remote data center backup.

10:05 *An Efficient FPGA Architecture for Hardware Realization of Hexagonal Based Motion Estimation Algorithm* 422

[Muhammad Muzammil](#) (International Islamic University, Islamabad, Pakistan); [Imdad Ali](#) (NCP, Pakistan); [Murtaza Sharif](#) and [Ahmad Khan](#) (UET Taxila, Pakistan)

Motion Estimation (ME) is the most critical and complex part of any video codec system. The different algorithms and their architectures are proposed for ME process. In this paper, we have proposed an efficient architecture for Hexagon Based Search (HexBS) algorithm and implemented on XC4VSX25 Virtex4 FPGA. Simulation results show that the proposed architecture is capable of calculating the Motion Vectors (MVs) of 1280 x 720 High Definition (HD) videos with throughput of 70 frames/sec. Moreover, the power and frequency requirements are 215mW and 127.27 MHz respectively for the proposed architecture with minimum hardware resources. Hence the proposed architecture is suitable for the real-time HD video applications.

Monday, June 8

10:10 Nanopower CMOS Voltage Reference Circuit with 16 ppm/°C from 0°C to 150°C without Resistors 424

Zhi Yang and Mei Jiang (Shenzhen University, P.R. China)

A voltage reference circuit providing a mean voltage of 281mV is proposed in this work. All transistors are biased in weak inversion region, and the 0.18um mix signal process is used in the simulation. This design is based on the weighted different threshold voltage between two devices, which has ultra low-power consumption of 1.5nW on 1V at room temperature. Besides, the temperature coefficient of voltage is as low as 16 ppm/°C at best @1V and 40 ppm/°C on average in a range from 0°C to 150 °C. The supply voltage of the proposed voltage circuit is from 0.65 to 5 V, and the power supply rejection ratio (PSRR) is -54dB@100Hz. The active area of circuit is 0.0013 mm².

10:15 - 10:50

B5: Coffee Break

Room: Break/Lunch Area

10:50 - 12:00

K4: Keynote Speech (IV)Mr. Stefan Mozar (IEEE Fellow), "How Consumer Electronics is Impacting Change in Healthcare"

Room: IB-101

Chair: KokSheik Wong (University of Malaya, Malaysia)

12:00 - 13:00

L3: Lunch

Room: Break/Lunch Area

13:00 - 15:15

Session I1: Trends in Multimedia Signal Processing Applications and Industry Technology

Room: IB-101

Chair: Keh-Yi Lee (Chinese Culture University, Taiwan)

13:00 Automatic SQL-to-NoSQL Schema Transformation over the MySQL and HBase Databases 426

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

The explosive growth of huge data lets cloud computing be more and more popular in recent years. Traditional web-based content management systems (CMS), e.g., phpBB, WordPress, and Joomla, store data using relational databases whose key advantage is the strong relationships among tables. However, regarding the flexibility and the feasibility of parallel processing, cloud computing adopts NoSQL databases that can support horizontal scaling to handle big data. Therefore, how to transform the existing SQL data into the NoSQL database becomes an emerging and necessary issue. This paper is motivated to propose an automatic SQL-to-NoSQL schema transformation mechanism over the MySQL and HBase databases. Based on our experimental results, the proposed mechanism is able to improve about 47% access performance.

13:15 The study of SDN for Campus Security 428

Chung-Hsin Liu and Yen-Te Yeh (Chinese Culture University, Taiwan)

The research introduces the network to monitor the environment on campus, under the existing distributed network architecture requirements are not easy to achieve. We propose a set of OpenFlow technology using SDN detect network attacks and network cameras and surveillance systems combining wireless sensors and artificial intelligence techniques supplemented purpose of this study for OpenFlow simulation experiment, in sensing system's part, exploring its security and network analysis, network attack simulation, observing the impact suffered attacks on normal service, and network information collection.

13:30 Study of Mirror Box Therapy Support System by Leap Motion 430

Makoto Fujimura, Shuhei Sato, Toshio Higashi and Kiyoshi Oguri (Nagasaki University, Japan)

Mirror box therapy is one of methods of treatment for hemiplegia due to post-stroke and developed by Ramachandran. But in the case of mirror box therapy an effect of treatment is decreased by little and little due to the mirror image is same motion of normal hand. Then we propose a mirror box therapy support system. In this paper, we study about motion capture method for our proposed mirror box therapy support system. This motion capture needs robust measurement, reasonable cost and compact size. Therefore, we used and investigated a leap motion device for motion capture. Experimental result show good result.

13:45 Document Image Enhancement Using Adaptive Directional Lifting-Based Wavelet Transform 432

Hsia Chih-Hsien, Han-Yen Tu and Huong-Giang Hoang (Chinese Culture University, Taiwan)

In this work, we proposed a new adaptive method for handwriting documents denoising, which differs from others in the two aspects: 1) The proposed method's process is an adaptive histogram equalization to suppress unwanted interfering strokes, and 2) It develops a clear document image by using adaptive directional lifting-based discrete wavelet transform enhancing operations for the foreground and interfering strokes, respectively. As a result, this method not only removes the interfering or visible watermarking in background information but also significantly increases the readability of each document.

14:00 ZigBee Wireless Sensor Network Application on Indoor Intrusion Detection 434

Hsien-Wei Tseng (Ningde Normal University, P.R. China); **Yang-Han Lee** (TamKang University, Taiwan); **Liang-Yu Yen** (TamKang University, Taiwan); **Su-Yi Yu** (Ningde Normal University, P.R. China); **Yi-Lun Chen** (TamKang University, Taiwan)

In this paper, it discusses and performs lab experiment of detecting LQI value from ZigBee wireless sensor network and from the variation of LQI values to determine is there any intrusion. In closed and no one existence indoor area it has a steady LQI value while it changes when someone intrudes into the area. An intrusion detection system is developed by using the variation in LQI values. After the system is validated we further develop an in house intrusion monitor system that when someone intrudes into the house the system will alarm or send a message to the house owner's cell phone to alarm the house has been intruded so as to attain the in house security protection effect.

14:15 System Performance Analysis for 4-G Mobile Wireless Communication System 436

Hsien-Wei Tseng (Ningde Normal University, P.R. China); **Yang-Han Lee** (TamKang University, Taiwan); **Chih-Yuan Lo** and **Ming-Hang Lee** (TamKang University, Taiwan)

In IEEE802.16m and LTE technologies, they all possess the advantages of high transmission rate and wide bandwidth. In information transmission between the mobile user and the base station it involves the propagation loss, the shadow fading loss due to building blocking and obstructions and the Doppler Effect due to the relative motion between the mobile user and the base station that will result in the signal fading at the receiver terminal. To maintain good service quality and system performance it needs to select a proper modulation format in the signal transmission. Every traffic service has its own requirement in its service quality.

14:30 Efficient Object Motion Detection Based on RGB-D Image 438

Ming-Hwa Sheu (National Yunlin University of Science & Technology, Taiwan); **Yi Wang** (National Yunlin University, Taiwan); **Chi-Chia Sun** (National Formosa University, Taiwan)

Low-cost RGB-D cameras, such as Kinect have widely used in image processing. Although Kinect can provide depth and color information simultaneously, but the depth information is very noisy. In this paper, we proposed a novel motion detection scheme based on depth and color information to enhance the object motion detection in Kinect. Our proposed algorithm can fast detect motion regions without background model building. It is efficient to be used in many applications, e.g. image recognition, tracking.

14:45 Extendable Multi-Pixel Object Labeling 440

Ming-Hwa Sheu (National Yunlin University of Science & Technology, Taiwan); **Shyue-Wen Yang** (National Yunlin University of Science and Technology, Taiwan); **Tzu-Hsiung Chen** (Taipei Chengshih University of Science & Technology, Taiwan)

This paper presents an extensible skew window for a multi-pixel inputs that enable parallel labeling. The corresponding 1×3 masks stack as a skew window based on the number of input pixels that require labeling. Based on the skew window and two pass processing, we developed a parallel labeling algorithm for assigning and merging parallel labels. To obtain tentative labels on the first pass, the priority-based label decision and parallel assignment are developed. On the second pass, parallel merging and replacement methods is proposed. From the experimental results this proposed design can perform object labeling at 30 f/sec for image up to 2560x2048 frame size.

Session I2: Circuits and Systems for Consumer Electronics

Room: IB-201

Chairs: **Ming-Chih Chen** (National Kaohsiung First University of Science and Technology, Taiwan), **Pao-Lung Chen** (National Kaohsiung First University of Science and Technology, Taiwan)

13:00 A USB3.0-Based Design of high-speed data channel for Charge Coupled Devices system 442

Yujie Qian (University of Technology and Science, P.R. China); **JunTao Fei** (HoHai University, P.R. China)

In order to solve the problem of high-speed data collection and transmission of CCD (Charge Coupled Devices) picture element, a USB 3.0 based design of high-speed data channel for CCD system is introduced in this paper. Through analyzing the requirement of the data throughput of a specific high-resolution and high frame rate CCD system, we propose this USB3.0-based scheme. By means of testing the actual speed of USB3.0 data channel, the proper USB-relevant parameters are obtained. The test indicates that the proposed USB-3.0-based design fulfills a maximal throughput of 224 Mbyte/s (1.79 Gbit/s) which makes it very suitable for high-speed CCD system. Furthermore, there is still enough throughput margin of the USB module, thus it is easily to be applied to where the higher-speed transmission is needed.

13:15 Design of a 0.6-V 0.2-mW CMOS MEMS Accelerometer 444

Po-Chang Wu and **Bin-Da Liu** (National Cheng Kung University, Taiwan); **Chih-Yuan Yeh**, **Sheng-Hsiang Tseng** and **Hann-Huei Tsai** (National Chip Implementation Center, Taiwan); **Ying-Zong Juang** (Chip Implementation Center, National Applied Research Laboratories, Taiwan)

This paper presents a low-voltage low-power monolithic complementary metal-oxide-semiconductor (CMOS) micro-electromechanical-system (MEMS) accelerometer design. This design utilizes low-voltage design techniques without using low-threshold devices or internal supply voltage boosting. The accelerometer, fabricated in the 0.18- μ m CMOS MEMS process, contains the micro-mechanical structure, readout circuits, and a 16-bit delta-sigma analog-to-digital converter ($\Delta\Sigma$ ADC). It occupies an area of only 0.8x1 mm² and draws 0.33 mA of current from a 0.6-V supply. The simulated sensitivity is 3000 LSB/g and the nonlinearity is 0.78% within the ± 6 g sensing range.

13:30 A Low Noise Local Oscillator for Wireless Regional Area Network Applications 446

Kang-Chun Peng (National Kaohsiung First University of Science and Technology, Taiwan); **Chan-Hung Lee** (National Kaohsiung First University Science and Technology, Taiwan); **Tzyy-Sheng Jason Horng** (National Sun Yat-sen University, Taiwan)

This work develops a high performance wideband and low noise local oscillator (LO) for wireless regional area network (WRAN) applications. The WRAN system uses the white spaces of the 50 – 860 MHz TV spectrum for increasing the spectrum efficiency. To cover such wideband operating range, we proposed a novel LO technique. This technique not only increases the operating range but also decreases the phase noise of the LO. Experimental results show that the proposed LO can achieve a wide operating range from 50 MHz to 1 GHz. The phase noise of the LO at 1 MHz offset frequency is as low as -131 and -132 dBc/Hz at 50 MHz and 1 GHz, respectively.

13:45 Carry Randomization with Fractional Control of a De Bruijn Sequence 448

Pao-Lung Chen (National Kaohsiung First University of Science and Technology, Taiwan)

This paper presents a carry randomization method with fractional control of a De Bruijn sequence for spurs reduction. The randomization method can be applied in a digitally controlled oscillator, flying-adder frequency synthesizer or other applications. The proposed method eliminates the large storage in conventional method that can greatly reduce the hardware cost. An example by using FPGA has been successfully demonstrated.

14:00 Digitally Controlled Oscillator with Storage Based Randomization for Spurs Reduction 450

Pao-Lung Chen (National Kaohsiung First University of Science and Technology, Taiwan); **Ting-Yao Chen** (National Kaohsiung First University of Science and Technology, Taiwan)

This paper presents a storage based randomization method for spurs reduction in digitally controlled oscillator (DCO). The storage size is very compact as compared with conventional large size. A modified linear feedback shift register is applied for random address generator. The proposed method has been demonstrated in field programmable gate array (FPGA) with a digitally controlled oscillator. The spurious-free dynamic range (SFDR) of proposed method is 32.3 dB as compared with conventional method's 28.9 dB. The proposed method has successfully reduced the spurs with very small storage for randomization.

14:15 *Secure Single-Side-Band Signal Generation Using Two Fractional Hilbert Transformers* 452

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

In this paper, a secure single-side-band (SSB) generation using two fractional Hilbert transformers (FHT) is presented. First, the SSB signal generation methods using conventional Hilbert transformer (HT) and one FHT are reviewed. Then, to improve the security, a more secure SSB generation method using two FHTs is proposed. The phase angles of two FHTs can be used as the secure keys for construction and reconstruction. Finally, a numerical example is illustrated to show the effectiveness of the proposed method.

14:30 *Design of a LED lighting module with multiple patterns* 454

[Ming-Chih Chen](#), [Jian-Yu Ciou](#) and [Guei-Sen Jhang](#) (National Kaohsiung First University of Science and Technology, Taiwan); [Yi-Wen Chiu](#) (Tatung Institute of Technology, Taiwan); [Chien-Hsing Chen](#) (Meiho University, Taiwan)

This work presents a LED imaging system, capable of shaping graphs on the bike wheel. LED lighting module is mounted on the wheel and shows graphs by rotating three LED lighting bars via human visual persistence. The system can change graphs by pushing the buttons on the control board. Our system can show the graphs under a safe riding speed of bike.

Session I3: Content-aware Multimedia Adaptation and Representation

Room: IB-202

Chairs: Li-Wei Kang (National Yunlin University of Science and Technology, Taiwan), Chih-Yang Lin (Asia University, Taiwan)

13:00 *Design of Synchronized Control Method of Dual-axis Linear Actuator* 456

[Wei-Lung Mao](#), [Jyun-Cheng Huang](#), [Suprpto Suprpto](#) and [Jen-Wei Lin](#) (National Yunlin University of Science and Technology, Taiwan)

This paper presents the motion synchronization of a dual-axis linear actuator system. The PI controller with Chien-Hrones-Reswick (CHR) method is employed in single servo axis control. The cross coupling configuration with back propagation neural network controller is applied for synchronization control. Simulation results shows the effectiveness of the propose architecture.

13:15 *The Standard Design Flow for Two-Stage Amplifier Design* 458

[Po-Yu Kuo](#), [Kuo-Yen Hsu](#) and [Ting-Hao Kan](#) (National Yunlin University of Science & Technology, Taiwan)

The two-stage amplifier design has been well studied in past decades. Many high performance amplifiers are proposed by researches. However, it is hardly to find a standard design flow for amplifier. Hence, in this paper, we propose a standard flow to design a two-stage amplifier. By applying the standard design flow, analog circuit designer can speed up whole design procedure. It also can make the procedure of design more efficiently. A conventional two-stage amplifier has been applied to demonstrate the proposed standard design flow. The simulation results has been verified using a standard 0.35um CMOS process technology.

13:30 *Analyze the Behavior Model Based on Verilog-A for Sallen-Key Low-Pass Filter* 460

[Po-Yu Kuo](#) and [Liao-Fong Sie](#) (National Yunlin University of Science & Technology, Taiwan)

To design an analogy circuit, most designers analyze the circuit performance using Hspice. However, if circuit scale is large, it will consume a lot of time to finish the simulations. In this paper, the behavior model of a Sallen-Key low-pass filter is analyzed based on Verilog-A. The behavior model has been applied to simulate the cutoff frequency and the total output noise. The error of simulation results from Verilog-A is less than 4% comparing to the results from Hspice. Moreover, Verilog-A simulate the results in the less computation time compared with Hspice.

13:45 *Single Image Rain Removal Based on Part-Based Model* 462

[Chia-Hung Yeh](#) (National Sun Yat-Sen University, Taiwan); [Pin-Hsian Liu](#) and [Cheng-En Yu](#) (National Sun Yat-sen University, Taiwan); [Chih-Yang Lin](#) (Asia University, Taiwan)

There are many outdoor vision applications such as surveillance and navigation. One of the challenges is rain removal, especially the rain removal from a single image. In this paper, a single rain image is divided into the high frequency part and the low frequency part by the Gaussian filter. Non-negative matrix factorization (NMF) is used to remove the rain streaks in the low frequency part. Then, Canny edge detection is applied to deal with the rain in the high frequency and the block copy method is employed to preserve the image quality. After that, we applied a rain dictionary to further divide the high frequency into rain and non-rain parts. The experimental results show that the proposed method is better than the state-of-the-art methods, especially in the high frequency part.

14:00 *Real-Time Handheld Indoor Positioning Device Based on RFID Heron-Bilateration Location Estimation and IMU Angular-Driven Navigation Reckoning* 464

[Chian C. Ho](#) (National Yunlin University of Science and Technology, Taiwan); [Zu-Hao Lai](#) (National Yunlin University of Science & Technology, Taiwan)

A real-time handheld indoor positioning device is developed, featuring 2 novel perfectly complementary positioning methods: 1) RFID Heron-bilateration location estimation, based on external RFID infrastructure, and 2) IMU angular-driven navigation reckoning, based on internal IMU module. At first, 2 or multiples of 2 active RFID tags as infrastructure landmarks are deployed along the surrounding walls in a single indoor space or room. After the infrastructure landmarks are set up, the handheld indoor positioning device begins to connect to the Bluetooth-based RFID reader by pairing with Bluetooth ID of the RFID reader. Then, on the screen of the handheld indoor positioning device, red landmarks on the 2D indoor map represents pre-deployed active RFID tags. When moving, the targeted handheld indoor positioning device keeps estimating the relative location through external RFID infrastructure and keeps reckoning the inertial navigation through internal IMU module. Furthermore, this work proposes and develops Kalman-filter drift removal, linear-like RSSI-to-distance transformation, RFID Heron-bilateration location estimation, and IMU angular-driven navigation reckoning to improve the accuracy and reliability of positioning. Finally, the screen of the handheld indoor positioning device can show the location and orientation indications of the targeted user on the 2D indoor map accurately and immediately.

14:15 *Image-based Heart Rate Measurement based on Multiple Regression* 466

[Kuan-Yi Lin](#) (National Chiao Tung University, Taiwan); [Duan-Yu Chen](#) (Department of Electrical Engineering, Yuan Ze University, Taiwan); [Wen-Jiin Tsai](#) (National Chiao Tung University, Taiwan)

Contact measurements of the cardiac pulse by using whether conventional electrocardiogram equipment or commercially-available pulse oximetry sensors would cause inconvenience for patients. Therefore, a novel robust non-contact technique is developed for the evaluation of heart rate variation. Image-based heart rate measurement based on multiple regression method is proposed.

14:30 *Deterministic Detection of Node Replication Attacks in Sensor Network* 468

[Chia-Mu Yu](#), [I-Chen Tsai](#), [Yu-Shen Ho](#), [Ruay-Lien Ma](#) and [Chen-En Sung](#) (Yuan Ze University, Taiwan); [Li-Wei Kang](#) (National Yunlin University of Science and Technology, Taiwan)

In Wireless Sensor Networks (WSNs), because sensor nodes do not equip with tamper resistance hardwares, they are vulnerable to the capture and compromise performed by the adversary. By launching the node replication attack, the adversary can place the replicas of captured sensor nodes back into the sensor networks so as to eavesdrop the transmitted messages or compromise the functionality of the network. Although several protocols are proposed to defend against node replication attacks, all the proposed

methods can only detect the node replication attacks probabilistically. In this paper, we propose Quorum-Based Multicast (QBM) and Star-shape Line-Selected Multicast (SLSM) to detect the node replication attacks, both of which can deterministically detect the replicas.

14:45 *Combination of RFID and Face Recognition for Access Control System* 470

Chuan-Yu Chang (National Yunlin University of Science and Technology, Taiwan)

In this paper, the Radio-frequency identification (RFID) technology and face recognition are integrated for access control system. A rapid face detection scheme which using a set of rotated haar-like features is adopted for face detection. A normalization process is then applied to adjust the detected faces. The speeded up robust features (SURF) algorithm is used for registering the detected face and the stored face image. The complex wavelet structural similarity is finally used for face authentication. Experimental results show that the proposed method achieves high recognition rate. The proposed method had operated in a multinational enterprise well with high satisfaction, which makes the security stronger and reliable.

15:00 *Implementing an SCORM-based E-Learning System for a Multinational Enterprise* 472

Chuan-Yu Chang (National Yunlin University of Science and Technology, Taiwan)

In this paper, an intelligent SCORM-based e-learning system, SELS (abbreviation of SCORM-based E-Learning System) was designed and implemented for a multinational enterprise (MNE). The main purpose of the SELS was to integrate all affairs for training employees and managing curriculums. The proposed SELS contains five sub-systems including curriculum registering, online learning, enterprise document management, resource sharing and E-portfolio. There are 4 types of user with 7 levels. Teachers can online assign pre-class quiz, satisfaction survey, examination and homework. In addition to online videos and educational materials, standard SCORM course packages are also provided. A specific designed reading tool is developed to avoid the download of educational materials. All the learning processes are recorded in E-portfolio. The SELS is performed in a multinational enterprise well with high satisfaction.

Session I4: Communication and Information Systems for Next Generation Internet

Room: IB-301

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

13:00 *Density-Aware Store-Carry-Forward Routing with Adaptive Forwarding Probability Control* 474

Tomotaka Kimura (Tokyo University of Science, Japan); Tatsuro Jonouchi, Takahiro Matsuda and Tetsuya Takine (Osaka University, Japan)

Store-carry-forward routing is a promising solution for achieving end-to-end delivery of messages in intermittently connected mobile ad-hoc networks. To reduce the number of message copies without increasing the message delivery delay, a probabilistic store-carry-forward routing scheme based on node density has been proposed so far. In this routing scheme, the forwarding probability is determined depending on node density and it is set to be small in high node-density areas. Although this routing scheme can suppress the speed of disseminating message copies over high node-density areas, the number of forwarded message copies increases gradually as time goes by. This means that a large delivery delay of a message causes excessively many copies to be disseminated. To solve this problem, we propose a routing scheme with an adaptive forwarding probability control, where the forwarding probability is reduced every time its copy is forwarded to a node. With simulation experiments, we evaluate the performance of our scheme in terms of the mean delivery delay and the mean number of forwarded message copies.

13:15 *Virtual Network Construction Scheduling based on Network Criticality for Robust Physical Networks* 476

Yasuhiro Urayama and Takuji Tachibana (University of Fukui, Japan)

In this paper, we propose a construction scheduling of virtual networks to utilize network resources effectively while keeping robustness of a physical network. In the proposed method, a service provider determines a schedule of virtual network construction for user's requests that are received during a waiting time. For this method, we consider two scheduling methods and two redesign methods. We evaluate the performance of our proposed method, and we investigate the effectiveness of the proposed method.

13:30 *Multiple Routing Configuration Method for Fast Failure Recovery and Low Energy Consumption* 478

Takayuki Hatanaka and Takuji Tachibana (University of Fukui, Japan)

In this paper, we propose a multiple backup configurations method to reduce the low energy consumption while realizing fast failure recovery from a single node failure or a single link failure. This method can reduce the energy consumption by turning off unused links. We evaluate the performance of the proposed method in some network topologies and investigate the effectiveness of the proposed method in terms of the low energy consumption.

13:45 *Concept of User-PC Computing System* 480

Nobuo Funabiki, Bongsu Kim and Yuki Aoyagi (Okayama University, Japan)

The User-PC computing system (UPC) is a technology of realizing a parallel computing environment using idling computing resources (CPU cycles) in Personal Computers (PCs) of members in the same organization or group such as a laboratory in a university and a section in a company. UPC can resolve drawbacks in the registration of computing projects, the reliability of computing results, and the continuity of computations that may often happen in Volunteer Computing (VC) systems using voluntary PCs in the Internet. Thus, UPC can be easily and comfortably used by computing users. In this paper, we show the concept of UPC and preliminary evaluations.

14:00 *Cross-Layer Selective Routing for Active Access-Point Minimization in Wireless Mesh Network* 482

I-Wei Lai (Okayama University, Taiwan); Wen-Chung Kao (National Taiwan Normal University, Taiwan); Nobuo Funabiki (Okayama University, Japan)

A Wireless Internet-access Mesh NETwork (WIMNET) provides the scalable and reliable internet access through the multiple access points (APs) and wireless relay communications. In particular, by redundantly deploying APs in the network field, the WIMNET becomes robust to the link or AP failure. However, these redundant APs increase the power consumption, and thus the number of active APs should be minimized by the selective routing without loss of the transmission performance. In this work, we propose to reinvent such selective routing algorithm by exploiting physical-layer technologies. An exemplar numerical simulation demonstrates that this cross-layer selective routing can further minimize the number of APs, leading to less operational costs in WIMNET.

14:15 *Development of the folk implements database for the digital archive* 484

Toshihide Hanyu (Kanagawa University, Japan); Sumiko Miyata (Shibaura Institute of Technology, Japan); Tetsuya Morizumi (Toyo Networks & System Integration, Japan); Hirotsugu Kinoshita (Kanagawa University, Japan)

In recent years, digitization of museum material information has been promoted. Some museums provide digital material information at online. However, digital archives and museum databases are not unified in each museum. Since folk implements are basic materials for understanding the ordinary people production activities and daily lives, there are many classification methods for these materials. Thus, it is difficult to search the folk implements adequately. In this paper, we propose a folk implements classification method. This method can effectively classify the folk implements by normalized relational model, and avoid the database redundancy.

14:30 *An efficient digital content sharing considering regional variety of popularities in hybrid peer-to-peer networks with cloud storages* 486

Shinji Sugawara (Chiba Institute of Technology, Japan); Masashi Tomimori (Nagoya Institute of Technology, Japan)

A variety of contents sharing methods that are available on Peer-to-Peer networks have been actively researched these days. We proposed a system using not only the peers' storages but also cloud storages for possessing the shared content items, which achieved higher contents acquisition rate and lower network load than conventional systems.

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However in the research, the situation where the popular content items are generally different among nations or regions was not considered. Therefore this research proposes the efficient contents sharing method taking into account the difference of contents popularities depending on regions, and in addition, evaluates the efficiency of the proposed method by computer simulations.

14:45 *A Basic Study on a Robust P2P Network Distributed Construction Method* 488

Rikuho Sakamoto and Katsunori Yamaoka (Tokyo Institute of Technology, Japan)

A P2P network has a problem that it is vulnerable to attacks on hub nodes. To solve this problem, a bimodal degree network has been studied. It is robust to both hub node attacks and node departures. However, the bimodal degree network construction method in the conventional studies may construct a vulnerable network. Therefore, we propose the distributed method to construct a robust bimodal degree network and show the effectiveness of our method by computer simulations.

15:00 *RFization of Database for Folk Implements and Ontology-assisted Information Retrieval System* 490

Rie Jimbo (Tokyo Institute of Technology, Japan); Sumiko Miyata (Shibaura Institute of Technology, Japan); Kazumitsu Matsuzawa and Hirotsugu Kinoshita (Kanagawa University, Japan)

This paper proposes an ontology-assisted information retrieval system for folk implements of Tadami in Fukushima Prefecture. The proposed system is capable of responding to a cross-search by classifying the folk implements by inferences based on the ontology.

15:15 - 15:40

B6: Coffee Break

Room: Break/Lunch Area

15:40 - 16:25

Session J1: Internet of Things in Digital Home and Lifestyle

Room: IB-101

Chair: Yoong Choon Chang (Multimedia University, Malaysia)

15:40 *Dominant speaker detection using discrete Markov chain for multi-user video conferencing* 492

Vishnu Monn Baskaran and Yoong Choon Chang (Multimedia University, Malaysia); Jonathan Loo (Middlesex University, United Kingdom); KokSheik Wong (University of Malaya, Malaysia); Ming Tao Gan (Multimedia University, Malaysia)

This paper puts forward a discrete-time Markov chain algorithm in predicting a pair of active or dominant speakers in an ultra-high definition multi-user video conferencing system. The applied Markov chain minimizes false dominant speaker classification due to transient noise during a video conferencing session. This algorithm also includes a set of linear weights-based assignment for both the initial state vector and transition probability matrix, which improves the response of the algorithm towards changing dominant speakers. Experimental results suggests that this algorithm accurately predicts the top-two dominant speakers at a rate of 83% for 11 clients in a combined video with 91% reduction in false dominant speaker classification, based on given a set of artificial speaker data.

15:55 *Visual Based Dining Activities Detection in Ambient Assisted Living* 494

Yoong Choon Chang, Ahsan Raza Sheikh, Jie Sheng Tham and Jia Luen Chua (Multimedia University, Malaysia)

This paper summarizes some of the recent research work in visual based ambient assisted living carried out in Centre for Digital Home, Multimedia University. In particular, this paper will focus on detecting dining activities at home with the use of the conventional RGB camera and Microsoft Kinect. According to the best of our understanding, little work has been reported in the literature on identifying dining activities at home using surveillance camera and Microsoft Kinect

16:10 *Vision-Based Landing System Design for a Small UAV* 496

Yufu Lin (Feng Chia University, Taiwan)

This paper presents a vision-based landing system concept which could be implemented in a small UAV (Unmanned Aerial Vehicle). Vision-based object detection provides object position information of objects such as pedestrian or road, and those detection methods can also provide precise position during the landing stage of aircraft. Besides, the take off weight of a small UAV should be light in order to increase endurance. Vision-based sensor is much low-cost compared with other sensors such as RADAR (Radio Detection And Ranging), LIDAR (Light Detection And Ranging) or DGPS (differential GPS) module. However, vision-based object detection methods have several challenges such as weather conditions, low illumination capability, and high false detection rate in complicated environment. Accordingly, this paper presents a practical method that can conquer the above challenges for vision-based landing system for UAV. In addition to desktop simulation, we also realize the proposed method on a portable device.

Session J2: Intelligent Signal Processing for Green Communications

Room: IB-201

Chairs: Eng Gee Lim (Xi'an Jiaotong-Liverpool University, P.R. China), KokSheik Wong (University of Malaya, Malaysia)

15:40 *LFSR Based S-box for Lightweight Cryptographic Implementation* 498

Ming Ming Wong (Swinburne University of Technology, Malaysia); M. L. Dennis Wong (Swinburne University of Technology Sarawak Campus, Malaysia)

This paper presents the hardware implementation of the Linear Feedback Shift Register (LFSR) based Substitution Box (S-Box) using ALTERA FPGA platform. Unlike the conventional designs, the proposed architecture is low in terms of its hardware cost; the total area and power consumptions. Hence, the new LFSR based S-box can be deployed in block ciphers to achieve lightweight cryptographic implementations.

15:55 *Semi-Blind Doppler Spread Tracking and Channel Equalization for Green Wireless MIMO Systems* 500

Teng Ma, Xu Zhu, Yufei Jiang and Yi Huang (University of Liverpool, United Kingdom); Eng Gee Lim (Xi'an Jiaotong-Liverpool University, P.R. China)

We propose an energy-efficient semi-blind receiver structure for green wireless multiple-input multiple-output(MIMO) orthogonal frequency division multiplexing (OFDM) systems. A reference data sequence designed offline is superimposed in the source data to enable Doppler spread estimation and ambiguity elimination caused by the independent component analysis (ICA) based equalization, without consuming extra power and spectral resources. The bit error rate (BER) performance achieved approaches the ideal case with perfect channel state information (CSI).

16:10 Energy-Efficient Positioning for Cellular Networks with Unknown Path Loss Exponent 502

Yang Li, Yufei Jiang, Xu Zhu and Yi Huang (University of Liverpool, United Kingdom); Eng Gee Lim (Xi'an Jiaotong-Liverpool University, P.R. China)

We propose a received signal strength (RSS) based energy-efficient positioning approach for cellular networks with unknown path loss exponent (PLE). A low-complexity searching algorithm is proposed for PLE estimation and a low-complexity iteration algorithm is proposed to provide the searching criteria. Simulation results show that the proposed positioning method achieves an accuracy similar to that of the nonlinear least square (NLS) algorithm, while requiring a much lower complexity.

Session J3: Ubiquitous Information Security Techniques and Applications

Room: IB-202

Chairs: Yi-Hui Chen (National Chung Cheng University, Taiwan), Pei-Yu Lin (Yuan Ze University, Taiwan)

15:40 Embedding Information on Search-order Codes of VQ indices by Rearranging the Indicators 504

Pei-Yu Lin (Yuan Ze University, Taiwan); Yuan-Yu Tsai, Yin-Chi Kuo, Yi-Hui Chen and Chi-Shiang Chan (Asia University, Taiwan)

The purpose of this paper is to embed information on codes when using search-order coding (SOC) to compress index table. The proposed method reassigned the shorter indicators to the indices that can be transformed to SOC codes and those that can not be transformed are assigned by the other indicators. If the cover image is a smooth image, the proposed method can significantly reduce the size of compression code. Moreover, the size of the compression code is only related to the cover image not to the information in the proposed method. This improves the security of the compression code. According to the experimental results, the proposed method has better performance comparing with the related methods.

15:55 A Receiver Oriented Multichannel Protocol for Underwater Acoustic Sensor Networks 506

Li-Ling Hung and Yung-Jeng Luo (Aletheia University, Taiwan)

This paper proposes a multichannel MAC protocol in underwater acoustic sensor networks for transmitting lots of monitoring data. Since the transmission speed of acoustic wave is much slower than radio, the propagation delay in the water is much more than in the air. Moreover, because of the long propagation delay, the hidden terminal problems are more severe. For solving the long propagation delay and hidden terminal problems, the bandwidth utilization may become very low. To increase the bandwidth utilization, multichannel concept is proposed but suffers from the rendezvous and complicated hidden terminal problems. In this paper, a receiver oriented multichannel protocol is proposed. In this protocol, the negotiations and communications are based on the channels and the time of receivers. By reducing the number of communication times, the waiting time of the network is reduced and the bandwidth utilization is improved. Performance study reveals that the proposed protocol outperforms existing work in terms of bandwidth utilization, collision problem as well as network throughput.

16:10 Active Tamper Detection of Digital Images Using VQ Compression 508

Wen-Chuan Wu and Hwai-Fan Hsu (Aletheia University, Taiwan); Pei-Yu Lin (Yuan Ze University, Taiwan)

This paper presents an active tamper detection and content recovery scheme for digital gray images. It mainly adopts vector quantization compression and treats the index codes as the authentication and recovery data of an image. In order to achieve the purpose of detecting and locating whether an image has been tampered with, this scheme embeds the essential information of authentication and recovery into each pixel value's LSB bit. In addition, this paper also utilizes Chan's LSB matching function to improve the quality of embedded image. Experimental results showed that the authentication data of index codes are able to detect those possible modified regions effectively and clearly. Moreover, the embedded image quality also improves nearly to 1.66dB.