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Monday, May 26

08:50 - 17:00

Registration 

09:00 - 10:00

A2: Information and Communication Technology for Translational Medicine and Green Applications

Room: 201

Chair: Cihun-Siyong Gong (Chang Gung University, Taiwan)

A2.1 09:00 *An Intelligence Data Encoding Algorithm for Low Noise Interference Multi-Channel Medical Ultrasound*

Jian-chiun Liou (Industrial Technology of Research Institute, Taiwan); Chin Hsia (National Chin-Yi University of Technology, Taiwan); Po-Lei Lee (National Central University, Taiwan)

An intelligent data encoding algorithm to control high voltage multiplexers for multi-channel medical ultrasound applications is validated in this paper. The time interleaving scanning sequence is controlled spatially on the ultrasound transducer elements to avoid the strong interference caused by the excitation of neighbor elements. The output noise of multiplexer which is designed to enable 32-channel ultrasound scanner match with a 128-element linear probe is measured to quantify the interference. The experimental results have shown the leakage at the outputs of multiplexer due to the excitation of the neighboring elements is negligible by adoption of the proposed encoding scheme.

pp. 1-2

A2.2 09:15 *An Ultra Low-power Wakeup Receiver for Energy-efficient Wireless Sensor Network*

Yu-Lin Tsou (Industrial Technology Research Institute, Taiwan); Cihun-Siyong Gong (Chang Gung University, Taiwan); Jou (National Chiao Tung University, Taiwan)

An ISM band sub-100 μ W Wake-Up Receiver (WuRx) has been presented in this study. Issues regarding tradeoffs between system architectures for Ultra-Low Power (ULP) WuRx are analyzed and compared. Push-Pull Current Re-Use (PPCRU) topology with programmable bias-controlled technique has been proposed for maximum conversion gain requirement for minimum power consumption. The chip of WuRx is 0.79 mm² in size and has been implemented in a 0.18- μ m CMOS technology. Measurement shows this technique increases conversion gain by 4.8 dB without extra core current consumption which comes the result of 3.7 dB figure-of-merit (FOM) improvement. Minimum power consumption of WuRx is 88.8 μ W from 1.2-V supply. When operating at 100 kbps data rate, the sensitivity is -63 dBm (10⁻³ BER) with 888-pJ/b energy consumption. Owing to gain improvement function in RF front end, the optimum FOM of -183.4 dB can be achieved. Therefore, the proposed gain-improved technique fulfills optimum system performance between power consumption and conversion gain requirement.

pp. 3-4

A2.3 09:30 *Design a brain computer interface gaming system using steady-state visual evoked potential*

Po-Lei Lee (National Central University, Taiwan)

In this study, we have developed a steady-state visual evoked potential (SSVEP) - based brain computer interface (BCI) gaming system. The gaming system was designed as a claw machine with two input selections. Two light emitting diode (LED) flickers, with flickering rate (15 and 17Hz), functioned as visual stimulators to induce the subjects' SSVEPs. EEG signal were wirelessly recorded by IMEC V1 headset and real-time analyzed by Matlab software. Users' gazed targets were recognized by comparing the amplitudes of 15Hz and 17 Hz frequency components in the induced SSVEPs, due to the time-locked and phase-locked characteristics of SSVEP. Users gazed at one chosen flicker at one time to generate particular SSVEP, and the frequency-coded SSVEP was used to judge which LED the user desired. The proposed system has been tested in three volunteers, and the mean accuracy and mean information transfer rate (ITR) were 96% and 18.23 bits/min, respectively.

pp. 5-6

A2.4 09:45 *Functional Connectivity Altering in Hippocampus with Closed-loop Deep Brain Stimulation*

You-Yin Chen (National Yang Ming University, Taiwan)

Hippocampus is considered as the main role of memory consolidation. Learning can be completed after memory consolidation. The thalamus plays an important role in consciousness. In past research had supported that that stimulation in the central lateral thalamus could enhance the learning behavioral. Here, we present an investigational platform including: an implanted sensing and stimulation components to collect data and run the closed-loop algorithm with real-time spectrum measurement. The prototyping system was demonstrated in a chronic animal model studying hippocampal dynamics.) spectral band θ (We used the platform to find the biomarker, that the theta power of local field potentials (LFPs) could be a control variable of interest when modulating hippocampal network state

after central lateral thalamic stimulation. The platform is designed to be a flexible prototyping tool and could be used to develop improved mechanistic models and automated closed-loop systems for a variety of neurological disorders.

pp. 7-8

A4: Wireless and Networking Poster Session

Room: 205

Chairs: Jeng-Han Tsai (National Taiwan Normal University, Taiwan), Chiapin Wang (National Taiwan Normal University, Taiwan), Chu Yu (National ILan University, Taiwan)

A4.1 09:00 EQTT: An Energy-Saving and Quality-Guaranteed Target Tracking Mechanism for WSNs

Cuijuan Shang (Chuzhou University, P.R. China); Guilin Chen (Chuzhou University, P.R. China); Zaixiu Dong (Chuzhou University, P.R. China); Chih-Yung Chang (Chuzhou University, P.R. China)

Target Tracking is one of the most important issues in wireless sensor networks. In a densely deployed wireless sensor networks (WSNs), all sensors participating in the monitoring task can provide full coverage but might inefficiently consume their energies if the target did not enter the region. This paper proposes an energy-saving and quality-guaranteed target tracking mechanism, called EQTT, which dynamically wakes up sensors in a distributed manner, aiming to minimize the number of working sensors while the user-defined tracking quality can be satisfied. The proposed EQTT mainly consists of two phases: the network initialization phase and target tracking phase. The first phase aims to wake up minimal number of boundary sensors whose sensing range is intersected with the boundary of the monitoring region M. These working sensors can construct barrier coverage for the boundaries of M and all the other sensors stay in sleep state for energy conservation. When the target is detected by the boundary sensors, the target tracking phase is automatically initiated, which aims to further wake up minimal number of neighboring sensors of the detected sensor but satisfy the user-defined tracking quality. Performance results show that the proposed EQTT outperforms existing work in terms of energy consumption of sensor nodes and the tracking quality.

pp. 9-10

A4.2 09:04 An Interference-Aware and Energy-Saving Connection Protocol for Bluetooth Radio Networks

Qiaoyun Zhang (Chuzhou University, P.R. China); Guilin Chen (Chuzhou University, P.R. China); Cuijuan Shang (Chuzhou University, P.R. China); Chih-Yung Chang (Chuzhou University, P.R. China)

Bluetooth and IEEE 802.11 (Wi-Fi) are two of the most popular communication standards which define a physical and a MAC layers for wireless transmissions and operate on 2.4 GHz ISM band. To avoid the rich interference existed in ISM band, Bluetooth adopts a time-slotted frequency-hopping spread-spectrum scheme, preventing from the interference for a long time on specific channel. However, the coexistence of Bluetooth and Wi-Fi in the neighborhood will degrade the performances of both networks because the two wireless technologies cannot negotiate with each other. This paper presents a novel Bluetooth network construction mechanism which takes into account the frequencies occupied by WiFi and thus constructs an efficient Bluetooth network, aiming at minimizing the interference from Wi-Fi transmissions, when they coexist in the same space. Performance study reveals that the proposed connection protocol reduces the interference between Bluetooth and WiFi and thereby saves the energy of Bluetooth radio networks.

pp. 11-12

A4.3 09:08 A Low Communication Cost and Delay Guaranteed Multicast Approach for Next Generation Vehicular Ad Hoc Networks

Chengchao Ji (Chuzhou University, P.R. China); Zhengkun Mi (Nanjing University of Posts and Telecommunications, P.R. China); Wen-Nai Wang (Nanjing University of Posts and Telecommunications, P.R. China); Shenghui Zhao (Chuzhou University, P.R. China)

Vehicle Ad hoc NETWORKS(VANETs) is an emerging wireless network technology whereby information is generally shared among vehicles through multi-hopping. In literature, a number of routing approaches has been proposed for reducing the end-to-end delay. However, the routing approaches applied to support multicast service will be inefficient since none of them considered the share path in VANETs. This paper considers the delay-bound guaranteed multicast service where a vehicle aims to send a message to a group of vehicles using minimal bandwidth within a guaranteed delay bound. The source and multicast destinations are location-aware and trip-aware. Therefore the multicast approach developed for VANETs is totally different to the one in ad hoc networks. The proposed approach forwards the multicast message to the vehicles in the multicast group along the road segment with the least time cost, reserving as much as possible the remaining time for carry-and-forward transmissions which helps reduce the bandwidth consumption for packet transmissions.

pp. 13-14

A4.4 09:12 On-Chip ESD Protection Designs with SCR-Based Devices in RF Integrated Circuits

Chun-Yu Lin (National Taiwan Normal University, Taiwan); Rong-Kun Chang (National Taiwan Normal University, Taiwan)

CMOS technology has been used to implement the radio-frequency (RF) integrated circuits for consumer electronics. However, the thinner gate oxide in nanoscale CMOS technology seriously degrades the electrostatic discharge (ESD) robustness. Therefore, on-chip ESD protection designs must be added at all input/output pads in CMOS chip. To minimize the impacts from ESD protection design on circuit performances, ESD protection at input/output pads must be carefully designed. A review on ESD protection designs with silicon-controlled rectifier (SCR) devices in RF integrated circuits is presented in this paper.

A4.5 09:16 A Compact Wideband Bandpass Filter Using Triple-Mode H-Type Resonator

Shih-Fong Chao (National Kaohsiung Marine University, Taiwan); Wei-Cheng Lin (National Kaohsiung Marine University, Taiwan); Che-You Kuo (National Kaohsiung Marine University, Taiwan); Pu-Hua Deng (National University of Kaohsiung, Taiwan)

In this paper, a new H-type triple-mode resonator is proposed to design a compact wideband bandpass filter. Due to the structure geometry, even-odd-mode analysis is applied to investigate the resonance conditions of the H-type resonator. To enhance the input/output coupling, an inter-digital coupling structure is adopted. A wideband bandpass filter is designed with a fractional bandwidth (FBW) of 80% to validate the design concept. The experiments are in good agreement with the simulations.

pp. 17-18

A4.6 09:20 An X-Band Power Amplifier Using Power Combining Transformer in Standard 0.18-um CMOS Technology

Jeng-Han Tsai (National Taiwan Normal University, Taiwan); Jen-Wei Wang (NTNU, Taiwan)

An X-band power amplifier (PA) using TSMC standard 0.18-um 1P6M CMOS technology is presented in this paper. Utilizing two-way direct shunt and transformer power combining technique, the PA monolithic microwave integrated circuit (MMIC) achieves high output power of 27.3 dBm with peak power added efficiency (PAE) of 32.8% at 10 GHz from simulation. The simulated output 1-dB gain compression point (OP1dB) is 25 dBm and the gain performance is 14.8 dB at 10 GHz. The chip size is only 1.085 × 0.7 mm²

pp. 19-20

A4.7 09:24 A New Variable Step-size Method for the M-max LMS Algorithms

Ying-Ren Chien (National I-Lan University, Taiwan); Wei-Jiun Tseng (National I-Lan University, Taiwan)

For power-limited mobile devices, how to prolong battery life is an important issue. The voice communication needs to implement high computation complexity echo cancellation to obtain a satisfied voice quality. Partial-update-based adaptive algorithms are known solutions to reduce the computation complexity for long-tap adaptation, such as echo cancellation. However, the convergence rate is decreased due to the partial update algorithm only updates part of weights of the adaptive filters. In this paper, we propose an enhanced switching-based variable step-size approach for the M-max partial update LMS algorithms. During the initial stage, the errors are dominated by the mismatch between the tap weights of the adaptive filter and its ideal weights. We correlate the squared error signals with polynomial of error signal to gain a large step-size; on the other hand, during the steady state, the errors mainly come from the additive noise. Therefore, we switch the correlation to the other mode so that the effect of noise can be eliminated. This can be done by correlating the error signals with a delayed version of error signals and hence a small step-size is obtained during the late stages. Simulation results show that when only a half of all taps are updated in one iteration, the proposed method significantly enhances the convergence rate of the M-max least-mean-square (LMS) algorithms.

pp. 21-22

A4.8 09:28 Hybrid maximum-rate and proportional-fairness resource allocation in the downlink of LTE networks

Chiapin Wang (National Taiwan Normal University, Taiwan); Yi-Pu Chung (National Taiwan Normal University, Taiwan); Kuo-Chang Ting (Minghsin University of Science and Technology, Hsinchu, Taiwan); Chih-Cheng Tseng (National Ilan University, Taiwan); Hwang-Cheng Wang (National Ilan University, Taiwan); Fang-Chang Kuo (National Ilan University, Taiwan)

In this paper, we propose a hybrid maximum-rate (MR) and proportional-fairness (PF) resource allocation scheme in the downlink transmissions of Long Term Evolution (LTE) networks. When the users are low-density or have small channel diversities, the proposed scheme performs closely like a PF manner because the PF policy can provides a superior fairness performance with a modest reduction in throughput as the user average channel qualities are fairly uniform. With the growth of user densities or user channel diversities, the proposed scheme behaves like a MR fashion so as to maximize the system throughput superior to providing user fairness. The simulation results demonstrate that our scheme can balance the tradeoff between system throughput and user fairness and thus optimize the overall LTE transmission performance.

pp. 23-24

A4.9 09:32 A Multi-to-One Short-Range Wireless Communication System for the Smart ICU Physiology Telemetry System

Chang-Hsi Wu (Lunghwa University Of Science Technology, Taiwan)

In this paper, a multi-to-one short-range wireless communication system for the smart ICU physiology telemetry system base on time division multiple access (TDMA) baseband design is proposed. The communication protocol is achieved by introducing the control codes of tag/data type and synchronization reference and the bit error rate (BER) is reduced by using the multiple reading technique. The designed TDMA baseband system is implemented by a FPGA of Altera Cyclon II with burning the designed verilog codes in it. The RF transmission is executed by an on-off-keying (OOK) transceiver. The resulted performances are verified with transmission data rate of 4Mbps based on 64MHz system clock via a carrier frequency of 5.2GHz.

pp. 25-26

A4.10 09:36 A Proposal of Routing Algorithm under Practical Conditions for Wireless Internet-Access Mesh Networks

Nobuo Funabiki (Okayama University, Japan); Toru Nakanishi (Hiroshima University, Japan); Wataru Maruyama (Okayama University, Japan)

A Wireless Internet-access Mesh NETwork (WIMNET) can provide an expandable Internet-access network by flexibly adopting multiple Access-Points (APs) that have wireless connections in the field. Previously, we proposed a routing algorithm for generating an optimal routing path between the hosts and one Internet Gateway (GW). However, in practical situations, multiple GWs are usually necessary for scalability. Besides, in high-speed IEEE802.11ac/n protocols, the link speed drastically decreases as the distance increases due to the lowered receiving signal quality. Furthermore, commercial APs implementing them have the limitation on the number of hops between a GW and a host. In this paper, we propose a routing algorithm to consider these practical conditions for large-scale WIMNET. We verify the effectiveness through simulating three topologies using the WIMNET simulator.

pp. 27-28

A4.11 09:40 *An Efficient Digital Contents Sharing with Transmission Records in Peer-to-Peer Networks*

Shinji Sugawara (Chiba Institute of Technology, Japan); Takuya Tomimatsu (Nagoya Institute of Technology, Japan)

For unstructured peer-to-peer (P2P) networks, we previously proposed an efficient digital content sharing method, in which content searching queries are guided properly to an appropriate peer which is likely to store a replica of target content item, by using query transmission records (TRs) maintained in each peer. In this paper, we improve the conventional method and make it achieve more efficiency especially in the situation where some content items which is likely to be highly interesting to some users are released at short intervals.

pp. 29-30

A4.12 09:44 *Petri Net Analysis On Path Protection Of A Multipath System With Bounded Buffers*

Victor R. L. Shen (Teacher, Taiwan); Gibran Gibran (National Taipei University, Taiwan)

With growing number of Internet users, the demand of reliable real time services such as Internet telephony and video conference increases over time. The nature of Internet forwarding system that tends to choose the shortest path to route the traffic from source to destination will lead to the congestion problem. Since the traffic load is not distributed properly, some paths are idle, while other paths are busy. The problem will get worse if some failures happen along the path. In this study, we model a distributed multipath system based on bounded buffer and path failure protection system using Petri nets. If the model is safe and deadlock free, then the model can be used by network engineers to optimize buffer usage without sacrificing network reliability.

pp. 31-32

A4.13 09:48 *SDN enabled QoS Provision for Online Streaming Services in Residential ISP Networks*

Irena Trajkovska (Universidad Politécnic de Madrid, Spain); Philipp Aeschlimann (ZHAW, Switzerland); Christof Marti (ZHAW, Switzerland); Thomas Michael Bohnert (Zurich University of Applied Sciences, Switzerland); Joaquin Salvachua (Technical University of Madrid, Spain)

In this paper we present the idea of a propriety Software Defined residential Network (SDrN) and discuss an example for a commercial P2P streaming service to be hosted on such networks. To verify the feasibility of the service in the context of Quality of Service (QoS), we offer to the providers of online streaming services (in some cases the ISPs themselves), APIs to control and validate the QoS between the users of the service. The QoS control algorithm was tested on SDN based simulation environment.

pp. 33-34

A4.14 09:52 *Real-time Streaming in the Cloud can Increase the Provider's Profit and the P2P Users' Benefit*

Irena Trajkovska (Universidad Politécnic de Madrid, Spain); Piyush Harsh (Zurich University of Applied Sciences & ICCLab, Switzerland); Thomas Michael Bohnert (Zurich University of Applied Sciences, Switzerland); Joaquin Salvachua (Technical University of Madrid, Spain)

This paper proposes a methodology to establish a billing model in a streaming service that can achieve high provider's profit and increased users' welfare. We relate three types of the service's topology: P2P (multicast), P2P-Cloud (hybrid) and Cloud (unicast) to different user profiles and analyze their effect on the provider's cost and profit. The evaluation shows that increased user cooperation, significantly decreases the provider's cloud infrastructure cost and make his profit highest when 50%-100% of the users cooperate. More cooperation increases the overall users' welfare in terms of monetary remuneration.

pp. 35-36

A4.15 09:56 *Implementation of Online Query and Navigation Service for Neighboring Emergency Departments*

Chao-Hsien Lee (National Taipei University of Technology, Taiwan); Yu-Cheng Tsao (National Taipei University of Technology, Taiwan); Chao-Wen Chen (Kaohsiung Medical University Chung-Ho Memorial Hospital, Taiwan); Kuan-Chieh Wang (Kaohsiung Medical University Chung-Ho Memorial Hospital, Taiwan)

This paper integrates location-based service (LBS) with emergency medical service for quality improvement. First, we cooperate with most hospitals in Kaohsiung, Taiwan to upload the real-time crowding condition of emergency departments, e.g., the patient number in the waiting room, the number of on-duty doctors and nurses, etc. Then, we convert the real-time crowding condition into simplified congestion signals, i.e., red, yellow and green, in order to let non-emergent patients understand easily. Finally, we implement a LBS App on two smartphone platforms, i.e., Android and Windows Phone. A non-emergent patient is able to access the congestion signals of neighboring hospitals on the map and then navigate himself to the selected target emergency department using our App.

A3: Analog/mixed-signal Technique for Emerging Consumer Electronics

Room: 207

Chair: Yuh-Shyan Hwang (National Taipei University of Technology, Taiwan)

A3.1 09:00 *Inverter-Based Low-Voltage Current Feedback Amplifier*

Yi-Tsen Ku (National Taipei University of Technology, Taiwan); An Liu (National Taipei University of Technology, Taiwan); Yuh-Shyan Hwang (National Taipei University of Technology, Taiwan); Jiann-Jong Chen (National Taipei University of Technology, Taiwan)

An inverter-based low-voltage current feedback amplifier (CFA) is proposed in the paper. The proposed current conveyor is based on an inverter-based low-voltage second-generation current conveyor (CCII) and an inverter-based buffer. There are no on-chip capacitors in the proposed current conveyor, and it can be designed with standard CMOS digital processes, hence will reduce the cost of chip fabrication. Moreover, the architecture of the proposed circuit without cascoded MOSFET transistors is easily designed and suitable for low-voltage operation. The CFA can be operated in a very low supply CMOS voltage such as $\pm 0.6V$. The proposed CFA has been simulated with TSMC 0.18 processes and validated by CFA based inverting amplifier and non-inverting amplifier.

pp. 39-40

A3.2 09:15 *A New Driver Scheme for Supply Noise Rejection and Uniformity Enhancement of AMOLED Displays*

Chia-Cheng Lei (National Taipei University of Technology, Taiwan); Jian-Fong Liou (National Taipei University of Technology, Taiwan); Yuh-Shyan Hwang (National Taipei University of Technology, Taiwan); Jiann-Jong Chen (National Taipei University of Technology, Taiwan)

The proposed driver circuit provides a new driver scheme for supply noise rejection and uniformity enhancement of AMOLED displays. We propose a new gamma circuit scheme for supply noise rejection improvement and provide a driver circuit with offset voltage zero-crossing detection (OZCD) technology to enhance the uniformity of larger displays. The simulation results show the supply noise rejection can improve more than 40dB, and the driver voltage output uniformity can be reduced to less than $\pm 1mV$.

pp. 41-42

A3.3 09:30 *A Modified Multi-fingers Structure for Power Transistor in 0.16 μm CMOS Process*

Chao-Chyun Chen (Yuan-Ze University, Taiwan); Jiun-Wei Yang (Yuan Ze University, Taiwan); Nai-Shen Kuo (Yuan Ze University, Taiwan)

This paper presents a modified multi-fingers structure for power transistors in the integrated chips. To evaluate the performance of structure, three open loop synchronous buck converter with different structures of power transistors, conventional multi-fingers structure, modified multi-fingers structure and hybrid waffle structure are fabricated in 0.16 μm CMOS process. Compared to conventional multi-fingers structure for the power transistors, the proposed structure improves the conversion efficiency by 29% in the heavy load while providing the same conversion efficiency as conventional structure in the light load. Compared to hybrid waffle structure of power transistors, the proposed structure improves the conversion efficiency significantly in the light load. Meanwhile, among all of three open-loop buck converters, the voltage ripples in the open-loop synchronous buck converter with power transistor of modified multi-fingers structure is also minimized.

pp. 43-44

A3.4 09:45 *A New Multi-Function Wave Generator Based on Multiple-Output Second-Generation Current Conveyors*

Yi-Tsen Ku (National Taipei University of Technology, Taiwan); An Liu (National Taipei University of Technology, Taiwan); Yuh-Shyan Hwang (National Taipei University of Technology, Taiwan); Jiann-Jong Chen (National Taipei University of Technology, Taiwan)

A new multi-function wave generator based on multiple-output second-generation current conveyor (MOCCII) is presented in this paper. With the control of the on-chip switches, the waveform of the output can be modified to achieve signal modulation like ASK, FSK, and PSK. The circuit consists of one multiple-output CCII, three resistors, and two capacitors. The proposed circuit has been designed with TSMC 0.18 μm CMOS process. The HSPICE simulation results are depicted to veridate the theoretical prediction of ASK, FSK, and PSK.

pp. 45-46

A1: Advanced Cryptography and Its Applications

Room: Auditorium

Chairs: Toru Nakanishi (Hiroshima University, Japan), Yasuyuki Nogami (Okayama University, Japan)

A1.1 09:00 *An Implementation of Mobile Anonymous Attribute Authentication for Android Devices*

Toru Mishima (Okayama University, Japan); Toru Nakanishi (Hiroshima University, Japan); Kan Watanabe (Okayama University, Japan); Nobuo Funabiki (Okayama University, Japan)

An anonymous credential system has been designed to allow a user to anonymously convince a verifier of the possession of a certificate issued by the issuing authority to enhance user privacy. In such a system, a user can anonymously prove relations on his/her attributes embedded into the certificate. Previously, we have proposed anonymous credential system with constant-size proofs on attributes. In this paper, toward realizing privacy-enhancing electronic ID system, we implement an anonymous attribute authentication in the anonymous credential system on NFC-enabled Android devices. The authentication is conveniently executed as the direct communication between the devices, by bringing the device close to each other. The experimental result shows that the total execution time is 1.85 seconds. To reduce the execution time is our future work.

pp. 1-10

A1.2 09:15 Collision Detection with DNS in Rho Method on BN Curve

Shunsuke Miyoshi (Okayama University, Japan); Yasuyuki Nogami (Okayama University, Japan)

Recently, much attention has been paid to pairing-based cryptosystem. In order to evaluate its security, this paper considers Pollard's Rho method to attack pairing-based cryptography especially on Barreto-Naehrig curve. Rho method need to save the data of the random points and it requires huge storage area. Thus, this paper considers a distributed system for efficiently saving rational points on Rho method. In detail, this paper proposes to use Domain Name System (DNS) so as to detect a collision for attacking pairing-based cryptography.

pp. 1-10

A1.3 09:30 Image Segmentation Methods for Sanitizable Signatures

Jing WU (Kyushu Institute of Technology, Japan); Yuma Oouchi (Kyushu Institute of Technology, Japan); Shunsuke Araki (Kyushu Institute of Technology, Japan); Ken'ichi Kakizaki (Kyushu Institute of Technology, Japan)

In the presented paper, we give two feature-based segmentation methods of image such as photo and scanned document for sanitizable signatures. Since the image is partitioned into multiple segments before it is signed, we focus on features such as faces in photo and characters in scanned document. Our methods divide the photo image into regions with the same pixel value and the scanned document into regions with a character.

pp. 51-52

A1.4 09:45 Lattice-based Cryptanalysis - how to estimate the security parameter of lattice-based cryptosystem

Po-Chun Kuo (National Taiwan University, Taiwan); Chen-Mou Cheng (National Taiwan University, Taiwan)

The usual cryptosystem behind debit card is RSA cryptosystem, which would be broken immediately by quantum computer. Thus, post-quantum cryptography rises and aims to develop cryptosystems which resist the quantum attack. Lattice-based cryptography is one on post-quantum cryptography, and is used to construct various cryptosystems. The central problem behind the lattice-based cryptosystem is Shortest Vector Problem (SVP), finding the shortest vector in the given lattice. Based on the previous results, we re-design the implementation method to improve the performance on GPU. Moreover, we implement and compare the enumeration and sieve algorithm to solve SVP on GPU. Thus, we can estimate the security parameter of lattice-based cryptosystem in a reasonable way.

pp. 53-54

10:00 - 10:40

Coffee Break 

Room: Break Area

10:40 - 10:50

Opening Remarks 

Prof. Wen-Chung Kao, General Chair, IEEE 2014 ICCE-TW and Prof. Cheng-Chih Wu, Vice President, NTNU

Room: Auditorium

10:50 - 12:00

Keynote Speech-1 

Prof. Mihaela van der Schaar (IEEE Fellow)

Room: Auditorium

12:00 - 13:10

Lunch

Room: Lunch Room

13:10 - 14:50

B2: Digital Television

Room: 201

Chair: Shingchern D You (National Taipei University of Technology, Taiwan)

B2.1 13:10 *Implementation of LDPC Decoder for L1 Signaling in DVB-T2 Transmission Frame*

Shingchern D You (National Taipei University of Technology, Taiwan); Shun-Jie Huang (National Taipei University of Technology, Taiwan)

The L1 signaling part of the DVB-T2 system uses punctured low-density parity check (LDPC) codes. This paper provides some implementation details regarding decoding punctured LDPC codes. The implemented program can successfully decode digitalized DVB-T2 signal from a generator.

pp. 55-56

B2.2 13:25 *Layer Arrangement and Assignment of H.264 Scalable Video on Content Delivery Networks*

Wei-Lune Tang (National Taipei University of Technology, Taiwan); Shih-Hsuan Yang (National Taipei University of Technology, Taiwan); Ho-Ting Wu (National Taipei University of Technology, Taiwan)

Scalable video coding (SVC) is a new coding paradigm in contrast to the conventional single-layer video coding. SVC enables an encoded video to be utilized in more flexible ways. In this paper, we combine the H.264 SVC with the content delivery network (CDN) to offer better video services. In particular, a new algorithm for layer arrangement and assignment of H.264 SVC is proposed.

Experimental results show that the proposed method greatly reduces the latency for end users to receive the desired video service.

pp. 57-58

B2.3 13:40 *QFD and AHP Integration for Smart TV Human-Computer Interaction Design*

Sheng-Ming Wang (National Taipei University of Technology, Taiwan); Chieh Ju Huang (National Taipei University of Technology & Chienkuo Technology University, Taiwan)

This paper will specifically examine scenario planning and user experience by two-stage decision-making processes by the integration of quality function deployment (QFD) and analytic hierarchy process (AHP) approach for smart TV human-computer interaction design. This research provides not only qualitative analysis but also the quantitative measurement of the priority and relevance of the features derived for smart TV HCI design.

pp. 59-60

B2.4 13:55 *Developing Hybrid Internet Broadcast Television User Interface Base on User Experience Design Principle*

Sheng-Ming Wang (National Taipei University of Technology, Taiwan); Veronique Bailey (National Taipei University of Technology, Taiwan); Cipto Hartanto (National Taipei University of Technology, Taiwan)

Broadband Internet usage is very prevalent in daily modern life, and with it we can turn Televisions into smart devices. Televisions that are capable of doing this are referred as Hybrid Internet Broadcast Television (HIBTV). Difficulties have arisen with User Interaction of HIBTV's since peoples' needs and behavior equally change over time. Improper user interface (UI) designs including layout and readability may trouble the users, lengthen users' access time; even worse ruin their mood. This research will investigate the existing UI designs of HIBTV and crosscheck whether they are properly designed based on user experience (UX) Design Theory. This research will also focus and anchor to Donald Norman's theory.

pp. 61-62

B2.5 14:10 *Real-time Eye Tracking and Event Identification Techniques for Smart TV applications*

Chuan-Yen Chiang (National Chiao Tung University, Taiwan); Yen-Lin Chen (National Taipei University of Technology, Taiwan); Chao-Wei Yu (National Taipei University of Technology, Taiwan); Wei-Chen Sun (National Taipei University of Technology, Taiwan); Shyan-Ming Yuan (National Chiao Tung University, Taiwan)

Due to the progress of computer technology, the detecting accuracy and speed of pattern recognition are promoted. Additionally, according to research advances in embedded systems, the applications of digital cameras, such as internet cameras, smart phones and smart TV, are widely used in nowadays. Therefore, we propose a set of real-time human-eye recognition and tracking systems with human-computer interaction mechanism. It can be adopted to help the smart TV users or any device which have camera and computing power to improve their using experience. So far, there still exist some difficulties in practical usage such as light shades, environmental background, camera angles, image noise and other issues. To overcome these problems, this study employs the AdaBoost algorithm combining with Haar-like features to enhance the detection accuracy, to reduce the influence of light, and to achieve human-face and human-eye recognition. The proposed system is demonstrated on OMAP4430 for embedded applications, and experimental results show that the proposed architecture is capable of effective and real-time eye position tracking.

pp. 63-64

B3: Young Professionals Workshop

Room: 207

B1: Intelligent Vision Processing for Automobiles

Room: Auditorium

Chair: Jiun-In Guo (National Chiao Tung University, Taiwan)

B1.1 13:10 *Maintaining Color Fidelity for Dual-Shot HDR Imaging*

Chingwei Yeh (National Chung-Cheng University, Taiwan); Cheng-Yao Tsai (National Chung-Cheng University, Taiwan); Tay-Jyi Lin (National Chiao Tung University, Taiwan); Jiun-In Guo (National Chung-Cheng University, Taiwan)

HDR synthesis using the minimal number of source images is crucial for real-time applications. This paper identifies the color distortion problem associated with the minimum of two source images, and proposes a solution using the virtual frame composed in the pixel domain. Experimental results demonstrate satisfactory results.

pp. 65-66

B1.2 13:25 *Adaptive Lane Departure Warning System on Android Smartphone*

Yu-Hua Yen (National Dong Hwa University, Taiwan); Chih-Li Huo (University of Dong Hwa, Taiwan); Tsung-Ying Sun (National Dong Hwa University, Taiwan)

This study proposes an adaptive Lane Departure Warning system (LDW) on smartphone, to deal with flexible warning capability for different road environment and driver behavior. The proposed system is migrated the preliminary developed LDW algorithm and utilizing mobile camera built-in Android smartphone to capture images of road environment. Through "Java Call C" approach, the LDW kernel is processing the captured images to obtain line-marking of road. When the vehicle departs from its lane, the departure alarm is active. An adaptive mechanism could adjust the parameters of alarm box according to different driving situations without any extra manual setting and yields user-friendly manipulation.

pp. 67-68

B1.3 13:40 *Dynamic Local Contrast Enhancement for Advanced Driver Assistance System in Harsh Environments*

Sheng-Wei Hsu (Advantech, Taiwan); Guan-Yu Chen (National Chiao Tung University, Taiwan); Po-Chun Shen (National Chiao Tung University, Taiwan); Chao-Yi Cho (ITRI, Taiwan); Jiun-In Guo (National Chung-Cheng University, Taiwan)

This paper presents a Dynamic Local Contrast Enhancement (DLCE) method, which can strengthen the image quality in most of inclement weather conditions. This improves unnatural image over-enhancement, reduce noise, make image more saturated, and can be applied on foggy day and night. DLCE reaches 50 fps D1 resolution and 120 fps CIF resolution on ATOM 1.6GHz in TREK-668 embedded platform.

pp. 69-70

B1.4 13:55 *Real-time Implementation and Design of an Embedded System for Identifying Speed Limit Sign*

Ching-Long Su (National Yunlin University of Science and Technology, Taiwan); Kai Ping Chen (National Yunlin University of Science and Technology, Taiwan); Hong Chen (National Yunlin University of Science and Technology, Taiwan); Yu Tong Jeng (National Yunlin University of Science and Technology, Taiwan); Kuan Hung Chen (Feng Chia University, Taiwan)

In this paper, we present an embedded system for identifying speed limit signs in real-time. The computation power of processors in embedded system is limited, so the reduction of computing for an embedded system is still an issue, especially for the real-time image processing. We proposed an efficient algorithm for identifying speed limit sign. According to the characteristics of speed limit signs, the proposed algorithm applies color clustering, dynamic thresholds and related digital image processing algorithms to propose three stages of clustering colors, searching speed limit signs and accessing the content of speed limit signs, which accesses the speed limit signs efficiently. Implementation results are conducted in different conditions, including sunny, cloudy and rainy days, which

demonstrate that most speed limit signs and supplementary signs can be correctly detected on the average of 96.38%, and the average processing frame rate was 52.49fps on a 1.7 GHz dual-core ARM Cortex-A15 embedded system.

pp. 71-72

B1.5 14:10 *Depth Rendering for Vehicle Collision Avoidance Applications*

Yeong-Kang Lai (National Chung Hsing University, Taiwan); Yu-Chieh Chung (National Chung Hsing University, Taiwan); Jian-Wen Li (National Chung Hsing University, Taiwan); Chih-Ming Hwang (National Chung Hsing University, Taiwan)

Stereo vision has been used in many different applications such as robot, entertainment, and electronics for car. Computation of the disparity map requires a large amount of computational resources because of many times of block matching, especially in high resolution image pair. In this paper, we proposed an algorithm for computing the disparity map of a full HD image pair from left and right cameras in order to focus on the front end of collision avoidance which estimates the distance between object and camera on the car. Our system is designed to avoid the collision against 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.

pp. 73-74

B1.6 14:25 *Vision-Based Moving Objects Detection for Intelligent Automobiles and a Robustness Enhancing Method*

Ting-Fung Ju (Department of Electronic Engineering, Feng-Chia University, Taiwan); Kuan-Hung Chen (Department of Electronic Engineering, Feng-Chia University, Taiwan); Jiun-In Guo (Department of Electronics Engineering, National Chiao-Tung University, Taiwan)

This paper presents a vision-based moving objects detection work which attracts much attention in intelligent automobile applications recently. Vision-based objects detection provides object behavior information of objects and is an intuitive detection method similar to human visual perception. Besides, vision-based objects detection methods are much low-cost compared with detection methods such as RADAR (Radio Detection And Ranging), or LiDAR (Light Detection And Ranging). However, current vision-based objects detection methods still suffer from several challenges such as high false alarms and unstable detection rate which limit their value in practical applications. Accordingly, this paper presents a robustness enhancing method for vision-based moving objects detection.

pp. 75-76

14:50 - 15:30

Coffee Break ☰

Room: Break Area

15:30 - 17:00

C3: Young Professionals Workshop ☰

C2: Pattern Recognition and Computer Vision ☰

Room: 201

Chair: Chi-Hung Chuang (Fo Guang University, Taiwan)

C2.1 15:30 *Accelerating Multi-Scale Retinex using ARM NEON*

Ching-Tang Fan (Fu Jen Catholic University, Taiwan); Jian-Ru Chen (Fu Jen Catholic University, Taiwan); Chung-Wei Liang (Fu Jen Catholic University, Taiwan); Yuan-Kai Wang (Fu Jen Catholic University, Taiwan)

High dynamic range image processing have recently become an important topic in consumer electronics market. While multi-scale retinex with color restoration (MSRCR) have been well developed, disadvantages of low performance is not favorable to a mobile computer-vision system. To remedy the above problem, this paper proposes an accelerated MSRCR with effective use of ARM Cortex-A9 architecture and NEON SIMD technology. A linear sampling method with binomial normal approximation is developed for improving performance of Gaussian smoothing. Overall performance improvement of MSRCR algorithm on Zedboard platform is 74% compared to original ARM optimized C code compiled to Cortex-A9 processor architecture.

pp. 77-78

C2.2 15:45 *Device-free Localization Using an Ensemble of Classifiers with a Tapped Delay Line*

Chih-Chang Yu (Vanung University, Taiwan); Wan-Hsin Hsu (Vanung University, Taiwan); Yi-Yuan Chiang (Vanung University, Taiwan)

This work proposes a novel system for device-free localization over an IEEE 802.11 wireless local area network (WLAN). The proposed system monitors the received signal strength (RSS) transmitted from access points (APs). RSS signals are collected for locating the

tracked subject. The subject is located by using an ensemble of classifiers: the support vector machine (SVM) and the Bayesian classifier. Moreover, decisions made by the classifiers at different time units are verified by incorporating the tapped delay line (TDL) architecture in the classifiers. Within a distance error of 1.3 meters and 10 taps, the proposed system achieves a high precision rate of 90.6% when using four access points. Fast, inexpensive, and applicable to any WLAN environment, the proposed system is highly promising for diverse applications.

pp. 79-80

C2.3 16:00 *Cross View Gait Recognition By Metric Learning*

Chun-Chieh Lee (National Central University, Taiwan); Chi-Hung Chuang (Fo Guang University, Taiwan); Kuo-Chin Fan (National Central University, Taiwan)

In this paper, we propose the human recognition framework based on the biometric trait conveyed by a walking subject, where the viewing angles of gallery and probe may differ. To deal with this kind of intra-class variance, we propose to exploit the view transformation technology to transform the embedded vector of one viewing angle into another embedded vector of target viewing angle. Then, the metric already learned previously on target manifold will be use to measure the similarity between vectors. Experiments were conducted on CASIA-B gait database and the results demonstrate the notable improvement of cross view gait recognition performance via the combination of feature transformation and metric learning.

pp. 81-82

C2.4 16:15 *Interactive Learning based on Kinect Device*

Hsien-Yu Huang (Dahan Institute of Technology, Taiwan); Ying-Nong Chen (National Central University, Taiwan)

Recently, digital learning has attracted a lot of researchers to improve the problems of learning carelessness, low learning ability, lack of concentration, and difficulties in comprehending the logic of math. In this study, a digital learning system based on Kinect somatosensory system is proposed to make children and teenagers happily learn in the course of the games and improve the learning performance. We propose two interactive geometry and puzzle games. The proposed somatosensory games can make learners feel curious and raise their motivation to find solutions for boring problems via abundant physical expressions and interactive operations. The players are asked to select particular operation by gestures and physical expressions within a certain time. By doing so, the learners can feel the fun of game playing and train their logic ability before they are aware. Experimental results demonstrate that the proposed somatosensory system can effectively improve the students' learning performance.

pp. 83-84

C2.5 16:30 *Face Recognition Using a Multiple Feature Space Method*

Ying-Nong Chen (National Central University, Taiwan); Hsien-Yu Huang (Dahan Institute of Technology, Taiwan)

In this study, we propose a face recognition method, termed multiple nearest feature space embedding (MNFSE). The idea of the MNFSE is that take the point-to-point, point-to-line, and point-to-plane into the calculation of covariance matrix. Based on such covariance matrix, the obtained feature space can alleviate the problem of pose, illumination, and expression (PIE) in face recognition. On the other hand, since the distance between a point and the nearest feature point, line (NFL) and NFS is simultaneously embedded in the transformation in the discriminant analysis, the ability of topology preserving, and generalizing is raised.

pp. 85-86

C3: Young Professionals Workshop

Room: 207

C1: Big Data Analytics in Multimedia Signal Processing

Room: Auditorium

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

C1.1 15:30 *Fault Detection of Surveillance Camera Using Fixed-point Arithmetic Operations*

Yi-Chong Zeng (Institute for Information Industry, Taiwan); Cheng-Juei Yu (Institute for Information Industry, Taiwan); Wen-Tsung Chang (Institute for Information Industry, Taiwan)

In this paper, we propose fixed-point operations to measure frame quality assessments as features, and then the computed features are analyzed for fault detection of surveillance camera. The proposed operations include fractional addition, fractional multiplication, and fractional division. Two kinds of quality assessments are employed namely structure similarity and average color. The proposed fault detection scheme analyzes the features using rule-based determination, discriminates corrupted frames among normal ones, and determines whether surveillance camera is normal or not. The experiment results will demonstrate that our scheme is efficient in fault detection of surveillance camera based on fixed-point operations.

pp. 87-88

C1.2 15:45 *Object Recognition using Bag of words with Kernels for Big Data*

Cheyu Wu (National Tsing Hua University, Taiwan); Ching-Te Chiu (National Tsing Hua University, Taiwan); Yarsun Hsu (National Tsing Hua University, Taiwan)

Scale Invariant Feature Transform (SIFT) descriptor can represent the object in detail, and is robust to variations due to image scaling and illumination changes. The challenge of using such descriptor to perform image retrieval in a large scale database is the high computational complexity. In this paper, we present the bag of words model combined with SIFT to reduce the computation cost. The average precision we get is about 30%.
pp. 89-90

C1.3 16:00 *Assessing the Aesthetic Quality of Photographs through Group Comparison*

Mei-Chen Yeh (National Taiwan Normal University, Taiwan); Chun-Hui Chuang (National Taiwan Normal University, Taiwan)

The availability and exponential growth in online media provides opportunities for understanding and responding to real world challenges. In this paper, we investigate the photo quality assessment problem using a large volume of online images retrieved by Google Image Search. To effectively use the big data, we present new approaches that compute discriminative features from a group of relevant images. We also evaluate two popular regression models, support vector regression (SVR) and ranking support vector machine (RankSVM), for their effectiveness in predicting an aesthetic score from the features. Experiments using 99,000 online images provide interesting results. We examine and identify the cases in which online images facilitate the automatic rating task.
pp. 91-92

C1.4 16:15 *Integration of LiDAR and Camera Data for 3D reconstruction*

Chia-Yen Chen (National University of Kaohsiung, Taiwan); Chia-Hung Yeh (National Sun Yat-Sen University, Taiwan); Tsung-I Chen (National Kaohsiung University, Taiwan); Yu-Xiang Zhang (National Kaohsiung University, Taiwan)

In this work, we propose an integration of the LiDAR device and a pair of binocular cameras for egomotion estimation and 3D reconstruction. The proposed system simultaneously acquires both range data and image data as input and calibrates the LiDAR and the cameras to determine the correspondences between them. Egomotion is determined as the system moves within the environment and finally the egomotion is used to register and integrate the data from the LiDAR device and the cameras to construct a 3D model of the environment. 3D reconstructions for both indoor and outdoor environments are performed to demonstrate the effectiveness of the proposed method.
pp. 93-94

C1.5 16:30 *Facial Expression Synthesis from a Single Image*

Man-Chia Chang (National Taiwan University, Taiwan); Ming-Sui Lee (National Taiwan University, Taiwan)

Facial expression synthesis has drawn a lot of attention in many applications, such as facial animation and human-computer interactions. Some expression synthesis methods are conducted in 2D domain where only images are taken as input but the muscle deformation is usually neglected regardless of different expressions. Methods performed in 3D domain generate more natural synthesized images but require a 3D model of the input and suffer high computational complexity, which makes it inapplicable to certain situations. A facial expression synthesis method which combines the advantages of 2D and 3D methods is proposed in this paper to synthesize expressions on an input neutral facial image. More accurate geometry information is exploited from 3D models by applying a time-saving face model reconstruction method. Expression on 2D is then synthesized using the information from 3D to produce a natural synthesized facial image with desired expression. To obtain the expressive image, the displacements of 48 facial feature points are utilized to approximate all the displacement for the whole face. Experimental results demonstrate that the proposed system can generate facial images of various expressions with satisfactory quality.
pp. 95-96

18:00 - 21:30

GOLD Event & Welcome Reception (Caesar Park Taipei Hotel) 

Tuesday, May 27

08:50 - 17:00

Registration 

09:00 - 10:00

D2: Systems and Architectures for Advanced Multimedia Applications 

Room: 201

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

D2.1 09:00 *Designs of VLC Transceiver Circuits for Reading Light Transmission of High-Quality Audio Signals on Commercial Airliners*

Lih Chieh Png (Nanyang Technological University, Singapore); Sharon Xueqi Lim (NTU, Singapore); A Rajamohan (Nanyang Technological University, Singapore); Boone-Wy Chan (Nanyang Technological University, Singapore); Faiz Azhar Hazman (Nanyang Technological University, Singapore)

Based on visible light communication (VLC) technology, three designs of audio transmitters and receivers have been built and tested successfully. The simplicity of these circuits and the very few components that are used enable them to be mass manufactured for use on passenger aircrafts. The receiver circuits can be implemented on headphones. The transmitter circuits can be integrated with LED reading lights above passengers' seats. The circuits presented here have different performance characteristics and sound qualities, depending on the type of audio ICs that are used.

pp. 97-98

D2.2 09:15 *Low Computing Complexity Architecture Design of 2D-to-3D Image Converter*

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

In this paper, we propose a low computing complexity architecture design of 2D-to-3D image converter. The presented approach establishes database of slope pattern to analyze the 2D image. According to slope and intersection, the scheme predicts vanishing points of 2D image. Then, depth map is reconstructed using vanishing points information. This approach focuses on fundamental structure analysis to reduce computing complexity and performs low computing complexity architecture of 2D-to-3D image converter.

pp. 99-100

D2.3 09:30 *A Spatial First 3-D XYT Feature Point Extraction Algorithm for Efficient Human Action Recognition*

Wan-Yu Chen (National Taiwan University & National Taiwan University, Taiwan); Ti-fen Pan (National Taiwan University, Taiwan); Liang-Gee Chen (DSP/IC Design Lab., National Taiwan University, Taiwan)

In this paper, we present a novel method of 3-D XYT feature extraction for efficient human action recognition. We propose the spatial first 3D feature extraction method to reduce the computation time and data bandwidth compared with Harris 3D corner detection. We also present experimental results through the proposed spatial first feature extraction to reach 83.33% accuracy of human action recognition through KTH dataset. Finally, we demonstrate the 67.8% computation time and 66.7% bandwidth reduction for the efficient human action recognition system.

pp. 101-102

D2.4 09:45 *An Adaboost-based Two-level Moving Object Detection Architecture with Dynamic ROI Allocation*

Jui-Sheng Lee (National Chiao Tung University, Taiwan); Hsiu-Cheng Chang (National Chiao Tung University, Taiwan); Jiun-In Guo (National Chung-Cheng University, Taiwan)

This paper presents a hardware architecture to detect moving objects based on Adaboost algorithm [1] with Haar-like feature for driving safety. According to the complex appearances of pedestrians and motorcyclists at closer distance, the proposed design supports 12-level scaling for detection window size with dynamic ROI allocation. The stride mode results in highly complex 12-level window size scaling. So a two-level fast search method for decreasing hardware cost while preserving 93.6% detection rate is proposed. The proposed design comprises of 173K gates and 35.7Kbytes SRAM. The maximum working frequency is 200MHz that is able to process VGA@31fps and QVGA@107fps input video. With the detection window sizes scaled from 14x28 to 40x80, the proposed design supports detection at a distance as far as 40 meters.

pp. 103-104

D2.5 10:00 *An RFID Management System for Multimedia Applications*

Yeong-Lin Lai (National Changhua University of Education, Taiwan)

This paper presents a radio-frequency identification (RFID) system for the management of manufacture, logistics, and services of multimedia consumer electronic devices. An RFID tag is embedded in each multimedia device in order to provide a unique identification code for each device. An RFID reader transmits electromagnetic waves to an RFID tag to deliver DC power to a low-power microcontroller unit (MCU) in the tag. The system monitors and controls the multimedia consumer electronic devices through the RFID reader and tag. The RFID management system exhibits the flexible functions of configuration programming and firmware installation and provides efficient capability for the management of multimedia consumer electronic devices.
pp. 105-106

09:00 - 10:40

D4: Image/Video Signal Processing Poster Session

Room: 205

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

09:00 *Modified Histogram Equalization Based on the Partitioned Dynamic Range*

Chia-Ying Chang (National Cheng Kung University, Taiwan)

Contrast enhancement algorithms have been designed to adjust contrast conforming to human visual perception. Histogram Equalization (HE) method is a very widely used for image contrast enhancement. However, HE may produce over-enhancement, washed out, and detail loss for some parts of the processed image and thus makes the processed image unnatural. This paper combines the Probability Density Function (PDF) and the Range Distribution Function (RDF) defined in this paper to solve the problems mentioned above for HE method.

pp. 107-108

09:07 *Automatic Mura Inspection Using the Principal Component Analysis for the TFT-LCD Panel*

Jun Woo Yun (Korea University, Korea); **Heon Gu** (Korea University, Korea); **Dae-Hwan Kim** (Korea University, Korea); **Hoi-Sik Moon** (Samsung Display, Korea); **Sung-Jea Ko** (Korea University, Korea)

In this paper, we propose a principal component analysis (PCA)-based mura detection algorithm. Recent conventional algorithms divide the panel image with the detection window and detect the mura in each detection window. However, these algorithms have several problems due to the limitation of the detection window size. To overcome these problems, we first estimate the background image of the entire panel image by applying the PCA method. And then, the difference image between the input panel image and the estimated background image is used for the mura region decision. The experimental results show that the proposed algorithm outperforms the conventional mura detection algorithm.

pp. 109-110

09:15 *A Fast Inter Residual Quad-Tree Construction Method in HEVC*

Chia-Ying Chang (National Cheng Kung University, Taiwan)

High Efficiency Video Coding (HEVC) is an ongoing video coding standard. Compared to H.264, it adopts quad-tree structure to decide the encoding efficiency by computing the rate-distortion (R-D) cost function recursively. The transform unit (TU) is the basic unit used for the transform and quantization processes in HEVC and the ranges size from 4×4 to 32×32 . In addition, a large size TU is always chosen, e.g., 32×32 , of the RQT if a residual block has a little prediction error, especially the homogeneous-area CUs are encoded. Based on the observations, the proposed method uses two stages to skip unnecessary computations on the residual quad-tree (RQT). First, to decide whether DCT/Q processes can be omitted or not. And then is used to early terminate the TU split process. Experiment results show that the proposed method is capable of reducing a large amount of time of inter prediction RQT decision on average 50% and retaining the coding performance by comparing the original HEVC encoder.

pp. 111-112

09:23 *A Wavelet-based Genetic Watermarking Scheme for Stereoscopic Images*

Yueh-Hong Chen (Far East University, Taiwan); **Hsiang-Cheh Huang** (National University of Kaohsiung, Taiwan)

In this paper, we propose a genetic watermarking method for stereoscopic images. A stereoscopic image is stored as two images and combined by software while displayed. Thus, a pirate can only clip half of the image to remove the embedded watermark. To prevent the watermarks from being removed, the proposed watermarking method embeds an identical watermark into two half images of a stereoscopic image, respectively. To resist collusion attacks, the proposed scheme identify similar portions of the two images containing in a stereoscopic image and the wavelet coefficients used to embed watermark data are selected with genetic algorithm. Then, identical modification will be applied on corresponding wavelet coefficients of the similar portions. As shown in experimental results, test images with watermarks embedded are still have high quality. Moreover, It has been indicated that the embedded watermarks are still detectable after common image processing operations. Thus, the proposed method can increase the capability to resist some image processing methods if an appropriate fitness function of GA is adopted.

pp. 113-114

09:30 *High Efficiency Video Coding (HEVC) Motion Estimation Parallel Algorithms on GPU*

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

Exhausted motion estimation in HEVC with variable block sizes is the bottleneck for real time encoding. Previous works show that CTU-based parallel processing will induce much coding efficiency loss. In this paper, focusing on the parallel processing in one CTU, efficient parallel algorithms are presented to accelerate integer motion estimation (IME) and fractional motion estimation (FME) on GPU, including multi-step composite method for IME and eliminating redundancies for FME. Experimental results show that the highest time reduction can reach up to about 52.38% compared with the non-parallel baseline implementation.

pp. 115-116

09:38 *An AR-Based VLAN Visualizer*

Nagatomo Yutaka (Oita University, Japan); Hiroaki Nishino (Oita University, Japan); Tsuneo Kagawa (Oita University, Japan)

Efficient management of Virtual Local Area Network (VLAN) requires highly-skilled administrators. We propose a network administration aid for visualizing VLAN configuration using Augmented Reality (AR). When an administrator simply looks at a real switch device in a machine room, the proposed system acquires the up-to-date configuration information about the observing switch. Then, the system graphically superimposes the information close to the switch. It assists even less-experienced administrators to easily find and grasp the VLAN configuration and enables them to perform basic maintenance tasks all by themselves.

pp. 117-118

09:46 *A Design of Supporting Diagnostic Imaging Method using Sound Feedback*

Tsuneo Kagawa (Oita University, Japan); Shuichi Tanoue (Oita University, Japan); Hiro Kiyosue (Oita University, Japan); Hiromu Mori (Oita University, Japan); Hiroaki Nishino (Oita University, Japan)

Recently, technologies for Computer Aided Diagnosis (CAD) has become more progressed, so it can provide very high quality diagnosis with large amount of high-definition images for radiologists. However, they must have loads to investigate these medical images. It is strongly required to reduce their burden without debasing the quality of imaging diagnosis. In this paper, we propose a method to support diagnosis with generating sound to represent medical image features. In addition, we discuss the effectiveness of the sonification method and how it can help for the fatigue reduction for medical imaging diagnosis.

pp. 119-120

09:53 *Using Infrared Watermark Technology to Design AR Markers with Different Hiding Effects*

Chun-Hsien Wang (National Taiwan Normal University, Taiwan)

This paper presents a method that using infrared watermark technology to design augmented reality (AR) marker with different hiding effects. By adopting both amplitude modulation (AM) and frequency modulation (FM) halftone dots, infrared watermark with AR marker pattern can be composed by the varied optical properties of YMCK inks under infrared light. The visibility of AR marker can be fine-tuned according to the density calibration chart.

pp. 121-122

10:01 *Real-Time Video Signal Processor for Electrophoretic Displays*

Wen-Chung Kao (National Taiwan Normal University, Taiwan); Chien-Hui Liu (National Taiwan Normal University, Taiwan)

Playing videos on the electronic paper, which is composed of the electrophoretic display (EPD), is an attractive feature, but none of commercial EPDs supports it. This is because the response time of the EPD is much longer than liquid crystal displays. In addition, the number of gray tones shown on the EPD is quite limited, and the state transitions between successive frames can be achieved by complicated driving waveforms. These issues result in the difficulties of supporting video display function on the EPD. In this paper, we propose a new real-time signal processor for the EPD. The processor is composed of hardware modules for producing halftoned video frames, encoding video data, and sending driving waveform to the display in real time to show good quality of videos on the EPD.

pp. 123-124

10:09 *A Forward Collision Avoidance System Adopting Multi-feature Vehicle Detection*

Guan-Yu Chen (National Chiao Tung University, Taiwan); Po-Chun Shen (National Chiao Tung University, Taiwan); Chao-Yi Cho (ITRI, Taiwan); Vinay Shivanna (National Chiao Tung University, Taiwan); Jiun-In Guo (National Chung-Cheng University, Taiwan)

This paper presents a vehicle collision avoidance method and it is associated with the exploitation of multiple features based on the AdaBoost classifier result. The proposed system will enhance the precision rate and accuracy of vehicle detection from 72% to 96% using an AdaBoost detection method extracting multiple features in vehicle detection and false alarms are reduced.

pp. 125-126

10:17 *Energy-Saving LED Control Module for Agent-Based Micro-Grid Systems*

Trong-Yen Lee (National Taipei University of Technology, Taiwan)

In this paper, an energy-saving LED control module is designed and implemented for agent-based Micro-grid systems. The proposed LED control modules have the properties of low power consumption and low cost which can be integrated with agent-based Micro-Grid systems. The hardware of proposed control module uses Programmable Logic Controller (PLC) with RS485 and RS232 to control LED lamps. An embedded software is proposed to control the LED control hardware and communicate with agent-based Micro-Grid system. The experimental results show that the proposed method can reduce 22% power consumption.

10:24 *A Portable Oxygen Concentration Detection and Monitor System Using a Smartphone and a Portable Sensor Module*

Y. W. Bai (Fu Jen Catholic University, Taiwan); Chang-Hsien Lin (Fu Jen Catholic University, Taiwan)

In this paper we use both a smartphone and a portable oxygen sensor module to detect and monitor the amount of oxygen concentration through Bluetooth communication. When the oxygen concentration exceeds the normal range our portable oxygen concentration detection and monitor system will notify the user immediately. We use an oxygen sensor both to detect ambient air and to generate the relative voltage value with respect to the oxygen level. This voltage value is amplified first through an instrumentation amplifier and the input to a MCU (Micro Controller Unit). The MCU calculates and transfers the oxygen value to a percentage of data. This design is easy to read and know how much oxygen concentration is present in the air. When the time interval of low oxygen concentration in the environment is longer than the value setting, the smartphone will set off an alarm to remind the user in order to prevent harm to human health.

pp. 129-130

10:32 *Projective Mapping Compensation for the Head Movement during Eye Tracking*

Chi-Wu Huang (National Taiwan Normal University, Taiwan); Shih-Chen Tseng (National Taiwan Normal University, Taiwan); Zong-Sian Jiang (National Taiwan Normal University, Taiwan); Chun-Wei Hu (National Taiwan Normal University, Taiwan)

This paper presents an approach, using a screen camera closely fixed above the eye to measure and correct the head movement errors, which might free the chin-rest support in eye tracking. The captured screen images, which are warped due to free head movement, could be restored back to the original by applying 3D forward as well as inverse projective mapping. The projective mapping notation and the related processes are described. The preliminary experiment results obtained favored the assumption that head movement errors can be compensated. Eye-tracker free of chin-rest supporting is rather convenient in Human Computer Interaction (HCI) applications.

pp. 131-132

09:00 - 10:00

D3: Recent Advances of Robot Intelligence

Room: 207

Chair: Chen-Chien Hsu (National Taiwan Normal University, Taiwan)

D3.1 09:00 *Defect inspection of disposable glucose test strips using machine vision*

Hsu Nan Yen (St. John's University, Taiwan)

This paper presents a machine vision system for defect inspection disposable glucose test strips. The proposed system first lightened and captured image of flawless glucose test strip while offline training. The captured image was processed through image processing technology to establish standard projection data of silver paste and carbon rubber in flawless glucose test strips. Then the measured blood glucose test strips were processed with the same lighting and image processing procedures when online detection. The defects of the measured blood glucose test strips were inspected by the projection data comparison. Experiments show that the proposed system can effectively detect three main defects on glucose test strips, i.e., silver exposing, short circuit of carbon paste electrode and unglued carbon plastic electrode.

pp. 133-134

D3.2 09:15 *Contact Lenses Try-On System*

Chen-Chien Hsu (National Taiwan Normal University, Taiwan); Hsiang Yu Huang (National Taiwan Normal University, Taiwan); Shih-An Li (Tamkang University, Taiwan); Yan Jhang Shih (National Taiwan Normal University, Taiwan); Man Wei Huang (National Taiwan Normal University, Taiwan)

This paper presents a hardware/software (HW/SW) co-design approach to establish a contact lenses try-on system via the use of the Field Programmable Gate Array (FPGA) [1]. To achieve an interactive user-friendly environment, the menu of contact lenses and the result are displayed on the LCD touch panel directly. After capturing the user's image via CMOS sensor, image processing is used to determine the user's irises in the image. A particle filter algorithm is then used to track the irises so that the contact lenses chosen by the user can be overlapped on the image to provide a natural examination of the effect of the contact lenses try-on system.

pp. 135-136

D3.3 09:30 *A Dead-Time Generator Based on OPA Slew Rate for Consumer Electronic Application*

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

Using H-bridge as a driving device is popular and important in many consumer electronic applications, such as robots, DC/DC converters, D-class audio amplifiers and so on. Furthermore, the existence of dead time is necessary for the H-bridge driver to avoid the occurrence of shoot-through current. In this paper, based on the concept of OPA slew rate, a new dead-time generation is proposed to achieve more precise dead time compared with the conventional dead-time generators.

pp. 137-138

D1: Crowd Sensing and Intelligent Transport Systems

Room: Auditorium

Chair: Tomoya Kitani (Shizuoka University, Japan)

D1.1 09:00 *An effective power saving method in Geo-fencing service using temperature sensors*

Yoshitaka Nakamura (Future University Hakodate, Japan); Masashi Sekiya (Future University Hakodate, Japan); Kazuaki Honda (IDY Corporation, Japan); Osamu Takahashi (Future University Hakodate, Japan)
In recent years, M2M (Machine-to-Machine) service attracts attention. M2M provides various services by interconnecting servers or sensors thorough network. Geo-fencing technology is one of the M2M services. Geo-fencing technology sets the virtual border on a map. This technology detects the positional relations between this border and target terminal, and let the terminal perform established processing automatically according to the relations. Location-based service can be easily provided for terminals by using Geo-fencing. The monitoring system in prisons and nursing homes is example services of Geo-fencing. It is necessary to manage the target person surely in such facilities, but it is undesirable to restrict the target indoors from a humanitarian point of view. The use of Geo-fencing is considered as a solution for these problems. The monitoring system sets the movement allowable range of the target person outside of facilities as a virtual border on the map. When the target person goes through the virtual border, the system notifies the manager of facilities. In this way, monitoring of the target person becomes easy. However, current Geo-fencing technology has some problems. For example, there are problems of the GPS precision, the privacy problems about the positional information, and problems of the power consumption of the terminals. The state that always started GPS consumes power of approximately 120 times in comparison with a standby state[1]. Therefore Geo-fencing technology which turn on GPS always has a big power consumption of the terminal. On the other hand, it is necessary to increase the number of times of positioning to raise detection precision of Geo-fencing technology. There is the trade-off relationship between the power consumption of the terminals and the number of times of positioning[2]. In this paper, we propose the saving method of power consumption of Geo-fencing service becoming the electric power saving of the terminal while maintaining the detection precision of the terminal position.

pp. 139-140

D1.2 09:15 *Cooperative Positioning Method Using On-Board LED Communication and Distance Measurement Devices*

Takaaki Umedu (Shiga University, Japan); Yasuhide Otsubo (Osaka University, Japan); Teruo Higashino (Osaka University, Japan)

A new kind of LED communication device, by which the receiver can measure the distance and angle to the sender, is proposed. In this article, we propose a cooperative positioning method using such LED communication devices to estimate vehicle positions with high accuracy. In the method, we assume that signals which can transmit own position information are deployed and the vehicles equip headlights and taillights that have a function of LED communication transmitter, and hold image sensors for reception of LED communication. The results of estimation will propagated to the surrounding vehicles and they estimate their positions by using the information.

pp. 141-142

D1.3 09:30 *A Proposal of a Transport System Connecting Demand Responsive Bus with Mass transit*

Kazuki Uehara (Graduate School of Engineering and Science, University of the Ryukyus, Japan); Yuhei Akamine (Faculty of Engineering, University of the Ryukyus, Japan); Naruaki Toma (Faculty of Engineering, University of the Ryukyus, Japan); Moeko Nerome (Department of Economics, Okinawa International, Japan); Satoshi Endo (University of the Ryukyus, Japan)

This paper describes a new transport system to promote use of public transit for reducing traffic congestions. In this system, people living in a suburban area can commute to a major urban area by the new demand responsive buses proposed by the authors and mass transits. The cooperation between the two transport modes provides reduction of the total trip time for passengers. The simulation results showed that the system users get a trip time reduction relative to existing demand responsive buses using the insertion heuristic for their path planning without connection of other transport modes.

pp. 143-144

D1.4 09:45 *Automatic Classification of Motorcycle Motion Sensing Data*

Tsukasa Kamimura (Shizuoka University, Japan); Tomoya Kitani (Shizuoka University, Japan); Daniel L Kovacs (Budapest University of Technology and Economics, Hungary)

Motorcycles are cost-efficient transportation but regarded as unsafe. To build safer motorcycle, the vehicle motion of motorcycles should be clarified. The motion depends on that of a rider much more than that of the body of a motorcycle, and thus motorcycle companies do not have enough motion data. Our research group has researched a sensing network with motorcycles and a vehicle-motion corpus of motorcycle. In this paper, we propose a method to attach an appropriate label to sensed data from the sensing network.

pp. 145-146

10:00 - 10:40

Coffee Break

Room: Break Area

10:40 - 12:00

Keynote Speech-2

Prof. Prof. Homer H. Chen((IEEE Fellow)

Room: Auditorium

Department of Electrical Engineering
National Taiwan University

12:00 - 13:10

Lunch

Room: Lunch Room

13:10 - 14:50

E2: Intelligent Multimedia Processing and Applications -I

Room: 201

Chairs: Shih-Chia Huang (National Taipei University of Technology, Taiwan), Gin-Kou Ma (ICL, Industrial Technology Research Institute, Taiwan)

E2.1 13:10 *Identifying Leaves with Watershed and CSS: Implementation of Segmentation and Object Matching*

Joey C. Su (National Chung Cheng University, Taiwan); Po-Yuan Su (National Chung Cheng University, Taiwan); Wei-Yang Lin (National Chung Cheng University, Taiwan)

Using the OpenCV library we combine the Curvature Scale Space (CSS) shape matching algorithm and the watershed algorithm that segments a leaf from a background, we aim to create a simple yet effective leaf identification software. Using the CSS shape matching algorithm we can solve the problems of: leaf self-intersection, overlapping parts of a leaf; leaf rotation, rotated images of a leaf; and leaf variation, no two leaves are the same. The watershed algorithm provides an effective way of segmenting a leaf from a non-ideal background which provides a method of creating pristine binary images. The result is a leaf identification software that is relatively accurate, fast, and with a large room for improvement.

pp. 147-148

E2.2 13:25 *Singing Performance Evaluation by Reference to CD Music Recordings*

Wei-Ho Tsai (National Taipei University of Technology, Taiwan); Cin-Hao Ma (National Taipei University of Technology, Taiwan)

This paper proposes an automatic system that rates a singing performance by comparing it with the vocal pitch in a referential CD music recording. The system allows users to not only enjoy listening to and singing with CD songs but also know how well or bad they sing. To this end, our special efforts are put on extracting the pitch-based features of the original singer in the accompanied vocals. Our experiment shows that the results of the proposed singing evaluation system are close to the human rating.

pp. 149-150

E2.3 13:40 *A L0 Norm Transmission Model for Defogging Images*

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

In this paper, we propose a new transmission model using L0 norm for image fog removal. In the prior work, the bilateral filter was used to reduce the halo artifacts. However, it is only a local optimization. Hence, we observe non-zero gradients to develop the gradient smoothing method for global control. The proposed model then locates significant edges to highlight the prominent parts of an image. Experimental results show the effectiveness of the proposed model for defogging.

pp. 151-152

E2.4 13:55 *A Block-Based Switch Median Filter for Removing High Density Salt-and-Pepper Noises*

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

This paper proposes a switch median filter to remove high density salt-and-pepper noises. Without any iteration of enlarging the square window, we compute the trimmed median and mean values to replace the noise pixels. To further increase the image quality, the proposed method also generates the sub-image to weight the filtered value. Experimental results show that the proposed method only consumes the short execution time to filter out the noise pixels.

pp. 153-154

E2.5 14:10 *Low-Complexity Camera Tamper Detection based on Edge Information*

Gil-beom Lee (Korea Aerospace Univ, Korea); Youn-chul Shin (Korea Aerospace Univ, Korea); Joo-heon Park (Korea Aerospace Univ, Korea); Myeong-jin Lee (Korea Aerospace Univ, Korea)

In this paper, a low-complexity algorithm for camera tamper detection is proposed which can detect various types of tamper attacks based on edge information. The performance of the proposed algorithm is evaluated for three types of tamper attacks and shown to achieve acceptable level of accuracy for all types of tamper attacks.

pp. 155-156

E3: Next Generation Healthcare and ICU System and Technology Development-I

Room: 207

Chairs: Wai-Chi Fang (National Chiao Tung University, Taiwan), Hsiang-Cheh Huang (National University of Kaohsiung, Taiwan)

E3.1 13:10 *A 1.4-GHz Crystal-less FSK Wireless Transceiver for Next Generation Intelligent Intensive Care Unit Healthcare Systems*

Chia Kai Chang (National Chiao Tung University, Taiwan)

A crystal-less FSK wireless transceiver is proposed for next-generation intelligent intensive care unit (ICU) health-care systems. The transceiver delivers bidirectional data of bio-signal collected from a patient and control signal from a centralized station. It features crystal-less design and direct frequency-shift-keying (FSK) modulation and demodulation at 1.4 GHz for low power consumption. As such, it transmits digital data without a local oscillator (LO) for frequency mixing. The system architecture is first verified using a hybrid system of commercial integrated circuits. The proposed transceiver is also designed in 0.18- μm CMOS technology.

pp. 157-158

E3.2 13:25 *Lossless Data Hiding with Multi-Round Difference Prediction*

Hsiang-Cheh Huang (National University of Kaohsiung, Taiwan); Chuan-Chang Lin (National University of Kaohsiung, Taiwan); Yueh-Hong Chen (Far East University, Taiwan); Wai-Chi Fang (National Chiao Tung University, Taiwan)

Lossless data hiding belongs to one major branch in information security researches. The major goal is to retain the lossless property of proposed algorithm, meaning that original image and embedded secret should be perfectly recovered at decoder. Based on the multi-round prediction of differences between original and marked images, enhanced amount of capacity can be obtained while retaining the acceptable quality of output image. Simulation results have demonstrated the better performances over relating methods in literature.

pp. 159-160

E3.3 13:40 *A Compact Power Management for Next Generation Intensive Care Unit with 91% Conversion Efficiency*

Chao-Chang Chiu, Chiu (National Chiao-Tung University & NCTU, Taiwan); Yi-Ping Su (NCTU, Taiwan); Hsiang-An Yang (NCTU, Taiwan); Chih-Wei Chang (NCTU, Taiwan); Che-Hao Meng (NCTU, Taiwan); Ke-Horng Chen (NCTU, Taiwan)

The proposed single-inductor dual-output (SIDO) converter with energy-conservation mode (ECM) control is designed for next generation intensive care unit. The energy-conservation mode (ECM) control generates two different energy delivery paths for dual buck outputs with only one inductor. In addition, the superposition technique is used to achieve a minimized inductor current level. The average inductor current is equal to the summation of two output loads. The measurement results shows the 91% peak efficiency can be derived.

pp. 161-162

E3.4 13:55 *Develop a Multiple Physiological System of ICU Patients with Symptom Analysis and Decision Making*

Chin Teng Lin (National Chiao-Tung University, Taiwan); Shi-An Chen (Brain Research Center & National Chiao Tung University, Taiwan); Yu-Kai Wang (Brain Research Center, Taiwan); Shao-Wei Lu (Brain Research Center, Taiwan)

This study presents a real-time, and auto-alarm intelligent system of healthcare for ICU patients. The current version of the expert system can detect EEG and ECG to identify different types of abnormal cardiac rhythms in real-time and identify patients' acute stress. The proposed system also activates an emergency medical alarm system when problems occur.
pp. 163-164

E3.5 14:10 *An Advanced Plug-and-Play Network Architecture for Wireless Body Area Network Using HBC, Zigbee and NFC*

Nicolas Fahier (National Chiao Tung University, Taiwan); Wai-Chi Fang (National Chiao Tung University, Taiwan)

This paper presents an advanced network system for Wireless Body Area Network (WBAN) using different types of transmission media and wireless technologies to satisfy the needs of WBAN. Based on current research and surveys, this network architecture constitutes an innovative plug and play sensor network for WBAN by using Human Body Communication (HBC), Zigbee and Near Field Communication (NFC).
pp. 165-166

E3.6 14:25 *Objective Assessment of Menstrual Pain Scale from Resting Brain Signals*

Pei-Chi Hu (National Chiao Tung University, Taiwan); Po-Chih Kuo (National Chiao Tung University, Taiwan); Li-Fen Chen (National Yang-Ming University, Taiwan); Yong-Sheng Chen (National Chiao Tung University, Taiwan)

Objective assessment of pain scale is essential to the understanding of its mechanism as well as the development of pain treatments. The purpose of this work is to develop an objective metrics for measuring endogenous pain scale by analyzing resting magnetoencephalographic data. The data used in this study were collected from fourteen PDM patients at the menstrual phase. Features were extracted by using spectral analysis, temporal complexity analysis and hemispheric asymmetric calculation. Eight features were selected and linear regression was adopted to predict the pain level. The averaged residual error was 0.21 with pain scales ranging from 0 to 10, suggesting that the proposed method could be a reliable indicator for the assessment of endogenous pain scale.
pp. 167-168

E1: Best Paper Competition

Room: Auditorium

15:30 - 17:00

F2: Intelligent Multimedia Processing and Applications-II

Room: 201

Chairs: Shih-Chia Huang (National Taipei University of Technology, Taiwan), Gin-Kou Ma (ICL, Industrial Technology Research Institute, Taiwan)

F2.1 15:30 *Stiffness Assessment of Carotid Artery via Portable B-mode Ultrasound Imager*

Chun-Chieh Huang (Laboratory of Imaging in Medicine and Remote Sensing, Taiwan); An-Bang Liu (Neuroscience Center, Hualien Tzu Chi Hospital, Taiwan); Wei-Min Liu (National Chung Cheng University, Taiwan)

The arterial vessel stiffness is one of the major factors to determine the vascular health, and only can be measured in the professional institutions. We propose an image processing workflow to analyze the common carotid artery (CCA) ultrasound (US) image series collected from a portable US scanner. The temporal CCA lumen variability is measured by approximate entropy and correlated with vessel stiffness by comparing subjects with normal blood pressure and essential hypertension. In the future such technique can be integrated in mobile devices equipped with US probes, and become easily accessible to the general public.
pp. 169-170

F2.2 15:45 *Real-Time Breathing Guidance System for External Beam Radiotherapy*

Chen-Lin Chen (Laboratory of Imaging in Medicine and Remote Sensing, Taiwan); Wei-Yi Chang (Laboratory of Imaging in Medicine and Remote Sensing, Taiwan); Yi-Wen Chen (Laboratory of Imaging in Medicine and Remote Sensing, Taiwan); Wei-Min Liu (National Chung Cheng University, Taiwan)

When external beam radiotherapy is proceeded, the radiation illumination should be focused on malignant tissues only. However, the breath of patient may result in the motion of the malignant tissue sites, and reduce the effectiveness of radiotherapy or even cause damage of normal tissues unpredictably. In this work we introduce a real-time image alignment application to such problem, and build a breath-guidance system to help patients to control the timing and depth of their inhalation and exhalation. Then the radiotherapy can be given under a more controlled situation to reduce the side effect.
pp. 171-172

F2.3 16:00 *Edge-based forward vehicle detection method for complex scene*

Wen Kai Tsai (Industrial Technology Research Institute, Taiwan)

A video-based vehicle detection method must be capable of continuous operation under various environment and illumination conditions. Thus, it is important to find out features which could adapt in various conditions. This paper proposes a robust vehicle detection method to achieve horizontal edge from Sobel filter with low computational complexity. Base on the orientation of the gradient, the feature of vehicle can be extracted accurately and quickly. In addition, symmetrical feature is also a important feature, and we used HOG to reduce the detection error. Experimental results show that the proposed method can efficiently and effectively detect the forward vehicle in various scenes.

pp. 173-174

F2.4 16:15 *Prediction of the BCI results For CAN Bus ECU using Incident Wave Excitation Method*

Wei Ting Lee (National University of Tainan, Taiwan); Yung Chi Chung (National Chiao Tung University, Taiwan); Chu-Yu Chen (National University of Tainan, Taiwan); Jing Jou Tang (Southern Taiwan University of Science and Technology, Taiwan); Chung Shun Yang (Institute for Information Industry, Taiwan)

In this paper, a method called the incident wave excitation method is proposed to incorporate the effects of the coupling noise onto leads of the CAN bus. The equivalent circuit model for two wires (CAN high line and CAN low line) system is firstly derived. The distributed voltage and current sources along the lead excited by the coupling noise can be computed. The set up for the ISO bulk-current injection (BCI) measurement at the IC level is performed. The computed results will be further verified and compared with BCI specific experimental results.

pp. 175-176

F3: Next Generation Healthcare and ICU System and Technology Development-II

Room: 207

Chairs: Wai-Chi Fang (National Chiao Tung University, Taiwan), Shang Hwa Hsu (Department of Industrial and Management, National Chiao Tung University, Hsinchu, Taiwan)

F3.1 15:30 *Developing intelligent human-machine interface for next generation ICU by using user-centered system development approach*

Shang Hwa Hsu (Department of Industrial and Management, National Chiao Tung University, Hsinchu, Taiwan)

For medical staffs, ICU is a high- risk and high- demanding environment. To reduce the medical staff's workload and improve their efficiency, we propose a user-centered approach for next generation ICU system development. The user-centered approach contains four phases: (1) user problem exploration; (2) user needs and requirements identification; (3) human-machine interface solution generation; and (4) user evaluation. The results from user evaluation of human-machine interface concepts showed that the user-centered approach is effective incorporating user needs and requirements into product development.

pp. 177-178

F3.2 15:45 *Implementation of a Human-Centric GUI for Next-Generation Intensive Care Unit*

Tsung-Che Lu (National Chiao Tung University, Taiwan); Shang Hwa Hsu (Department of Industrial and Management, National Chiao Tung University, Hsinchu, Taiwan); Sing-Jia Tzeng (National Chiao Tung University, Taiwan); Che-Ming Chang (National Chiao Tung University, Taiwan); Lan-Da Van (National Chiao Tung University, Taiwan)

In the intensive care unit (ICU), the situations of the critical patients vary rapidly. To give the patient the necessary medical treatment, the medical staffs need to response in no time. However, making the diagnosis is not easy since there is tremendous information to be processed in ICU. In this paper, a prototype human-centric graphical user interface (GUI) based on ecological interface design (EID) is implemented by C# that is compatible with Microsoft Windows system. The human-centric GUI integrates the necessary information and will help the medical staffs to interpret them efficiently. The waveforms of artificial vital signs are displayed to show the variations of those signs instantly. Besides, the GUI can display the heart/lung/kidney indicators in radar charts to assist medical staffs aware of abnormal indicators in a visual way.

pp. 179-180

F3.3 16:00 *Intelligent ICU Video Display for Multi-Intensity IR Illumination*

Wen-Chih Teng (National Chiao Tung University, Taiwan); Jen-Hui Chuang (National Chiao Tung University, Taiwan)

An Intelligent ICU Video Display System for monitoring patients at nighttime is proposed for the next generation ICU environment, wherein infrared light is employed in place of the visible one. However, for simple system with a single light source, patients at different locations may not be illuminated properly due to overexposure/underexposure. To resolve such a problem, a novel IR illuminator is proposed which can emit periodically varying intensity of IR light toward the patients. An effective monitoring system can then be established, with multi-channel display of videos of different dynamic range for each camera. Hopefully our innovation will greatly benefit the ICU healthcare system.

pp. 181-182

F3.4 16:15 *A Real Time 1080P 30FPS Gaussian Mixture Modeling Design for Background Subtraction And Object Extraction*

Tian-Sheuan Chang (Chiao-Tung University, Taiwan); Shuo-Wen Hsu (National Chiao Tung University, Taiwan)

Gaussian Mixture Modeling (GMM) algorithms provide robust background subtraction but suffer from heavy computational complexity and bandwidth due to pixel-based parameter update. For real time application needs, this paper proposed a block based GMM design for background subtraction with message passing between blocks to avoid performance drop. The corresponding parallel hardware design can reach real time 1080P@30fps and cost 164.82K gate-counts at 125MHz with 90nm process.

pp. 185-186

F3.5 16:30 *A Highly Integrated Hardware Design Implemented on FPGA for a Wireless Healthcare Monitoring System*

Kuen-Chih Lin (National Chiao Tung University, Taiwan); Wai-Chi Fang (National Chiao Tung University, Taiwan)

In this paper, we present a highly integrated hardware design providing several biomedical signals processing in a wireless healthcare monitoring system. This system includes a biomedical front-end circuits acquires and digitizes biomedical data such as electroencephalogram (EEG) and electrocardiogram (ECG), a control interface to connect and control the biomedical front-end circuits, a real-time online recursive independent component analysis (ORICA) engine to extract artifacts automatically of brain electroencephalogram signals, a heart rate variability (HRV) analysis engine for processing ECG signals and a display platform to display the physiological data. A commercial Bluetooth module is used to transmit wirelessly between the processor and the display platform. This system can provide several physiological data such as blood pressure, oxygen saturation and body temperature. This hardware design implemented using field-programmable gate array (FPGA) and schedule for fabricated using TSMC 90 nm CMOS technology.

pp. 187-188

F1: Time-Frequency Signal Processing Techniques and Their Applications for Consumer Technologies

Room: Auditorium

Chair: Jian-Jiun Ding (National Taiwan University, Taiwan)

F1.1 15:30 *Automatic White Balancing by Integer Wavelet Transform for Digital Still Camera*

Min-Hung Yeh (National Ilan University, Taiwan)

In this paper, an automatic white balancing algorithm based upon the integer wavelet transform is proposed. Through the proposed method, the image taken by digital still camera can be adjusted successfully and efficiently.

pp. 188-190

F1.2 15:45 *Freezing of Gaits Detection for Parkinson's Disease Patients Using Fast Time-Frequency Analysis Methods and Onset Detection*

Hao Hu (National Taiwan University, Taiwan); Jian-Jiun Ding (National Taiwan University & Graduate Institute of Communication Engineering, Taiwan); Kwan-Hwa Lin (Tzu-Chi University, Taiwan); Wen-Chieh Yang (National Taiwan University, Taiwan)

Parkinson's disease (PD) patients often suffer from the freezing of gait (FOG) problem, which interferes their daily life. In this paper, we develop an algorithm which uses fast time-frequency analysis methods and onset detection to detect FOG in real time. Simulations show that the specificity, the sensitivity, and the accuracy of the proposed algorithm is 81.83%, 82.66%, and 82.83%, respectively, which are better than existing FOG detection algorithms. Furthermore, since the asymmetric and shorter response smooth filter is applied, the time latency of the proposed algorithm is only 0.95 second, which is less than other methods. Our algorithm can help PD patients overcome the difficulty of walking and is easier to be implemented in hardware.

pp. 191-192

F1.3 16:00 *Polynomial Annihilating Systems and Their Applications*

Peng-Hua Wang (National Taipei University, Taiwan)

In this paper, we present a fundamental result of polynomial signal processing. We show that a system annihilates any polynomial input signals up to a given degree if and only if the derivatives of the frequency response of the system vanish. A direct consequence of the result is that the maximally flat filters are ideal for polynomial signals. Our result interprets maximally flat filters in the time domain. Besides, our result suggests that numerical methods derived from the polynomial interpolation are equivalent to the maximally flat filter design, and suggests that any maximally flat filters can be analyzed by polynomial interpolation in the time domain.

pp. 193-194

F1.4 16:15 *Low Complexity Time-Frequency Analysis Methods for Efficient Implementation*

Jian-Jiun Ding (National Taiwan University, Taiwan); Hao Hu (National Taiwan University, Taiwan)

Since the time-frequency distribution can analyze how the instantaneous frequency of a signal varies with time, it is very effective for signal processing. However, due to that the time-frequency distribution has a two-dimensional output, it has a higher complexity and

requires more computation time. In this paper, we find that if the window of the short-time Fourier transforms (STFTs) has some specific form, then they can be implemented in very efficient ways. Their performances are similar to that of the conventional STFT but the complexity is reduced from $O(TN\log 2N)$ to $O(TF)$ and have much lower cost for hardware implementation.
pp. 195-196

18:00 - 21:30

Banquet (Sheraton Grande Taipei Hotel) 

Wednesday, May 28

08:50 - 12:00

Registration 

09:00 - 10:30

G2: Recent Advances in Video Surveillance 

Room: 201

Chair: Jun-Wei Hsieh (National Taiwan Ocean University, Taiwan)

G2.1 09:00 *Image Parsing with Automatic Detection of Symmetrical Parts and Its Application on Human Activity Recognition*

De-Kai Huang (National Taiwan Ocean University, Taiwan); Tzu-Hao Hsu (National Taiwan Ocean University, Taiwan); Po-Yen Lee (National Taiwan Ocean University, Taiwan); Shyi-Chyi Cheng (National Taiwan Ocean University, Taiwan)

In this paper we present a variant of Hough voting for detecting and parsing image objects into their constituent symmetrical parts. The parsing algorithm, given an input image, first uses the Hough voting scheme to detect the salient symmetrical parts by an integrating of color segmentation, depth coherence, and motion grouping. The output of the parsing algorithm is an object graph which is further denoised with the optimization of dominant sets. Subsequently, the detected objects and their parts are tracked across video frames to capture the object part movements which are used to learn and classify human activities. The proposed approach has a significant advantage: no models are learned in advance in the object detection and parsing algorithm. Experimental results show that the proposed method gives good performance on publicly available datasets in terms of detection accuracy and recognition rate.
pp. 197-198

G2.2 09:15 *The Optical Flow-Based Analysis of Human Behavior-Specific System*

Chi-Hung Chuang (Fo Guang University, Taiwan)

To detect illegal behaviors in public, intelligent video surveillance system can be set up and analyze suspicious behaviors automatically. In this paper, we focus on detecting specific behaviors performed by one subject with handheld objects. In our proposed system, where optical flow technique is employed, no background modeling is necessary, and hence is more robust to environmental changes, such as lighting and cluttering background. Three important features: hand-face touching duration, handheld object, and smoke are extracted and used in a decision tree to recognize these behaviors.
pp. 180-181

G2.3 09:30 *Pedestrian Detection Using SURF and Shift with Importance Sampling*

Bo-Yuan Wong (National Taiwan Ocean University, Taiwan); Jun-Wei Hsieh (National Taiwan Ocean University, Taiwan); Li-Chih Chen (Yuan-Ze University, Taiwan); Duan-Yu Chen (Department of Electrical Engineering, Yuan Ze University, Taiwan); Hong-Yi Liu (National Taiwan Ocean University, Taiwan); Chong-Po Liao (National Taiwan Ocean University, Taiwan)

This paper proposes a novel Shift with Importance Sampling (SIS) scheme to improve the efficiency in pedestrian detection but maintain its high accuracy. For fast and efficient object detection, the cascade-Adaboost structure is the commonly-used approach in the literature. However, its detection performance is quite lower due to non-robust features and a fully-scanning on image especially when deformable part models are adopted. Firstly, various SURF points are first detected and then clustered via the K-Means scheme to produce potential candidates. Each pedestrian candidate is verified by a SVM-classifier based on HOG features. However, each SURP point will not exactly locate in the center of each detected pedestrian and lead to the failure of detection. To speed up the detection efficiency, we propose a novel Shift with Importance Sampling technique (SIS) to quickly shift into the correct location of each pedestrian with minimum tries and tests. The time complexity is reduced from $O(n^2)$ to $O(\log n)$. After that, the particle filter is adopted to track targets if they are missed. Experimental results show the superiority of our SIS method in pedestrian detection.
pp. 201-202

G2.4 09:45 *Panoramic image stitching system for automotive applications*

Hsia Chih-Hsien (Chinese Culture University, Taiwan)

This paper proposes an image stitching system based on Speeded Up Robust Feature (SURF). Considering that numerous car accidents occur due to blind spots of the rear mirror view, we propose a method with Haar wavelet transform to acquire the rear view using multiple monitors and apply the technique of image stitching to solve blind spots issue in order to reduce car accidents.
pp. 203-204

G2.5 10:00 *Robust Nighttime Turn Signal Direction Recognition*

Duan-Yu Chen (Department of Electrical Engineering, Yuan Ze University, Taiwan); Yag-Jie Peng (Department of Electrical Engineering, Yuan Ze University, Chung-Li, Taiwan); Jun-Wei Hsieh (National Taiwan Ocean University, Taiwan); Chien-Peng Ho (Industrial Technology Research Institute, Hsinchu, Taiwan)

In this work, to recognize the direction of turn signals, reflectance is decomposed from the original image. Rather than using knowledge of heuristic features such as the symmetry, position and size of the rear-facing vehicle, we focus on finding the invariant features to model turn signal scattering by Nakagami imaging and therefore conduct the detection process in a part-based manner. Experiments on an extensive dataset show that our proposed system can effectively detect vehicle braking under different lighting and traffic conditions, and thus demonstrates its feasibility in real-world environments.

pp. 205-206

G3: Recent Advances in Image and Video Analysis

Room: 207

Chairs: Chao-yung Hsu (Academia Sinica, Taiwan), Chien-Cheng Tseng (Kaoshiung first University of Science and Technology, Taiwan)

G3.1 09:00 *Digital Color Image Sharpening Using Riesz Potential*

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

In this paper, a digital image sharpening algorithm is presented by using Riesz potential. First, the definition of Riesz potential is reviewed briefly. Then, the sharpened image is obtained by adding the original image to the scaling Riesz potential of image. Finally, the gray-level and color digital images are used to show the effectiveness of the proposed digital image sharpening method based on Riesz potential.

pp. 207-208

G3.2 09:15 *Learning Sparse Representation for Leaf Image Recognition*

Jou-Ken Hsiao (National Yunlin University of Science and Technology, Taiwan); Li-Wei Kang (National Yunlin University of Science and Technology, Taiwan); Ching-Lung Chang (National Yunlin University of Science and Technology, Taiwan); Chao-yung Hsu (Academia Sinica, Taiwan); Chia-Yen Chen (National University of Kaohsiung, Taiwan)

Automatic plant identification via computer vision techniques has been greatly important for a number of professionals, such as environmental protectors, land managers, and foresters. In this paper, a novel leaf image recognition technique via sparse representation is proposed for automatic plant identification. In order to model leaf images, we learn an overcomplete dictionary for sparsely representing the training images of each leaf species. Each dictionary is learned using a set of descriptors extracted from the training images in such a way that each descriptor is represented by linear combination of a small number of dictionary atoms. For each test leaf image, we calculate the correlation between the image and each learned dictionary of leaf species to achieve the identification of the leaf image. As a result, efficient leaf recognition can be achieved on public leaf dataset based on the proposed framework leading to a more compact and richer representation of leaf images compared to traditional clustering approaches. Moreover, our method is also adapted to newly added leaf species without retraining classifiers and suitable to be highly parallelized as well as integrated with any leaf image descriptors/features.

pp. 209-210

G3.3 09:30 *Real-Time Traffic Light Detection on Resource-Limited Mobile Platform*

Duan-Yu Chen (Department of Electrical Engineering, Yuan Ze University, Taiwan); Yi-Tung Chiu (Department of Electrical Engineering, Yuan Ze University, Taiwan); Jun-Wei Hsieh (National Taiwan Ocean University, Taiwan)

Given the rapid expansion of car ownership worldwide, vehicle safety is an increasingly critical issue in the automobile industry. The reduced cost of intelligent mobile phones has made it economically feasible to develop intelligent systems for visual-based event detection for forward collision avoidance and mitigation. In this work, a real-time traffic red light recognition is proposed under mobile platforms. The proposed method consists of real-time traffic lights localization via image down-sampling, circular regions detection and further traffic lights recognition. Hough Transform is modified to fast localize the traffic light candidates. Finally, a strong classifier is made from multiple weak features is employed for further verifications. In the experiment, the detection rate can achieve above 70%.

This shows that our proposed traffic light recognition can be applied in real world environments.

pp. 211-212

G3.4 09:45 *Pedestrian Detection using Hybrid Features*

Hsu-Yung Cheng (National Central University, Taiwan); You-Jhen Zeng (National Central University, Taiwan); Chia-Fang Chai (Chung-Shan Institute of Science and Technology, Armaments Bureau, Taiwan)

In this work, we propose a mechanism to segment groups of pedestrians using hybrid features for intelligent surveillance systems. The goal is to specify the number of people and locate the position and size of each individual in groups of people. Human detection and clustering techniques are combined to achieve the segmentation purpose. The histogram of oriented gradients and curvelet features are extracted for full body detection using a support vector machine classifier. Modified Haar of Oriented Gradient features are constructed for upper body and lower body detectors. A clustering algorithm is then applied to the detected humans to eliminate the

redundant detection responses. The proposed mechanism requires no prior assumptions of human sizes, human heights, camera distances, and other calibration parameters. The proposed approach is tested with pedestrian benchmark dataset and surveillance videos. The experimental results have demonstrated the effectiveness of the proposed pedestrian segmentation mechanism.
pp. 213-214

G3.5 10:00 *Sensor Localization via Robust Principle Component Analysis*

Chia-Mu Yu (Yuan Ze University, Taiwan); Li-Wei Kang (National Yunlin University of Science and Technology, Taiwan)

In the received signal strength (RSS)-based localization problem, in spite of their different formulations, most of the existing methods minimize the measurement errors between sensor nodes, leading to the error diffusion problem. In this paper, aiming at solving this problem, we adopt a fundamentally different optimization strategy to propose a novel localization method exploiting the invariant distance characteristic in the network. To our knowledge, the proposed method is the first one formally dealing with the error diffusion.
pp. 215-216

G1: Intelligent Devices and Systems for Real-life Applications

Room: Auditorium

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

G1.1 09:00 *An Arduino-based Indoor Positioning System (IPS) using Visible Light Communication and Ultrasound*

Lih Chieh Png (Nanyang Technological University, Singapore); Liangquan Chen (Nanyang Technological University, Singapore); Song Liu (Nanyang Technological University, Singapore); Wei Kuan Peh (Nanyang Technological University, Singapore)

A versatile outdoor and indoor position detection mobile prototype has been successfully constructed and tested. The receiver consists of a GPS module, a GSM shield, a visible-light data receiver, and two ultrasonic sensors, all controlled by an Arduino Mega and an Arduino Uno microcontroller. Each ultrasonic sensor detects distance in the X and Y axis respectively. The transmitter system consists of four LED shields each attached to an Arduino Uno which is programmed to transmit the global position relevant to the position of the LED lamp. When a person is outdoors, the GPS module receives global position from the satellite. When a person goes indoors, his or her global position will be given by the LEDs and ultrasound sensors. The location data can be transmitted via GSM to a monitoring system or to an individual smartphone. This system is extremely useful in elderly care service. It ensures specific accuracy in locating senior citizens during cases of emergency.

pp. 217-218

G1.2 09:15 *A Multiple-transfer Framework for Learning Context Models for Dynamic Smart-Home Environments*

Ching-Hu Lu (Yuan Ze University, Taiwan); Yi-Ting Chiang (Academia Sinica, Taiwan)

A real living space is dynamic in nature, which leads to various changes over time and would render a smart-home system incapable of providing reliable services. In this regard, a smart home often needs to keep context models adaptable, which may cause tremendous efforts. To reduce the efforts, a multiple-transfer framework is proposed to transfer knowledge from a source domain to a target one by reusing as much information from the source domain. This way, the efforts of model training in the target domain can be effectively reduced. The proposed framework provides flexibility of replacing its internal components to help a smart home respond to inevitable changes particularly for transferring knowledge to a new domain. Such design will improve the overall adaptability and practicality and the preliminary results also show the potentials of the framework.

pp. 219-220

G1.3 09:30 *Biased Boosting Using Weighted Template Matching for Pedestrian Detection*

Shih-Shinh Huang (National Kaohsiung First University of Science and Technology, Taiwan); Shih-Han Ku (National Kaohsiung First University of Science and Technology, Taiwan)

The main objective of this work is to alleviate this problem by imposing the matching results from a classifier based on a set of constructed weighted templates to the boosting framework. The integration of global contour templates and local HOGs is through the adjustment of the hyperplane from the support vector machine. The concept behind is to bias the hyperplane and make it consistent with the template-based classifier at each round of boosting stage.

pp. 221-222

G1.4 09:45 *Development of an Image Processing Based Sheet Music Recognition System for iOS Devices*

Bo-Ren Wang (National Kaohsiung First University of Science and Technology, Taiwan); Ching-Yung Chen (National Kaohsiung First University of Science and Technology, Taiwan)

Intelligent mobile devices with multiple sensors and technologies have been spread widely and gradually. This paper presents a sheet music recognition system that can automatically recognize and perform the musical score with a simulated piano on iOS devices. The overall music recognition system consists of three functional parts. The first part is designed to pre-process the input image of a musical

score. The major task of the second part is to segment each individual object on the musical score followed by note and pitch recognition. Finally, the recognized notes are transformed to the MIDI forms and the musical score is performed by a simulated piano. The proposed system has been implemented as an App which can be run of iOS devices.
pp. 223-224

G1.5 10:00 *Fish-eye Cameras Calibration for Vehicle Around View Monitoring System*

Cheng-Ming Huang (National Taipei University of Technology, Taiwan); Ting-Yi Yang (National Taipei University of Technology, Taiwan); Kuang-Yow Lian (National Taipei University of Technology, Taiwan); Shih-Che Chien (Chung-Shan Institute of Science and Technology, Taiwan); Min-Fong Luo (Chung-Shan Institute of Science and Technology, Taiwan)

This paper presents a camera calibration method for estimating the intrinsic parameters of fish-eye cameras which would be utilized in the vehicle around view monitoring system. A calibration pattern is devised to provide the information for calibrating all of the fish-eye cameras simultaneously. The diagonal projection is applied to extract the feature points on the calibration pattern. The lens distortion coefficient of a fish-eye camera can then be obtained based on the boundary of extracted feature blob. The camera lens principal point is evaluated by using the symmetry of the dark zones around image corners. The extracted feature points on the calibration pattern could further be utilized to generate the bird's-eye view image around vehicle.

pp. 225-226

G1.6 10:15 *An Experimental Study of MEMS-Based Magnetometers on Android Mobile Phones*

Fan-Yu Sung (University of Testing, Taiwan); Shih-Hau Fang (Yuan Ze University, Taiwan); Ying-Ren Chien (National I-Lan University, Taiwan)

In recent years, the micro-electro-mechanical systems (MEMS)-based inertial sensors fabrication technology became matured. The technology created inertial sensors greatly enhance the stability, miniature the size, and reduce the cost. Therefore, smartphones or mobile phones are embed many kinds of sensors. These sensors can provide many useful data, enabling new applications in various domain such as pedestrian navigation system, fall detection, and activity recognition. In this paper, we focus on the MEMS-based magnetometer, which can detect earth's magnetic field and guide directions. However, magnetometer is susceptible to interference resulted from ferrous material. This study presents the implementation of magnetometer's measurements on Android-based platform, observes the interference phenomenon by realistic measurements, and uses the compensation algorithms to calibrate.

pp. 227-228

10:30 - 11:00

Coffee Break 

Room: Break Area

11:00 - 12:30

H2: Mobile Computing and Networking 

Room: 201

Chair: Kuo-Yi Chen (National Formosa University, Taiwan)

H2.1 11:00 *Sensor fusion control a mobile robot with smart devices*

Liang Jhe Wei (National Formosa University, Taiwan); Kuo-Yi Chen (National Formosa University, Taiwan) with the growing of mobile devices using, it is a significant trend for every one has their own smart devices. On the hand, the using of mobile robots is also increasing in the present day, such as elder caring and natural disaster rescuing. However, the control of mobile robots usually is very complicated and hard to be programmed on a single device. Therefore, to use the smart devices which every one has to be the major device to control the mobile robots efficiently is the goal of this research

pp. 229-230

H2.2 11:15 *The analysis of wireless throughput and power consumption on Android systems*

Dai-Rong Wu (National Formosa University, Taiwan); Kuo-Yi Chen (National Formosa University, Taiwan) with the wide use of smart phones, the performance and power-saving issue is also increasing. Since the battery capacity is limited, the energy-saving technology is very important to mobile devices. In this study, we proposed an approach to observe energy consumption of smart devices, especially while smart devices are connect to a wireless hotspot with UDP protocol.

pp. 231-232

H2.3 11:30 *The Novel Falling Detection Method with G-sensors on Waist*

Shih-Chang Huang (National Formosa University, Taiwan); Li-Chang Chen (National Formosa University, Taiwan); Hsuan chia Chang (University, Taiwan); Hong-Yi Chang (National Chiayi University, Taiwan)

Accidental falling is one of the health hazards for seniors. A well falling detection mechanism can help the caregivers to save the elders in time. Falling detection technique becomes a critical factor to improve the quality of home care. Generally, the acceleration of a human's waist is smooth. Only the unstable state will generate acute acceleration. Therefore, in this paper, we installed the G-sensor in waist. We used the returned values of two installed G-sensors and the slopes of their signal measure vector to detect whether the tested man is falling or not in the sitting on the chair and standing cases. Our experimental results show that the falling can be detected when the slope of the signal measure vector rises steeply.

pp. 233-234

H2.4 11:45 *The Intelligent Pill Box - Design and Implementation*

Shih-Chang Huang (National Formosa University, Taiwan); Yu-Chen Jhu (National Formosa University, Taiwan); Hong-Yi Chang (National Chiayi University, Taiwan)

Taiwan is stepping into the aging society. Most of the elders have multiple chronic illnesses, and they use drugs to stabilize their health status. Pharmacists Association urged the family should be more concerned on medication safety of the elders. Thus, this paper designs an intelligent pill box and its back-end monitoring system. The implemented pill box can remind the elders to take medicine in time and can inform the families remotely when the elders take the medicine. The safety design of this pill box can prevent the drugs abusing. The caregivers can easily schedule the time for the elders to take medicine.

pp. 235-236

H3: Sensor in Human Body

Room: 207

Chairs: Keh-Yi Lee (Chinese Culture University, Taiwan), Min Haw Wang (Chinese Culture University, Taiwan)

H3.1 11:00 *Design of a Barcode Identification System*

Syue-Cin Lin (National Taipei University, Taiwan); Peng-Hua Wang (National Taipei University, Taiwan)

Modern barcode readers need to decode many symbologies. It is inefficient for the readers to read and decode a barcode symbol in the try-and-error manner. That is, it is inefficient to decode a given symbol by testing all symbologies supported by the reader. A more efficient decoding scheme is to identify the symbology used by the target symbol. Then the decoder in the reader uses the correct symbology for decoding. In this paper, we propose a method of identifying the QR and Aztec barcodes. We use the connected component labelling algorithm to compute the tag for each connected component, then search for the innermost connected component of the finder patterns in the tag image. Experimental results show that the method can identify rotated or de-focusing barcode images.

pp. 237-238

H3.2 11:15 *Gesture Recognition with two 3-axis Accelerometer*

Mi-Chia Hsieh (National Dong Hwa University, Taiwan); Yu-Hua Yen (National Dong Hwa University, Taiwan); Tsung-Ying Sun (National Dong Hwa University, Taiwan)

This paper is talking about using two digital accelerometers to recognition the gestures composed of thumb and forefinger. We let two accelerometers parallel, y-axis and z-axis of accelerometers toward opposite direction. Then add up two accelerations of the same axis from different accelerometer to eliminate the anti-gravitational acceleration. Integrate the pure acceleration to find the velocity and uses the curve of velocity to recognition the gestures.

pp. 239-240

H3.3 11:30 *The Evaluation of a Upper-body Movement of Kinect Motion Capture System for Rehabilitation Treatments*

Lin-sen Pon (Chinese Culture University, Taiwan); Keh-Yi Lee (Chinese Culture University, Taiwan)

In this paper, we have developed and evaluated a primitive Microsoft Kinect based physical rehabilitation therapy system for upper-body movement. It aimed the home environment for easy using without professional clinical assistance. The Microsoft Kinect is a low cost motion capture device with color, depth and skeletal sensors that promises to provide a convenient interface for the user, while maintaining the robustness and body tracking capabilities. This research explores and evaluates the potential usage and the limitation for motion capture technology of Microsoft Kinect with a personal computer for rehabilitation treatments. It turns a medical therapy into a game-based interactive process requiring no medical attachments or devices to do the rehabilitation treatment. This system is used as an input method for several stroke rehabilitation games. The developed system has several sessions that could be used to help physical rehabilitation used at normal house and it can reduce the frequency of visiting clinical office. A prototypic system has been developed for the first stage of evaluation. This protocol has successfully recognized the gesture for different treatment purposes.

pp. 241-242

H1: 3-D Image Theory and Its Applications

Room: Auditorium

Chairs: Hsia Chih-Hsien (Chinese Culture University, Taiwan), Han-Yen Tu (Chinese Culture University, Taiwan)

H1.1 11:00 *Low-Cost MCU Solution for Measuring HRV using SpO2 Sensor*

Thanh Tu Thai (National Formosa University, Taiwan); Po-Kai Lin (National Formosa University, Taiwan); Chi-Chia Sun (National Formosa University, Taiwan); Kuo Wen-Kai (National Formosa University, Taiwan); Ya-Wen Yang (National Taiwan University Hospital Yunlin Branch, Taiwan); Hui-Kai Su (National Formosa University, Taiwan)

In this paper, a low-cost Heart Beat Variability (HRV) analyzer base on the principle of Photoplethysmography (PPG) is presented on an ultra-low power MCU platform. It is a non-invasive method of measuring the variation in blood volume in tissues using a light source and a detector. Base on the blood variation, the proposed HRV device will be able to calculate the heart beat rate, level of oxygenation and HRV data. In emergency, the specific information will be send back to the ICU center through the 3G-WCDMA interface, where caregivers can further analyze it and determine treatment methods.

pp. 243-244

H1.2 11:15 *DIBR with Content-Adaptive Filtering for 3D View*

Che-Wei Liu (Tamkang University, Taiwan); Shao-En Li (Tamkang University, Taiwan); Jia-Liang Syu (Tamkang University, Taiwan); Hsin-Ting Li (Tamkang University, Taiwan); Wei-Han Cheng (Tamkang University, Taiwan); Hsia Chih-Hsien (Chinese Culture University, Taiwan); Jen-Shiun Chiang (Tamkang University, Taiwan)

Depth Image Based Rendering (DIBR) is a well-known process for producing 3D views, which can synthesize a virtual view from images and their associated depth information. However, in an image owing to the abrupt change of the scene, the depth image may change rapidly to make the converting view have holes with different sizes and directions, and subsequently it affects qualities of the 3D view and may take more time for hole-filling. This paper presents a content-adaptive filtering technique to modify the depth map. A preprocessing that applies respective filter to different sizes and directions of holes is used to achieve the optimization of the depth map. As results, this method not only improves the 3D view quality and maintains the texture information, but also reduces the number of holes and the computing time on hole-filling.

pp. 245-246

H1.3 11:30 *Vehicle Verification Using Generalized Gaussian Distribution Feature Descriptor*

Jing-Ming Guo (National Taiwan University of Science and Technology, Taiwan); Hsia Chih-Hsien (Chinese Culture University, Taiwan)

A new feature descriptor based on the statistical modeling of wavelet output is proposed for vehicle verification problem. The Generalized Gaussian Distribution (GGD) offers accurate statistical fitting for the real and imaginary part of Gabor and Dual-Tree Complex Wavelet Transform (DT-CWT) output. Consequently, the descriptor is simply composed from the GGD parameters of Gabor and DT-CWT output by means of Maximum Likelihood Estimation (MLE) approach under GGD assumption. Experimental result shows that the proposed feature descriptor outperforms the former existing method in the vehicle verification using SVM classifier.

pp. 247-248

H1.4 11:45 *Compression for fringe-projection-based three-dimensional object reconstruction*

Han-Yen Tu (Chinese Culture University, Taiwan); Ching Hsieh (Chinese Culture University, Taiwan); Ching Li (Chinese Culture University, Taiwan)

We present the results of lifting-based wavelet analysis to the compression of fringe projection patterns for three-dimensional object reconstruction. Experimental results verified that the proposed encoding scheme can compress these projected patterns more efficient storage and transmission for 3D object reconstruction and preserve three-dimensional shape information well compared with conventional wavelet image coding schemes.

pp. 249-250

H1.5 12:00 *Design and Implementation of a Bluetooth Air Finger Mouse*

Hui-Kai Su (National Formosa University, Taiwan); Hua-Yi Wu (National Formosa University, Taiwan); Jian-Yi Wu (National Formosa University, Taiwan); Ting-Wei Nian (National Formosa University, Taiwan); Chien-Min Wu (NanHua University, Taiwan); Chi-Chia Sun (National Formosa University, Taiwan)

With the trends of more and more new technology emerging, smart products, such as smart phones and tablet PCs, have become daily necessities. They bring a convenient life for people. The development of new technologies not only improves the performance of system hardware and software continuously, but also impacts the evolution of machine user interface. From keyboard control to touch operation, the users' operation habit is changed. However, in order to integrate into humans' life, this paper design and implement a bluetooth air finger mouse, that uses 3D image recognition and emulate a bluetooth mouse to any computer device. The issue of small body movement detection is improved. The bluetooth air finger mouse is approached by system software and hardware. It provides a convenient and intuitional operation interface. Users can use his finger to control any computer devices that are compatible with a normal bluetooth mouse. In the future, the air finger mouse technology should be extend to more novel and creative applications.

pp. 251-252