Program for 2016 IEEE International Conference on Consumer Electronics (ICCE)

Friday, January 8

18:30-20:30
Welcome Reception

Saturday, January 9

08:30-09:00
Breakfast

09:00-09:30
Opening Address: Honorable Oscar Goodman (Las Vegas Mayor Emeritus), Gary Shapiro (President of CTA)

09:30-10:30
Keynote 1: Peter Hoddie (Marvell Semiconductor): Programming for the IoT

10:30-11:00
Break

11:00-12:40
Tutorial 1: Lee Stogner: Mobile Power
IT01 - Design and Repair
CT01A: Devices in the Internet of Me
CT02A: Devices in the Internet of Me
CT04A: Security and Privacy in the Internet of Me
CT08A: RF & Wireless Technologies
RT01A: RF & Wireless Technologies
RT02A: RF & Wireless Technologies
RT03A: AV Systems, Image/Video
RT04A: Automotive Electronics and
RT06A: Health and Wellness
RT07A: Energy Management

12:40-13:30
Lunch

13:30-14:30
KeyNote: Scott Jenson, Product Manager, Google, “Building the Physical Web Together”

14:30-16:10
Mini Technology Time Machine Special
IT02 - Imaging Applications
CT02A: Devices in the Internet of Me
RT03A: AV Systems, Image/Video
RT04A: Automotive Electronics and
Program for 2016 IEEE International Conference on Consumer Electronics (ICCE) [2016 ICCE]

Sunday, January 10

08:30-09:00
Breakfast

Keynote 2,
Petronel Bigioi (Fotonation):
Mobile computer vision and computational photography

10:00-10:30
Break and Poster Session

10:30-12:10
Tutorial 3 -
Elie Track:
Rebooting Computing

Tutorial 4 -
Xiaoyu Sun
(Sabic): CE

Lunch/Ibuka Award:
Steven Sasson

Martin G. Kienzle, Ph.D,
IBM IoT Research Division,
"Using Cognitive Technologies in Internet-of-Things Solutions"

12:10-13:10
13:10-14:10
14:10-15:50
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<th>Time</th>
<th>Session</th>
<th>Materials</th>
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<th>Processing</th>
<th>Technologies</th>
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<td>Break and Poster Session</td>
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<td>16:20-18:00</td>
<td>Panel Discussion: &quot;Internet of Things&quot; (Soumya Kanti Datta from Eurocom)</td>
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<td>IT06 - Ultra High Definition Video</td>
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<td>16:20-18:00</td>
<td>CT03B: Infrastructure and Enabling Technologies of the Internet of Me</td>
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<td>RT05B: Sensors, MEMS and Enabling Technologies</td>
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<td>RT02B: Entertainment, Game &amp; Services</td>
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**Monday, January 11**

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<td>09:00-10:00</td>
<td>Keynote 3: Ariel Garten (InteraXon) Tim Mullen (Sytrogi): Brain Computer Interface: Present and Future</td>
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<td>10:00-10:30</td>
<td>Break</td>
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<td>10:30-12:10</td>
<td>Tutorial 5: Brian Zahnstecher (PowerRox): Power-Driven Consumer Market Disruption</td>
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<td>CT01C: Services in the Internet of Me</td>
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<td>RT08B: Other CE Related Innovations and Applications</td>
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<td>13:20-14:10</td>
<td>Awards Luncheon</td>
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<td>14:10-15:50</td>
<td>Tutorial 6: Patrice Roulet (ImmerVision): Create, share and experience in 360° - the Privacy and Personal</td>
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<td>IT08 - Privacy and Network</td>
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<td>RT07C: Energy Management</td>
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Program for 2016 IEEE International Conference on Consumer Electronics (ICCE) [2016 ICCE]

Saturday, January 9

Friday, January 8, 18:30 - 20:30
Welcome Reception Go To Top
Room: N258/N260

Saturday, January 9, 08:30 - 09:00
Breakfast Go To Top
Room: N255/257/259

Saturday, January 9, 09:00 - 09:30
Opening Address: Honorable Oscar Goodman (Las Vegas Mayor Emeritus), Gary Shapiro (President of CTA) Go To Top
Room: N255/257/259
Chairs: Stuart Lipoff (IEEE & ICCE, USA), Francisco J. Bellido Outeiriño (University of Córdoba, Spain)

Saturday, January 9, 09:30 - 10:30
Keynote 1: Peter Hoddie (Marvell Semiconductor): Programming for the IoT Go To Top
Room: N255/257/259
Chair: Richard Doherty (The Envisioneering Group, USA)
Saturday, January 9, 10:30 - 11:00

Break

Room: Hall Area

Saturday, January 9, 11:00 - 12:40

CT01A: Services in the Internet of Me

Room: N256
Chair: Soumya Kanti Datta (EURECOM & Co-Founder, Future Tech Lab, France)

11:00  **Top-view People Detection Based on Multiple Subarea Pose Models for Smart Home System**
Wang Han and Dubok Park (Korea University, Korea); K. Han David (Office of Naval Research, USA); Hanseok Ko (Korea University, Korea)
In this paper, an effective top-view people detection algorithm based on multiple subarea models is proposed for smart home system.

11:20  **Thumbnail-based Interaction Method for Interactive Video in Multi-Screen Environment**
Ui Nyoung Yoon, Seung Hyun Ko, Kyeong-Jin Oh and Geun-Sik Jo (Inha University, Korea)
Many people use mobile device to obtain more information about TV contents while watching TV. However, current methods are not efficient for users. In this paper, a thumbnail-based interaction method for interactive video and user interface are proposed to provide user interaction in personal view in multi-screen environment.

11:40  **Home Outlet and LED Array Lamp Controlled by a Smartphone with a Hand Gesture Recognition**
Chi-Huang Hung and Y. W. Bai (Fu Jen Catholic University, Taiwan); Hsu Yao Wu (Fu-Jen Catholic University, Taiwan)
In this paper, we design a home outlet and a LED array lamp controlled by hand gesture recognition with a smartphone. This design incorporates an LED array lamp as the home outlet used to control both the on/off function and the dimming function.

12:00  **Design of 3D Action Camera System with Automatic Vergence Control (AVC) Module**
Sung geun Yoo (Seoul Natl. University of Science and Technology, Korea); Sang-II Park (Korea Communications Commission, Korea); Youngwha Lee (Wasol Co., Ltd., Korea); Sojeong Yoon (Seoul National University of Science & Technology, Korea); Yumi Eom (Seoul National University of Science and Technology, Korea)
With the proposed system, normal 2D action camera is converted to 3D action camera. The outcome of 3D videos have natural depth perception delivering more realistic features. The videos taken by this camera is directly linked to Virtual Reality (VR) Head-Mounted Display (HMD) and 3D TV.

CT04A: Security and Privacy in the Internet of Me

Room: N261
Chair: Scott L Linfoot (MASS, United Kingdom)

11:00  **Black Networks for Bluetooth Low Energy**
Shaibal Chakrabarty (US-Ignite, USA); Daniel W Engels (Southern Methodist University, USA)
We present Black Networks for Bluetooth Low Energy (BLE), to secure the Internet of Things (IoT). The meta-data in BLE Packet Data Units (PDUs) can be used for IoT passive and active attacks. Black Networks encrypt the meta-data and the payload, using AES-EAX mode, resulting in a BLE-compatible PDU.

11:20  **Proxy Re-encryption Schemes for IoT and Crowd Sensing**
Daniel Díaz-Sánchez (Universidad Carlos III de Madrid, Spain); R. Simon Sherratt (University of Reading, United Kingdom); Patricia Arias and Florina Almenares (Universidad Carlos III de Madrid, Spain); Andrés Marín López (University Carlos III of Madrid, Spain)
IoT, crowd sensing and smart cities will be a traffic challenge. New communication paradigms as asynchronous messaging, carry and forward, scheduled delivery and temporary storage will be needed to manage network resources dynamically. Since traditional end to end security will require keeping security...
associations among devices for a long time draining valuable resources, we propose and evaluate the use of proxy re-encryption protocols in these scenarios as a solution for reliable and flexible security.

11:40 **Distributed Access Control and Privacy for the Internet of Me**
Daniel Díaz-Sánchez (Universidad Carlos III de Madrid, Spain); R. Simon Sherratt (University of Reading, United Kingdom); Florina Almenares and Patricia Arias (Universidad Carlos III de Madrid, Spain); Andrés Marín López (University Carlos III of Madrid, Spain)
This article presents an experimental scalable message driven IoT and its security architecture based on Decentralized Information Flow Control. The system uses a gateway that exports SoA (REST) interfaces to the internet simplifying external applications whereas uses DIFC and asynchronous messaging within the home environment.

12:00 **My Brain is My Passport. Verify Me**
Amanda S Danko and Gabriel C Fernandez (USAA, USA)
Biometrics secure consumer electronics while decreasing the responsibility of the user. However, most authenticate based upon static characteristics such as voice patterns or fingerprints, rather than dynamic qualities such as brainwaves. This work evaluates the efficacy of existing consumer-level EEG devices for authentication, enumerating implementation requirements of future consumer solutions.

**IT01 - Design and Repair**

Room: N254
Chair: Takako Nonaka (Shonan Institute of Technology, Japan)

11:00 **"Making the Future" with New and Emerging Innovations WORKSHOP**
Kathy Grise (IEEE, USA)
Predicting & making the future: a challenge and desire. Workshop demonstrates interplay and intersections among Big Data, IoT, Rebooting Computing, and Digital Senses. Emphasis on practical applications, its implementations. Invited SMEs will comment on current and past implementations, focus on predictions of future and potential implications to the consumer.

11:20 **Methods and Apparatuses for Drying Electronic Devices**
Reuben Zielinski (Redux LLC & Roundroom, USA)
The proliferation of smart devices and portable, wireless wearable technology has exploded in the last decade. Consumers are more apt to subject them to unintended water perils. Methods and apparatuses are described herein to remove water completely from electronic devices in a fast yet convenient manner.

11:40 **Simulation of Serpentine Trace of DQ PCB Layout for DDR3 Applications**
Baekseok Ko (Korea University & Samsung Electronics, Korea); Kihun Oh (Samsung Electronics, Korea); Chankeun Kwon (Korea University, France); Soo-Won Kim (Korea University, Korea)
This paper presents an analysis of a simulated serpentine signal line for a DDR3 memory interface. Data serpentine line is simulated using an EM tool and DOE analysis. And the weight of a serpentine structure is quantified by comparing it with the other factors of PCB routing.

12:00 **PerfEPI: Parallel Performance Estimation with Effective Progress Index**
Youngsam Shin (SAIT Samsung Electronics, Korea); Won-Jong Lee (SAIT, SAMSUNG Electronics, Korea); Seok Joong Hwang and Soojung Ryu (Samsung Advanced Institute of Technology, Korea)
In this paper, we propose a novel design methodology with parallel performance estimator
Daniel Rother, Florian Jackisch and Jan Zoellner (TU Braunschweig, Germany)

The performance of SDR applications is hard to predict. Therefore, we develop a generic framework for evaluating the SDR performance. The framework supports several metrics, e.g. time or throughput, and can be used to automatically determine and use the best available implementation of an algorithm on a given platform.

11:40 **Field Experiments of Dual-Polarized MIMO-OFDM Transmission Using Non-Uniform Constellations**
Takuya Shitomi, Susumu Saito, Shingo Asakura, Akihiko Satou, Masahiro Okano and Kenichi Tsuchida (Japan Broadcasting Corporation, Japan)

We have been researching a transmission system that uses ultra-multilevel OFDM and dual-polarized MIMO for 8K Super Hi-Vision terrestrial broadcasting. We implemented Non-Uniform Constellations (NUCs) on a prototype MIMO-OFDM modulator and demodulator. We confirmed that the 4096-NUCs improved the required C/N by about 1 dB compared to a conventional constellation.

12:00 **Improving of Channel Estimation Scheme in Mobile Reception of OFDM**
Akira Nakamura (Tokyo University of Science, Japan); Kohei Ohno (Meiji University, Japan); Makoto Itami (Tokyo University of Science, Japan)

In this paper, the improvement scheme of the channel estimation in mobile reception OFDM (Orthogonal Frequency Division Multiplexing) is proposed. In the proposed scheme, the iterative channel estimation is adopted. As the results, the proposed scheme can improve the reception characteristics and the accuracy of channel estimation.

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**RT06A: Health and Wellness Go To Top**

Room: N264
Chairs: Narisa Chu (CWLab International, USA), Reinhard Moeller (University of Wuppertal, Germany)

11:00 **A Novel Computer Vision Based E-Rehabilitation System: From Gaming to Therapy Support**
Lucio Ciabattoni (Università Politecnica delle Marche, Italy); Francesco Ferracuti (Polytechnic University of Marche, Italy); Sabrina Iarlori (Università Politecnica delle Marche, Italy); Sauro Longhi (Università Politecnica delle Marche, Italy); Luca Romeo (Università Politecnica delle Marche, Italy)

We propose a novel e-rehabilitation system based on a commercial RGB-D device. Differently from exergaming approaches, clinical objectives scores of each specific body part involved in the exercise are computed. Patients performances are sent to the physiotherapists in order to support and improve decisions and therapies.

11:20 **A Real-Time Mobile Emergency Assistance System for Helping Deaf-Mute People/ Elderly Singletons**
Liang-Bi Chen (BXB Electronics Co., Ltd. & National Sun Yat-Sen University, Taiwan); Chia-Wei Tsai (Thriving Inc. & Shu-Te University, Taiwan); Wan-Jung Chang (Southern Taiwan University of Science and Technology, Taiwan); Yuh-Ming Cheng (Shu-Te University, Taiwan); Katherine Shu-Min Li (National Sun Yat-Sen University, Taiwan)

This paper presents an emergency assistance system for helping deaf-mute people/elderly singletons, called iHelp, which is a real-time emergency reporting App. in smart phone. The proposed system not only assists deaf-mute people/elderly singletons in the shortest possible time to report, the report also uses SMS intimate to achieve offline report.

11:40 **Movement Noise Cancellation in PPG Signals**
Dahee Ban and Sungoh Kwon (University of Ulsan, Korea)

In this paper, we propose an algorithm to remove movement noise in PPG signals. To that end, we use the multipath diversity of PPG signals and the wavelet transform. When PPG signals have movement noise for 30% of the time, the proposed algorithm can reduce that noise to 5.18%.

12:00 **An Wearable Device Platform for the Estimation of Sleep Quality Using Simultaneously Motion Tracking and Pulse Oximetry**
Dong Jin Choi, Moon Sik Choi and Soon Ju Kang (Kyungpook National University, Korea)

We propose a wearable device platform that utilizes motion tracking to determine the user's status and measures oxygen saturation depending on the status.

12:20 **Blindness Support Using a 3D Sound System Based on a Proximity Sensor**
Ibraheem Abdul-salam, Jong Rhee and Se Mog Kim (Myongji University, Korea)

An approach that requires inexpensive geometrical arrangements of a couple of proximity-based ultrasonic sensors to create a field around the blind person. This method also fits many designs and is flexible enough to use within a normal daily environment.

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**Tutorial 1: Lee Stogner: Mobile Power Go To Top**
Saturday, January 9, 12:40 - 13:30

Lunch

Saturday, January 9, 13:30 - 14:30

KeyNote: Scott Jenson, Product Manager, Google, "Building the Physical Web Together"

Saturday, January 9, 14:30 - 16:10

Mini Technology Time Machine - Special Session

CT02A: Devices in the Internet of Me

14:30 Image Retargeting for Wearable Devices
Jwalant Bhatt (Nirma University, India); Deepiti Pappusetty and Hari Kalva (Florida Atlantic University, USA); Mehul R Naik (Nirma University, India)
This paper reports new approaches to image retargeting for wearable devices. Key to the proposed approach is identifying and presenting regions of interest that allows users to comprehend content and context. The system was evaluated on Android watches and subjective evaluation of the proposed approach shows improved user experience.

14:50 Performance and Energy Efficient Dynamic Voltage and Frequency Scaling Scheme for Multicore Embedded System
Yen-Lin Chen, Ming-Feng Chang, Wen-Yew Liang and Chao-Hsien Lee (National Taipei University of Technology, Taiwan)
His paper proposes a multicore DVFS method that predicts the best voltage/frequency setting for the embedded system. A smart adjustment mechanism for performance is also provided to users under various performance requirements.

15:10 Blind User Wearable Audio Assistance for Indoor Navigation Based on Visual Markers and Ultrasonic Obstacle Detection
Walter Charles Sousa Seiffert Simões (UFAM - Universidade Federal do Amazonas, Brazil); Vicente Ferreira Lucena Junior (CETELI, Brazil)
This paper presents an indoor navigation wearable system as audio assistant based on visual markers recognition and ultrasonic obstacles perception of blind people. Visual markers identify the interest points in the environment. A map lists these points and indicates the distance and direction between closer points, building a virtual path.

15:30 A Configurable Web Browser for Heterogeneous Consumer Devices
Kavitha Devara, Sungwon Han and Honguk Woo (Samsung Electronics, Korea)
While web is definitely ubiquitous and content rich today, it becomes difficult to maintain web browsing experiences with much satisfaction and consistency
across various consumer devices due to their inherent resource heterogeneity. In this paper, we present a configurable web browser which consumer devices of dissimilar specifications can cost-effectively embed.

15:50 **Design and Implementation of a Universal Smart Energy Management Gateway Based on the Internet of Things Platform**
Chao-Hsien Lee (National Taipei University of Technology, Taiwan); Ying Hsun Lai (Institute for Information Industry, Taiwan)
An energy management cloud called In-snergy can collect home consumption usage and support remote control home appliances. In order to increase the interoperability, this paper proposes a universal smart energy management gateway based on an open-source IoT platform called Iotivity. Therefore, the In-snergy can be extended to manage Iotivity-compatible devices.

**IT02 - Imaging Applications**

Room: N254
Chair: Bill Orner (GoPro, USA)

14:30 **High Performance Deep Neural Network on Low Cost Mobile GPU**
Pei-Kuei Tsung, Sung-Fang Tsai, Alex Pai, Shu-Jen Lai and Chienping Lu (MediaTek, Taiwan)
The multi-layer characteristic in DNN makes the huge computational complexity and power consumption requirement. In this paper, a mobile-GPU-accelerated DNN flow is proposed. 58x speed up comparing with pure CPU solution is achieved. Furthermore, comparing with the state-of-the-art GPU accelerators/libraries, the proposed scheme provides a 226%~1000% higher computing efficiency.

14:50 **Tile Binning and Rendering for Resolution Independent Graphics**
Jeong-Joon Yoo (Samsung Advanced Institute of Technology & Samsung Electronics, Korea); Jaedon Lee (Samsung, Korea); Sundeepr Krishnadasan (Samsung Electronics, SRI-Bangalore-GPU, India); Won-Jong Lee (SAIT, SAMSUNG Electronics, Korea); John Brothers (Samsung Electronics, SRA-Silicon Valley, USA); Soojung Ryu (Samsung Advanced Institute of Technology, Korea)
In this paper, we present an efficient resolution independent rendering algorithm. To do so, we propose tile binning and rendering algorithm which is suitable to use on mobile. Experimental comparisons show that our scheme reduces not only most of memory I/O but also 50% of computations.

15:10 **A Robust and Real-Time Image Based Lane Departure Warning System**
Prashanth Viswanath (Texas Instruments, India); Pramod Swami (Texas Instruments India Pvt Ltd, India)
Lane departure warning (LDW) systems have gained a lot of interest over the last few years. EuroNCAP regulations mandate European car makers to have LDW system to get star rating. In this paper, we propose a simple image-based implementation of LDW system optimized for the Texas Instruments (TI) C66x DSP.

15:30 **Boot Time Optimization Techniques for Automotive Rear View Camera Systems**
Yogesh Marathe, Kedar Chitnis and Rishabh Garg (Texas Instruments India Pvt Ltd, India)
Boot time optimization is crucial in order to improve subtle user experience & driver safety in automotive. The paper focuses methods applied on Rear View Camera System (RVCS) to achieve less than half a second boot time. Fast boot feature is a unique selling proposition for RVCS.

15:50 **Energy-Efficient Batch Scheduling for Background Network Services in Mobile Devices**
Minho Ju (Samsung Electronics Co., Ltd., Korea); Hyeonggyu Kim and Soontae Kim (KAIST, Korea)
Indiscreet uses of background network services in mobile devices increase the energy consumption because of the state machine changes of wireless networks and low utilization of the idle state. We propose a method to reduce the energy consumption using a batch scheduler, which controls the trigger time of background services.

**RT03A: AV Systems, Image/Video Processing**

Room: N261
Chair: Wen-Chung Kao (National Taiwan Normal University, Taiwan)

14:30 **Human Face 3D Reconstruction with Handheld Single 2D Camera on Mobile Devices**
Alexander Limonov, Jae-Yun Jeong, Minsoo Kim, Sungjin Kim and Yonggyoo Kim (Samsung Electronics, Korea)
We propose an efficient and convenient system for 3D reconstruction of human face using monocular 2D camera. Using this algorithm, we can create a complete 3D face model that can be directly used for 3D printing or VR within 40 sec in currently commercialized smartphones.

14:50  **Hybrid Write Buffer Algorithm for Improving Performance and Endurance of NAND Flash Storages**
Se Jun Han, Dong Hyun Kang and Young Ik Eom (Sungkyunkwan University, Korea)
In this paper, we propose a novel buffering algorithm for write buffer, comprised of DRAM and NVM, in NAND flash storages of the home cloud server. As adopting dirty first migration and clean page caching technique, we got improved performances and lifetime of storage system of the home cloud server.

15:10  **Error Resilience Aware Motion Estimation and Mode Selection for HEVC Video Transmission**
Gosala Kulupana, Dumidu S. Talagala, Hemantha Kodikara Arachchi and Anil Fernando (University of Surrey, United Kingdom)
Error concealment techniques such as motion copying require significant changes to HEVC (High Efficiency Video Coding) motion estimation process when incorporated in error resilience frameworks. This paper demonstrates a novel motion estimation mechanism incorporating the concealment impact from future coding frames to achieve an average 0.73 dB gain over the state-of-the-art.

15:30  **A Novel Method to Generate the Ghost-Free Wide Dynamic Range Image**
Seok-Jae Kang, Dae-Hong Lee and Seo-Won Ji (Korea University, Korea); Chae-Sung Kim (Samsung Electronics, Korea); Sung-Jea Ko (Korea University, Korea)
In order to generate the ghost-free HDR-like LDR image, this paper presents a method which can effectively detect and process the motion region by using the structural similarity in the co-located local region of multiple LDR images.

**RT04A: Automotive Electronics and Entertainment**  [Go To Top]

Room: N262
Chair: Carsten Dolar (Robert Bosch GmbH, Germany)

14:30  **Indoor Visible Light Positioning System with Multipath Reflection Analysis**
Wenjun Gu and Mohammadreza Aminikashani (The Pennsylvania State University, USA); Mohsen Kavehrad (The Pennsylvania State University -- University Park, USA)
Multipath-induced dispersion is one of the major concerns for complex indoor environments affecting the positioning accuracy. This paper investigates the impact of multipath reflections numerically on the visible light positioning systems. Power distribution is first calculated, then the positioning accuracy in terms of root mean square (RMS) error is analyzed.

14:50  **Korean LVCSR System Development for Personal Assistant Service**
Taeyoon Kim (Samsung Electronics, Korea); Chang Woo Han and Sangha Kim (Samsung Electronics Co. Ltd, Korea); Donghoon Ahn (DMC R&D Center, Samsung Electronics, Korea); Seo-kyeong Jeong (Samsung Electronics, Korea); Jaewon Lee (Samsung Electronics Co. Ltd, Korea)
This paper describes Korean automatic speech recognition (ASR) system for personal assistant service in mobile phone. Methods are presented for building baseline model and its optimization for noise robust acoustic modeling and contextual language modeling. Proposed system achieved the performance suitable for consumer product in mobile phone.

15:10  **Smart Advisor: Real-time Information Provider with Mobile Augmented Reality**
Seungho Chae and Yoonsik Yang (Yonsei University, seoul, Korea); Heeseung Choi and Ig-Jae Kim (Korea Institute of Science and Technology, Korea); Junghyun Byun, Jiyooon Jo and Tack-Don Han (Yonsei University, seoul, Korea)
This paper presents a mobile-based real-time information providing system with augmented reality, called Smart Advisor. Smart Advisor can make users' life convenient by informing necessary information and actions in advance by recognizing and tracking the interest object captured by the camera in mobile devices.

15:30  **Android4Auto: a Proposal for Integration of Android in Vehicle Infotainment Systems**
Branimir Kovacevic and Marko Kovacevic (Faculty of Technical Sciences, University of Novi Sad, Serbia); Tomislav Maruna and Davor Rapic (RT-RK Computer Based Systems LLC, Serbia)
This paper presents a proposal for integration of Android into vehicle infotainment systems. Proposed system offers infotainment functionality, while enabling users to use the device as a regular Android device. Proposal includes a specification of a Java API that should be used to access in-vehicle related content from Android applications.
RT07A: Energy Management

Room: N264
Chair: Jose-Maria Flores-Arias (University of Cordoba, Spain)

14:30 Data-Driven State-of-health Estimation of Ev Batteries Using Fatigue Features
Sangdo Park, Gae-won You and Duk-jin Oh (Samsung Advanced Institute of Technology, Korea)
Estimating SOH for EV batteries is the most crucial to determine replacement time of the battery or to calculate driving mileage. However, partial charge and discharge of current loads in EV make estimation error increase. We present a data-driven method for BMS to estimate the SOH reflecting battery stress pattern.

14:50 A Digitally Assisted Technique to Improve Rectifier Efficiency in Wireless Energy Harvesting Systems
Kamyar Keikhosravy and Pouya Kamalinejad (University of British Columbia, Canada); David Harkness (recon Instruments Inc., Canada); Hamid Abdollahi (Recon Instruments, Canada); Shahriar Mirabbasi (University of British Columbia, Canada)
This paper presents a efficiency enhanced rectifier for wireless energy harvesting (WEH) systems. A prototype of the proposed technique is implemented with discrete components and a microcontroller. Measurement results verify the performance of the approach for small input levels which corresponds to a WEH system operating over a long range.

15:10 A Flyback Driver with Adaptive Switching Frequency Control for Smart Lighting
Chua-Chin Wang, Zong-You Hou and Teng-Wei Huang (National Sun Yat-Sen University, Taiwan)
A novel flyback light emitting diode (LED) driver with adaptive switching frequency for smart lighting is proposed in this investigation. Switching loss and severe harmonic distortion of conventional flyback LED drivers when the LED is operating in high switching frequency and high voltage are resolved.

15:30 Cost-Effective Instrumentation Via NILM to Support a Residential Energy Management System
Ali Adabi, Pavlo Manovi and Patrick Mantey (University of California Santa Cruz, USA)
Research in NILM requires a cost-effective sensor system with fast sampling and significant precision, leading to a cost-effective system for residential applications. A system has been described providing a powerful and flexible platform, supporting user configuration of sampling rates up to 65kHz and amplitude resolution up to 24 bits.

15:50 Photovoltaic Energy Sharing System in a Multifamily Residential House to Reduce Total Energy Costs
Jinsoo Han, Moonok Choi and Il-Woo Lee (ETRI, Korea); Sang-Ha Kim (Chungnam National University, Korea)
This paper describes a photovoltaic (PV) energy sharing system in a multifamily house. The community-shared PV system is connected to each home, monitors each home's energy use, and assigns more energy to a large energy-consuming home. Under increasing block tariffs, this architecture contributes to reducing total energy costs.

Sunday, January 10

Saturday, January 9, 16:10 - 16:40

Break and Poster Session - 1

Room: Hall Area
Chair: Bingo Wing-Kuen Ling (Guangzhou, P.R. China)

16:10 Interoperability Optimization and Service Enhancement in Vehicle Onboard Infortainment Systems
Bernard Fong (Automotive Parts and Accessory Systems R&D Centre, New Zealand); Chup-Chung Wong (University of Warwick & Hong Kong Productivity Council, Hong Kong); Acm Fong (University of Glasgow, Singapore)
This paper presents an overview on optimizing interoperability between different applications for enhanced return-on-investment through utilization of business intelligence in conjunction with prognostics and health management methodology. Such implementation is particularly suitable for deployment in mass-produced vehicle onboard diagnostics system.
16:11 **Design and Implementation of Personal ICT Asset Management Service Based on Smart Power Socket**
Byeongkwan Kang, Myeong-in Choi, Seonki Jeon, Yongkwen Hwang and Sehyun Park (Chung-Ang University, Korea)
As the numbers of ICT assets consumers own are increasing, consumers have problems managing and maintaining their personal ICT assets. To solve these problems, the personal ICT Asset management service is proposed. The proposed service transfers invisible data into visible data using smart power sockets and a service platform.

16:12 **NuriPet: A Smart Pet Feeding Machine for SNS**
Ji Yong Jung (Samsung Electronics Co. & Korea Advanced Institute of Science and Technology(KAIST), Korea); Chul-Min Ji (Korea Advanced Institute of Science and Technology(KAIST) & KEPCO KDN Co., Korea); Joo-Rak Sohn and Hong-Jae Meng (Korea Advanced Institute of Science and Technology(KAIST) & LG Electronics Co., Korea); Byung-Sun Hwang (Korea Advanced Institute of Science and Technology(KAIST), Korea)
We are proposing a new way for pets to post on social media networks, where pets post by pressing a pedal. For pets to post, we create a pet feeder with a camera, pedal, and internet connection. This will make our lives more convenient and make sharing and reminiscing easier.

16:13 **H.721: Standard for Multimedia Terminal Devices Supporting HEVC**
Fernando Matsubara (Mitsubishi Electric Corporation, Japan); Hideki Yamamoto (Oki, Japan)
The newest ITU-T H.721 standard "IPTV terminal devices: Basic model" is described. Main goal of this revision is to enhance content quality by adopting latest video coding and adaptive streaming techniques. Selected technologies include HEVC and MPEG-DASH. This paper summarizes the standard and carefully chosen profiles to maximize perceived quality.

16:15 **Ontology-based Intelligent Home Assistance System**
Ji-In Nam, Pawan Nagwani, Sae-Bom Jang, Young-Bin Shin and Ho Jin (Samsung Electronics, Korea)
This text describes a new framework for an ontology based intelligent home assistance system with the aim of facilitating action planning to meet user's intended actions. The ontologies structure the knowledge on which user's decision making process is reliant to help the system in interpreting the user's intentions properly.

16:16 **The Practical Power Supply Design Method for the Display Panel of Smartphone**
Yun Chuleun (Samsung Electronic. LTD & Korea University, Korea); Baekseok Ko (Korea University & Samsung Electronics, Korea); Chankeun Kwon (Korea University, France); Soo-Won Kim (Korea University, Korea)
This paper introduces a practical power supply design method for the display panel of smartphone. The specific goal of this design method is to reduce the voltage stress over the internal MOSFET of the power supply.

16:17 **IoT Based Indoor Personal Comfort Levels Monitoring**
Lucio Ciabattoni (Università Politecnica delle Marche, Italy); Francesco Ferracuti (Polytechnic University of Marche, Italy); Gianluca Ippoliti and Sauro Longhi (Università Politecnica delle Marche, Italy); Giacomo Turri (Università Politecnica delle Marche, Italy)
We present a low-cost IoT based system able to monitor acoustic, olfactory, visual and thermal comfort levels. The system is provided with different ambient sensors, computing, control and connectivity features. The integration of the device with a smartwatch makes it possible the analysis of the personal comfort parameters.

16:19 **Staring Classification Using Deep Belief Networks**
Hyun Sung Park and Wontaek Chung (POSTECH, Korea); Dai-Jin Kim (Postech, Korea)
We propose the gaze classification using Deep Belief Networks for consumer electronics. This method classifies whether the user stares at the camera or not. Target devices of the proposed method are digital cameras, web cameras, and especially mobile devices such as a smart phone and a tablet PC.

16:20 **MinT: Middleware for Cooperative Interactions of Things**
Soobin Jeon, Chungsan Lee and Youngtak Han (Kangwon National University, Korea); Dongmahn Seo (Catholic University of Daegu, Korea); Inbum Jung (Kangwon National University, Korea)
This paper proposes an integrated middleware platform providing a development environment to use numerous types of sensors and network devices. Using proposed API, developers can easily develop IoT Application. Furthermore, they operate not only most of IoT device platform low and high process but also two or more network protocols.

16:21 **A New Digital Face Makeup Method**
Jae-Yoon Lee and Hang-Bong Kang (The Catholic University of Korea, Korea)
This paper proposes a new method for the application of makeup on the eyes, face, and lips based on several makeup examples. We created two Gaussian weight maps to generate the effect of natural skin makeup. Because on complicated calculation is involved in our method, our makeup results are natural.

16:23 **Non-Parametric Human Segmentation Using Support Vector Machine**
Kyuuwon Kim (Yonsei University & Samsung Electronics, Korea); Changjae Oh and Kwanghoon Sohn (Yonsei University, Korea)

Human segmentation is an important task in digital cameras. In this study, we present a framework of non-parametric human segmentation based on SVM. By exploiting spatial and color features of training images, the framework achieves noticeably better human segmentation results than GrabCut in terms of the overlap ratio with ground-truth.

16:24 **An Implementation of Web-RTC Based Audio/Video Conferencing System on Virtualized Cloud**
Sunghyun Yoon (ETRI, Korea); Taehaum Na (Electronics and Telecommunications Research Institute, Korea); Ho Yong Ryu (ETRI, Korea)
Audio/video conferencing system have been increasing due to enhancement of work productivity and deduction of expenditure. We implemented a web-RTC-based audio/video conferencing system on virtualized cloud. Through this system, users can experience audio/video conference with only web browser. Also this system provides flexible capabilities through the elastic resources management.

16:25 **Investigation and Design of Distributed Subarray SIMO (DS-SIMO) Microstrip Antenna System with SPDT-T/R Switch for Consumer Receiving Diversity Applications**
Yasser M. Madany (IEEE, Senior Member, Alexandria University, Egypt); Hassan El Kamchouchi and Ashraf Ahmed (Alexandria University, Egypt)
Analysis and design of DS-SIMO microstrip antenna system with SPDT-T/R switch has been introduced and investigated. The final proposed design has been fabricated and the measured S-parameters of the proposed structure can be analyzed with network analyzer to demonstrate the performance to meet the requirements for consumer receiving diversity applications.

16:26 **An Autonomous Information Device with E-Paper Display for Personal Environments**
Diego Sánchez De Rivera, Ramon Alcarria and Diego Martín de Andres (Universidad Politecnica de Madrid, Spain); Borja Bordel Sanchez (UPM, Spain); Tomás Robles (Technical University of Madrid, Spain)
We propose an autonomous wireless device with e-paper display and low-energy communication for information requirements in personal environments. A commercial hardware platform is used and an additional PCB designed to achieve a power saving strategy. To detect existing devices and transmit images a distributor node is defined and implemented.

16:28 **Performance Improvement of Speaker Recognition by MCE-Based Score Fusion**
Jihoon Kang, Youngil Kim and Sangbae Jeong (Gyeongsang National University, Korea)
This paper proposes an improved feature extraction in glottal flow signals and minimum classification error-based fusion of multiple feature scores to improve speaker recognition accuracy. Experimental results show that the proposed score fusion method with the improved feature extraction in glottal flow signals outperforms conventional speaker recognition methods.

16:29 **A Downhill Simplex Approach for HEVC Error Concealment in Wireless IP Networks**
Kyoungho Choi (Mokpo National University, Korea); Do Hyun Kim (ETRI, Korea)
In this paper, a novel video error concealment algorithm is presented for HEVC in wireless IP networks. In the proposed approach, a downhill simplex approach is adopted for fine-tuning motion vectors, considering residual errors and block reliability, and minimizing boundary errors along prediction blocks at the same time.

16:30 **Sound Event Classification with Feature Vector Combination for Automatic Audio-based Surveillance**
Seunghyung Lee and Jinuk Park (Korea Institute of Science And Technology, Korea); Sangjun Park (KAIST, Korea); Minsoo Hahn (Korea Institute of Science And Technology, Korea)
This paper deals with the sound event classification for automatic audio-based surveillance. To improve the performance, we proposed a feature vector combination scheme. The performance is evaluated by using the combination of three segment-based features. The result shows significant amount of improvement compare to the conventional method.

16:32 **Cluster-based Voice Activity Detection for Mobile Devices**
Sangjun Park, Seunghyung Lee, Jinuk Park and Minsoo Hahn (Korea Institute of Science And Technology, Korea)
A voice activity detection in mobile environments is not performed well due to arbitrary noises. In this paper, a robust voice activity detection framework for mobile devices is proposed. The unsupervised clustering and discriminative weight training of each cluster is employed to model various characteristics of arbitrary noises.

JiHak Yu (Korea University & Samsung Electronics co Ltd, Korea); Min Ki Park (Korea University & Mando Company, Korea); Soo-Won Kim (Korea University, Korea)
A new time-to-digital converter for the time-of-flight measurement architecture using a cyclic method and time amplifier with three level conversions is proposed. The proposed TDC has been simulated in a 65-nm CMOS process. The input range is over 1μ, and the minimum time resolution is 2ps.

16:34 **Supporting Self-tuning Application Development for Smart Devices**
Jeong-Si Kim (Electronics and Telecommunications Research Institute, Korea); Young-Joo Kim and YungJoon Jung (ETRI, Korea)

Recently self-adaptive computing has been considered as a valuable technique to address the demand of automatically achieving performance goals for smart device applications. This paper presents a development tool for self-adaptive applications on smart devices. The key value of this tool is enabling developer to find optimal observation points automatically.

16:36 **A Hybrid Malware Detecting Scheme for Mobile Android Applications**
Yu Liu, Yichi Zhang and Haibin Li (Tianjin University, P.R. China); Xu Chen (Oakland University, P.R. China)
This paper proposes a static-dynamic hybrid malware detecting scheme for Android. The suggested methods can deliver an unknown App to static or dynamic analysis process according to whether it can be decompiled. The experimental results show the suggested scheme is effective as its detection accuracy can achieve to 93.33 – 99.28%.

16:37 **A New Current Balancing Circuit for Multiple AC-Loads of Flat Panel Display and Lighting Devices**
JaeJung Yun (Daegu University, Korea); Yong-Kyu Park (LG Display, Korea); Sungwoo Bae (Yeungnam University, Korea)
This paper presents a new balancing circuit for multiple AC-loads connected in parallel. The proposed circuit, which consists of BJTs and diodes, can balance the current of each AC-load. The simulation results show that the proposed circuit reduced the maximum current deviation among the multiple AC-loads from 18% to 0.6%.

16:38 **Real-Time Web-Based System for Remote Monitoring of Automatic Test Execution on Set-Top Boxes**
Sebastian Novak (RT-RK Computer Based Systems LLC, Serbia); Nenad Cetic (, Yugoslavia (defunct)); Dejan Stefanovic (RT-RK, Serbia)
Active exploitation of the previously proposed Set Top Box testing framework has given rise to new requirements such as remote monitoring of test execution. The system described in this paper is web-based and receives periodic updates of each registered test station, thus being a real-time web application.

**Saturday, January 9, 16:40 - 18:00**

**CT03A: Infrastructure and Enabling Technologies of the Internet of Me**

Room: N256
Chair: Peter Corcoran (National University of Ireland, Galway & National University of Ireland Galway, Ireland)

16:40 **FFS: A Fast Peer-to-Peer File Sharing Approach for Mobile Devices**
Jaewon Cho (Samsung Electronics Co., Ltd, Korea); Sungwon Kang (KAIST, Korea)
With the emergence of mobile devices and the rapid growth in mobile networks, file sharing became a common activity. In this paper, we propose FFS, a fast file sharing approach for peer-to-peer file sharing. FFS overcomes network limitations through a hybrid approach of NAT traversal techniques.

17:00 **Context Based Service Discovery in Unmanaged Networks Using mDNS/DNS-SD**
Milosh Stolikj (Eindhoven University of Technology, The Netherlands); Pieter Cuijpers (Technische Universiteit Eindhoven, The Netherlands); Johan J. Lukkien and Nina Buchina (Eindhoven University of Technology, The Netherlands)
We propose an extension of the mDNS/DNS-SD service discovery protocol, which enables service clients to discover and select services based on their context. The extension improves scalability in large networks, which is of particular importance in future Internet of Things deployments.

17:20 **S-Beacon: Next Generation BLE Beacon Solution for Enhanced Personalization**
Dojun Byun (Samsung Electronics, Korea); Jaewoon Cho and Sang Jun Moon (Samsung Electronics Co., Ltd., Korea); Dohy Hong (Samsung Electronics, Korea)
We introduce next generation Bluetooth Low Energy (BLE) Beacon solution called S-Beacon that opens a new business opportunity by globally interconnecting smartphone users with next generation personalization services.

17:40 **Beyond Stream Processing - a Distributed Vision Architecture for the Internet of Things**
Peter Corcoran (National University of Ireland, Galway & National University of Ireland Galway, Ireland)
The internal architecture of today's smartphone cameras is modified to process images 'at-the-edge', generating scene metadata and image primitives with much lower bandwidth than streaming video. This enables a distributed, multi-camera environment adaptable to new use-cases and new categories of computer vision applications 'at-the-edge' of the Internet.

**IT03- Artificial Reality and Digital Senses**

Go To Top
16:40 **UWB Localization Modeling for Electronic Gaming**
Yang Zheng and Yuzhang Zang (Worcester Polytechnic Institute, USA)
In this paper, we introduce results of empirical measurement and modeling of the statistics of localization error in a typical indoor motion gaming scenario. Both time of arrival (TOA) and received signal strength (RSS) estimations are modeled, and the multipath dispersion, human body influence and bandwidth effects are analyzed.

17:00 **Selective Multi-Sample Anti-Aliasing for Mobile Vector Graphics**
Jaedon Lee (Samsung, Korea); Jeong-Joon Yoo (Samsung Advanced Institute of Technology & Samsung Electronics, Korea); Soojung Ryu and Jeongwook Kim (Samsung Advanced Institute of Technology, Korea)
We have proposed the efficient anti-aliasing algorithm for mobile vector graphics. Our algorithm does multi-sampling selectively. We can find the multi-sampling pixel by pixel-primitive intersection test. For optimization, we have proposed the pixel block and the hierarchical sampling. Our method is 29.4 times faster than the original 16× MSAA.

17:20 **Internet of Things as Enabler of Digital Senses**
Soumya Kanti Datta (EURECOM & Co-Founder, Future Tech Lab, France); Yu Yuan (Cate Global Corp., P.R. China); Thomas Coughlin (Coughlin Associates, USA)
This paper presents a visionary concept on how the IoT could act as Digital Senses Initiative (DSI) enabling technology. We attempt to fuel some thoughts on how digital senses benefit from uniform metadata exchange, low power communication protocol, automatic management, semantic reasoning and actuation based IoT technologies.

17:40 **Embedding Physical Objects in Web Apps on Consumer Devices**
Honguk Woo (Samsung Electronics, Korea); Ming Jin (Samsung Electronics Co., Ltd., Korea); Kichul Park (Samsung Electronics, Korea)
In this paper, we present a web framework for supporting the web programming model over heterogeneous IoT infrastructures. The principle of the framework is consumer-centric where end-users and application developers have the illusion of a unified, federated, and secured resource pool of not only regular web resources but physical objects.

**RT03B: AV Systems, Image/Video Processing**
Room: N261
Chair: Fernando Pescador (Universidad Politécnica de Madrid, Spain)

16:40 **Evaluation and Simplification of Objective Estimation for the Quality of HDR Images**
Hirofumi Takano, Naoyuki Awano and Kenji Sugiyama (Seikei University, Japan)
Quality estimation of high dynamic range (HDR) images are studied. To consider human perception, we proposed an objective estimation method based on the actual brightness. We used 2D filter on an FFT for spatial frequency weighting. Also, we propose more simplified method without FFT/IFFT is discussed.

17:00 **Interpolation Using Hybrid Wavelet Transform and Discrete Cosine Transform for Display Device**
Ramesh Lama (Chosun univ., Korea); Goo-Rak Kwon (Chosun University, Korea); Moo-Rak Choi (LG Electronics, Korea); Seokjoo Shin and Moonsoo Kang (Chosun University, Korea)
We propose a new interpolation method based on the hybrid technique combining the discrete wavelet transform (DWT) and discrete cosine transform (DCT). The high frequency wavelet coefficients are interpolated using the zeropad method in DCT domain. The upscaled image is generated using inverse DWT of interpolated coefficients and original image.

17:20 **Multiview Synthesis Based on Hole Restoration Using Similar Pattern Distribution of Disparity**
Yang-Ho Cho (Samsung Electronics Co., Ltd., Korea); Dongkyung Nam (Advanced Media Lab, SAIT, Samsung Electronics, Korea)
Autostereoscopic 3D Display needs multi-view to cover wide viewing angle without wearing the glasses. We propose multi-view synthesis method based on hole restoration using similar pattern distribution(SPD) of each disparity level. The SPD is used as a referenced searching position for inpainting the hole.

17:40 **Request Adaptation for Adaptive Streaming Over HTTP/2**
Duc V. Nguyen (The University of Aizu, Japan); Hung Thai Le (University of Aizu, Japan); Pham Nam (Hanoi University of Science and Technology & School of...
Electronics and Telecoms, Vietnam); Anh T. Pham and Truong Cong Thang (The University of Aizu, Japan)
In this paper, we propose an adaptation method for Adaptive Streaming over HTTP/2 leveraging server push feature. Experiment results show that the proposed method can improve the tradeoff between the number of requests and buffer stability compared to existing methods.

RT05A: Sensors, MEMS and Enabling Technologies

Room: N262
Chair: Scott L Linfoot (MASS, United Kingdom)

16:40 **OFDM and TDM Based Sensing Method for Large Projected Mutual-Capacitance Touch Screens**
Mohamed Gamal Ahmed Mohamed (Chungbuk National University & Minia University, Korea); Ahmed Nabil Ragheb (Chungbuk National University, Korea); Hossam Hassan (Chungbuk National University & MSIS Lab, Korea); HyungWon Kim (Chungbuk National University & College of Electrical and Computer Engineering, Korea)
This paper presents a technique for scanning mutual capacitance touch screens. It resembles touch screen as communication system. Orthogonal frequency division multiplexing OFDM is used in addition with time division multiplexing TDM to read out all channels (cells) of touch screen panel.

17:00 **A New Approach to Mapping Software to Coprocessor Circuits**
Nils Potthoff, Carsten Gremzow, Christoph Brandau and Dietmar Tutsch (University of Wuppertal, Germany)
It is beneficial to use digital circuits for data processing. Mobile devices can reduce their power consumption. This paper presents a new approach to use software descriptions to build a macroscopic circuit structure. As an example for digital signal processing the mpeg2 decoder reference implementation was transformed.

17:20 **Efficient Segmentation for Multi-frame Iris Acquisition on Smartphones**
Shejin Thavalengal (National University of Ireland, Galway & FotoNation, Ireland); Petronel Bigioi (FotoNation & National University of Ireland, Galway, Ireland); Peter Corcoran (National University of Ireland, Galway & National University of Ireland Galway, Ireland)
An iris segmentation technique, optimized for relatively low-quality images acquired with smartphone visible-near infrared cameras is presented. This technique is based on 1-D processing of the eye image and doesn't employ shape fitting. It is computationally efficient and enables multiple iris images to be extracted sequentially at native frame rates.

17:40 **Social Media Mediation System for Elderly People**
Toru Kobayashi and Kazushige Katsuragi (Nagasaki University, Japan)
We propose a Social Media Mediation System which can be used for interactive communication between elderly people and younger generation via existed social media. This system was implemented on a single board computer which equips simple I/O devices and network access function to exchange social media information through voice.

18:00 **Vision Based Wearable Eye-Gaze Tracking System**
Cheng-Lung Jen (HTC, Taiwan); Yen-Lin Chen, You-Jie Lin and Chao-Hsien Lee (National Taipei University of Technology, Taiwan); Augustine Tsai and Meng-Tsan Li (Institute for Information Industry, Taiwan)
This paper proposes a wearable eye-gaze tracking system with a single webcam mounted on the glasses. Hough circle is used to search the candidate of circles in the eye's ROI. We use particle filter to deal with the disturbance of eye center position induced by different lighting condition and noise.

RT08A: Other CE related innovations and applications

Room: N264
Chair: Shingo Yamaguchi (Yamaguchi University, Japan)

16:40 **Design and Implementation of Intermediate Frequency Control and Tuning System (IFCTS) for Machine-To-Machine (M2M) Communication Applications**
Yasser M. Madany (IEEE, Senior Member, Alexandria University, Egypt)
In this paper, an intermediate frequency control and tuning system (IFCTS) has been introduced, designed and implemented. The proposed IFCTS practical design has been tested and its measurements have been demonstrated to show the excellent performance and reliability to access multiple devices and meet
the requirements for M2M communication applications.

**17:00**  
*HD-CCTV System with Extended Transmission Distance for Smart Surveillance System*  
Sungwon Hong (Kyungpook National University, Korea); Byung-Min Min (4NSYS Co. Ltd., Korea); Dong Seog Han (Kyungpook National University, Korea)

In this paper, CCTV transmission system called ER-SDI is proposed to improve the transmission distance while preserving the quality. The current standard of HD-SDI has the maximum transmission distance of 200m. The proposed ER-SDI provides a transmission distance of 518m. Its required transmission bandwidth is only 337.5MHz for coaxial cables.

**17:20**  
*A Mobile Robot Which Can Follow and Lead Human by Detecting User Location and Behavior with Wearable Devices*  
Jae Geun Lee, Min Su Kim, Tae Min Hwang and Soon Ju Kang (Kyungpook National University, Korea)

A mobile robot that can detect human’s location and behavior for following and leading human is proposed with the use of low frequency, radio frequency communication, various sensors and wearable devices.

**17:40**  
*Complete Hardware and Software Bench for the CAN Bus*  
Jose-Maria Flores-Arias (University of Cordoba, Spain); Manuel A. Ortiz López and Francisco J. Quiles Latorre (University of Córdoba, Spain); Víctor Pallarés-López (University of Cordoba & Electronics and Electronic Technology Area, Spain); Aihou Chen (University of Cordoba, Spain)

This paper explains an application aiming to reduce the cost for testing cars. Through the CAN bus our proposal can read the message sent by the car’s control unit, then record, analyze and represent it. The proposed system has been designed, implemented and tested and some experimental results are shown.

**Tutorial 2: Mark Sargent (VP at CTIA): Wireless Evolution - A 5G Tutorial**

Mark Sargent, Vice President of Certification Programs at CTIA  
Room: N253

This tutorial introduces the evolution of various wireless air interface generations - 1G/2G/3G/4G/5G with some qualitative and quantitative characteristics. It provides the current status of LTE along with its market drivers. It continues with the description of 5G requirements followed by identification of a few necessary elements to meet these requirements. It concludes with the timeframe projections of 5G wireless Standards along with some use cases.

**Saturday, January 9, 18:30 - 21:30**

**Young Professionals Event**

Room: N255/257/259  
Chair: Carsten Dolar (Robert Bosch GmbH, Germany)

**Sunday, January 10, 08:30 - 09:00**

**Breakfast**

Room: N255/257/259

**Sunday, January 10, 09:00 - 10:00**

**Keynote 2, PetronelBigioi(Fotonation): Mobile computer vision and computational photography**

Room: N255/257/259  
Chair: Peter Corcoran (National University of Ireland, Galway & National University of Ireland Galway, Ireland)
Sunday, January 10, 10:00 - 10:30

Break and Poster Session - 2

Room: Hall Area
Chair: Bingo Wing-Kuen Ling (Guangzhou, P.R. China)

10:00 **Image Quality Metric System for Color Filter Array Evaluation**
   Tae-Wuk Bae and Hwi-Gang Kim (Electronics and Telecommunications Research Institute, Korea); Steven Lansel (Olympus, USA); Munenori Fukunishi (Olympus, Japan); Wen Lu (Xidian University, P.R. China); Joyce Farrell and Brian Wandell (Stanford Univ, USA)
   This paper describes image quality metrics for quantitatively evaluating color filter arrays. It includes proposed metrics such as moire robustness and subjective preference, as well as the existing metrics such as CIELAB, spatial CIELAB, structure similarity, and MTF50.

10:01 **New Compression Distortion Oriented Stereo Video Quality Assessment Method**
   Hong Zhu, Mei Yu, Yang Song and Gangyi Jiang (Ningbo University, P.R. China)
   Based on feature analysis of video compression distortion, a new stereo video quality assessment method is proposed from temporal characteristics of video and binocular perception in this paper. Experimental results show that the proposed method is quite efficient, and its evaluating results are more consistent with subjective perception.

10:02 **Human Height Analysis Using Multiple Uncalibrated Cameras**
   Jaehoon Jung, Hyun-tae Kim, InHye Yoon and Joonki Paik (Chung-Ang University, Korea)
   This paper presents a human feature retrieval algorithm using multiple uncalibrated cameras. The proposed human height analysis algorithm consists of three steps: i) line extraction from the background, ii) estimation of the vanishing points using the extracted lines, and iii) camera calibration for human height estimation.

10:04 **Flicker-free Low-light Video Enhancement Using Patch-Similarity and Adaptive Accumulation**
   Seungyong Ko, Soohwan Yu, Wonseok Kang, Donggyun Kim and Joonki Paik (Chung-Ang University, Korea)
   In order to remove the unnatural artifacts such as flicker effects, this paper presents a flicker-free low-light video enhancement method using patch-similarity and adaptive accumulation. In experimental results, the proposed method can better improve the video frames without flicker effects than existing enhancement methods.

10:05 **A New Reduced-Reference Stereo Image Quality Assessment Model**
   Kaihui Zheng, Mei Yu and Gangyi Jiang (Ningbo University, P.R. China)
   Considering the processing of binocular perception in viewing stereo image, we present a reduced-reference stereo image quality assessment model based on binocular visual perceptual characteristics. Experimental results show that the proposed model has high correlation with the subjective scores and represent human stereo visual properties effectively.

10:07 **Power Consumption Comparison Between H.265/HEVC and H.264/AVC for Smartphone Based on Wi-Fi, 3G and 4G Networks**
   Min Xu (California State University, Long Beach, USA); Xiaojian Cong (California State University Long Beach, USA); Qinhua Zhao (California State University Long Beach, USA); Hen-Geul Yeh (California State University Long Beach, USA)
   The H.265/HEVC can help reduce much bandwidth for streaming video on mobile networks where wireless spectrum is at a premium. However, it will take more computing power for decoding. This paper is to perform a power consumption evaluation of streaming and decoding H.265/HEVC and H.264/AVC video for Smartphones.

10:08 **Robust Feature Detection Using Particle Keypoints and Its Application to Video Stabilization in a Consumer Handheld Camera**
   Semi Jeon (Chungang University, Korea); InHye Yoon (Chung-Ang University, Korea); Seungji Yang, Bongmo Kim and Jisung Kim (SK Telecom, Korea); Joonki Paik (Chung-Ang University, Korea)
   Compact, portable digital cameras have been popular to consumers. This paper presents a robust feature detection algorithm by redefining important feature points using particle keypoints, and applies the proposed feature detection algorithm for video stabilization.

10:09 **Two-Stage Adaptive Noise Reduction System for Broadcasting Multicopters**
   Sojeong Yoon (Seoul National University of Science & Technology, Korea); Sang-II Park (Korea Communications Commission, Korea); Sung geun Yoo (Seoul Natl. University of Science and Technology, Korea)
   The related studies of sound capturing in the multicopter had not research much. To extend the previous paper in ICCE 2015, this paper proposes two
methods using adaptive filtering and pitch shifting. Therefore, it fulfills the main purpose of capturing a high quality sound.

10:11 **Decoding of Main 4:2:2 10-bit Bitstreams in HEVC Main 8-bit Best-Effort Decoders**
Woo-Seok Jeong, Hyunmin Jung and Soo-ik Chae (Seoul National University, Korea)
This paper describes a new method of best-effort decoding that substantially reduces PSNR loss especially in intra prediction. For intra prediction in the decoder, reference pixels are decoded in the 4:2:2 10-bit format and non-reference pixels are in the 4:2:0 8-bit format.

10:12 **Evaluation System of Adaptive Temporal Aperture Control for OLED Displays**
Takenobu Usui, Hiroto Sato, Yoshimichi Takano, Keiji Ishii and Toshiihiro Yamamoto (NHK Science & Technology Research Laboratories, Japan)
We previously proposed an adaptive temporal aperture control method and confirmed that better motion image quality and longer lifetimes were obtained through simulation. We therefore developed evaluation system of adaptive temporal aperture control for OLED displays and confirmed that the proposed method is effective to improve motion image quality.

10:14 **Cross-Layer QoE Prediction for Mobile Video Based on Random Neural Networks**
Emad Danish (University of Surrey, United Kingdom); Mohammed Alreshoodi (University of Essex, United Kingdom); Anil Fernando (Center for Communications Research. University of Surrey, United Kingdom); Sami Alharthi (University of Essex, United Kingdom); Bander Alzahrani (King Abdulaziz University, Saudi Arabia)
Based on random neural networks, a cross-layer prediction model is proposed for estimating the perceptual quality of mobile video in no reference mode. The model exploits key parameters affecting video quality. Simulation results show considerable predictability performance with R-squared correlation of 0.90 and 0.39 root mean squared error.

10:15 **A New Scene Change Detection Method of Compressed and Decompressed Domain for UHD Video Systems**
Yumi Eom (Seoul National University of Science and Technology, Korea); Sang-Il Park (Korea Communications Commission, Korea); Chung Chang Woo (Seoul Natl. University of Science and Technology, Korea)
We propose a new method using two layers that can detect the scene change frames in a fast and accurate way. Also, we propose an algorithm that can be applied to the HEVC. Through the experimental results, our proposed method will helps UHD video contents analysis and indexing.

10:16 **Dynamic Gamma Correction Algorithm Using Content-Based Analysis for Display Systems**
Yeong-Kang Lai and Shu-Ming Lee (National Chung Hsing University, Taiwan); Thomas Schumann (Hochschule Darmstadt-University of Applied Sciences, Germany)
In this paper, we propose an improved dynamic gamma correction method to enhance contrast and image quality for Liquid Crystal Displays (LCD) with Multi-Phosphor White Light Emitting Diodes (MPW LED). And, the proposed gamma correction method uses content-based analysis to reduce computational complexity.

10:18 **Bitrate and Complexity Optimizations for Video Conferencing Systems**
Prashant Laddha and Senthil Prakash Ramalingam (Cisco Systems, India)
In video conferencing, encoder and camera being part of same system, can interact with each other to make better informed encoding decisions and control camera image processing to suit encoding needs. We propose multiple techniques to reduce bitrate and encoder complexity using camera-encoder interactions to achieve significant gains.

10:19 **Push-content Delivery Method for Accurate Synchronization Between Broadcast Programs and Push Content**
So Tanaka, Satoshi Nishimura and Yosuke Endo (Japan Broadcasting Corporation, Japan)
We developed a push-content delivery method for integrated broadcasts on the Internet. To provide services that are highly synchronized between the broadcast programs and push content, we propose a new push-content delivery method that enables simultaneous reception of push content on all terminals.

10:21 **Functional Evaluation of Hybrid Content Delivery Using MPEG Media Transport**
Yuki Kawamura (NHK Science & Technology Research Laboratories & Japan Broadcasting Corporation, Japan); Kazuhiro Otsuki (NHK Science & Technology Research Laboratories, Japan); Akinori Hashimoto (NHK Science and Technical Research Laboratories, Japan); Yosuke Endo (Japan Broadcasting Corporation, Japan)
In MMT-based broadcasting systems, a common encapsulation format and UTC-based media synchronous mechanisms promote hybrid channel use of broadcast and broadband. We have developed an MMT receiver, which can process multiview programs with synchronized media presentation and targeted advertising with seamless switching of videos.

10:22 **Determining Bitrate Requirement for UHD Video Content Delivery**
Fujun Xie (University of British Columbia, Canada); Mahsa T Pourazad (TELUS Communications Company, Canada); Panos Nasiopoulos (The University of British Columbia, Canada); Jim Slevinsky (TELUS Communications, Canada)
Our objective is to identify the appropriate bitrate for transmission of Ultra High Definition (UHD) content with different complexity levels and frame rates. We
compressed several UHD videos at different bitrate levels and evaluated their quality subjectively. Results revealed that 3.5-5.6 Mbps is appropriate for transmitting high quality UHD content.

**10:23 A QR Code Based Highly Secure Covert Communication**
Saif alZahir (UNBC, Canada)
We present secure QR guided message technique for covert communications. We use the binary values of the QR code that contains the message to steer the repositioning of some singular values of the wavelet coefficients of an image to represent the message. Results of 2,761 images show 100% efficiency.

**10:25 Improvement of H.265/HEVC Encoding for 8K UHDTV by Detecting Motion Complexity**
Shota Orihashi (Waseda University & Graduate School of Fundamental Science and Engineering, Japan); Harada Rintaro (Waseda University & Fundamental Science and Engineering, Japan); Yasutaka Matsuo (Japan Broadcasting Corporation (NHK), Japan); Jiro Katto (Waseda University, Japan)
We propose a method to improve H.265/HEVC encoding performance for 8K UHDTV moving pictures by detecting amount or complexity of object motions. The proposed method estimates motion complexity by external process, and selects an optimal prediction mode and search ranges of motion vectors for highly efficient and low computation encoding.

**10:26 Wireless Biosensing Network for Drivers’ Health Monitoring**
Acm Fong (University of Glasgow, Singapore); Charlie Chan (Automotive Parts and Accessory Systems R&D Centre, Hong Kong); Bernard Fong (Automotive Parts and Accessory Systems R&D Centre, New Zealand)
Biosensors integrated into the vehicle controller area network are used for detecting symptoms such as anxiety, pain, and fatigue that may affect driving safety. The proposed system provides a flexible options for implementation in a diverse range of mass-produced automotive accessories without affecting the driver's movement.

**10:28 Optimization of Resonant Inductive Links for Wireless Power Transfer**
Hyeonseok Hwang and Byeonghak Jo (Korea University, Korea); Jun il Moon (Korea University & ASIC, Korea); Chankeun Kwon (Korea University, France); Baekseok Ko (Korea University & Samsung Electronics, Korea); Soo-Won Kim (Korea University, Korea)
A shunt-series mixed resonant coupled structure for the wireless power transfer is proposed. If the coils are designed to have proper inductance values, the power transfer efficiency depending on distance has proportional relation only to the shunt capacitors. It enables that the proposed structure facilitates tracking the maximum efficiency.

**10:29 QoE-enabled Efficient Resource Allocation for H.264 Video Streaming Over WiMAX**
Mohammed Alreshoodi (University of Essex, United Kingdom); Emad Danish (University of Surrey, United Kingdom); John Woods (University of Essex, United Kingdom); Anil Fernando (Center for Communications Research. University of Surrey, United Kingdom); Fawaz Alarfaj (University of Essex, United Kingdom)
A power and bandwidth efficient resource allocation approach considering consumer’s Quality of Experience (QoE) in the context of mobile video streaming is presented. Online QoE is estimated using Fuzzy Inference Systems. Compared to Quality of Service (QoS)-based techniques, the proposed QoE-enabled approach offers considerable saving in bandwidth and power.

**Sunday, January 10, 10:30 - 12:10**

**CT01B: Services in the Internet of Me**

Go To Top

Room: N256
Chair: Soumya Kanti Datta (EURECOM & Co-Founder, Future Tech Lab, France)

**10:30 Design and Implementation of Intelligent Finger-Aware System for User-Centric Service in IoT Environment**
Tacklim Lee and Sang-uk Park (Chung-Ang University, Korea); SeongMan Jang (University of Chung-Ang, Korea); Soono Seo and Sehyun Park (Chung-Ang University, Korea)
Internet of Things is one of the future technology. It is available to provide customized services. Although IoT devices have many advantages, weak people are difficult using IoT devices directly. This paper proposes intelligent finger-aware system, it provides service to improve accessibility of IoT devices for weak people.

**10:50 Battery Lifetime Performances of Radiofrequency Systems Using the ISO Standard KNX-RF Multi and Bluetooth Low Energy for Home Automation Applications**
Salma Oudji (University of Limoges, France); Stanis Courrèges and Jean-Noël Paillard (HAGER CONTROLS, France); Vahid Meghdadi (University of Limoges,
The paper presents simulation tools to determine battery lifetimes of different products for a complete RF standard home automation system based on KNX and Bluetooth Low Energy. 2D and 3D results allow studying various parameters of these RF protocols and the performances of the used radio chips.

**11:10 An Adaptive Residential Energy Management Scheme in the Smart Home**

Liang-Bi Chen (BXB Electronics Co., Ltd. & National Sun Yat-Sen University, Taiwan); Meng-Kang Chiang, Chia-Lun Liu and Katherine Shu-Min Li (National Sun Yat-Sen University, Taiwan); Jing-Jou Tang (Southern Taiwan University of Science and Technology, Taiwan)

This paper presents an adaptive residential renewable energy management scheme considering end-users' life style to optimize electricity consumption including renewable resources in the smart homes. The proposed scheme generates smart residential power schedules dynamically according to the real-time stock of renewable resources and user-specific life style in home energy management.

**11:30 Construction of Environment for the Evaluation of the Subjectivity of Brightness Suitable for Indoor Activities**

Kenji Okamoto, Masaya Ishikawa and Takayuki Misu (Kanagawa Institute of Technology, Japan); Masao Ishihiki (Kanagawa Institute of Technology and Keio University, Japan)

Many studies have been made on side-window lighting systems which use motorized blinds to effectively utilize sunlight. Conventional side-window lighting or lighting control systems using evaluation indices are often unsuitable for household use. We propose a side-window lighting system for stable optimization of brightness required for at-home studying and relaxing.

**11:50 Smart Parking System for Internet of Things**

Chungsan Lee, Youngtak Han and Soobin Jeon (Kangwon National University, Korea); Dongmahn Seo (Catholic University of Daegu, Korea); Inbum Jung (Kangwon National University, Korea)

This paper propose smart parking system enables vehicle location service. Based on the ultrasonic and the magnetic sensor, the proposed system accurately detects vehicle in indoor and outdoor parking fields. The USIM ID and wireless sensor motes support vehicle location service in parking lots using Bluetooth communication.

**IT04 - Human Machine Interfaces**

**10:30 Estimation of Wrist Angle Using EMG and Hand Movement Direction**

Hiroyuki Motoyama and Tsuyoshi Inoue (Panasonic Corporation, Japan); Jun Ozawa (Panasonic, Japan)

We developed a prototype of 16-channel electrodes band and a wrist angle estimation method. The EMG recorded from wrist and a direction of hand movement were used. The result show that the error rate of the estimated angle was decreased by 15.97% compared to the method which uses only EMG.

**10:50 Real-time Personalized Facial Expression Recognition System Based on Deep Learning**

Injae Lee (ETRI, Korea); Heechul Jung (KAIST, Korea); Chung Hyun Ahn (Electronics and Telecommunications Research Institute, Korea); Jeongil Seo (Electronics and Telecommunications Research Institute, Korea); Junmo Kim (KAIST, Korea); Oh-Seok Kwon (Chungnam National University, Korea)

We proposed the real-time personalized facial expression recognition system based on deep learning. It recognized the facial expression of remote users for smart TV environment using a webcam. It recognized 6 primary emotions and 3 secondary emotions. The experimental results show that the proposed method achieves high accuracy.

**11:10 Development of a Reliable SSVEP-Based BCI Mobile Dialing System**

Chen Tsan Yu, Chih-Wei Feng and Wai-Chi Fang (National Chiao Tung University, Taiwan)

This paper demonstrates a high performance brain-computer interface that allows users to dial phone numbers. The system is based on Canonical Correlation Analysis (CCA) and Steady-State Visual Evoked Potential (SSVEP). Through six frequency bands displayed on the screen, subjects can choose a phone number by gazing at the display interface.

**11:30 A Distant Signal Pick-Up System for Audio Recording with a Constant Background-Noise Level**

Akihiko K. Sugiyama (NEC Corporation, Japan); Ryoji Miyahara (NEC Engineering Ltd., Japan)

This paper proposes a distant signal pick-up (DSPU) system with a constant background-noise level. The input signal is separated into a target signal and background noise. They are applied different gains so that only the target signal is scaled by the processing gain and the noise power is kept unchanged.

**11:50 Type-C: Applications and User Benefits**

Kay Annamalai (Pericom Semiconductor, USA)
USB connectivity is ubiquitous in almost every electronic gadget, from notebooks to smart phones, to storage. As connectivity speeds are becoming increasingly faster while gadgets are becoming smaller, there is a dire need for universal connectivity that is simpler and easier to use and scalable to higher bandwidths. This need has been met with the recent proliferation of Type-C connectivity for USB interfaces.

**RT02A: Entertainment, Game & Services**

**Room:** N262  
**Chair:** Dietmar Hepper (Technicolor, Germany)

10:30 **Efficient Implementation of BCH Decoders on GPU for Flash Memory Devices Using iBMA**
Arul Subbiah (Santa Clara University & Avago Technologies, USA); Tokunbo Ogunfunmi (Santa Clara University, USA)
Recent development and popularity of Flash Memory requires efficient error correction technique on its eco system, which includes gaming systems and mobile platforms. We have addressed an efficient method to decode and correct errors using the parallel computing technique, employed by the Graphical Processing Unit (GPU).

10:50 **3-D Perception Enhancement in Autostereoscopic TV by Depth Cue for 3-D Model Interaction**
Yi-Ting Shen (National Taiwan University, Taiwan); Guan-Lin Liu (Nation Taiwan University, Taiwan); Sih-Sian Wu and Liang-Gee Chen (DSP/IC Design Lab., National Taiwan University, Taiwan)
Autostereoscopic TV provides users 3-D experience without wearing glasses. In this paper, some depth cues were added into the proposed system. It is shown that the viewers can perceive the 3-D models twice as much as the conventional one. A 3-D interaction system was built with the proposed framework.

11:10 **Acoustic Distance Rendering for the Application of Internet-based Mobile Virtual Reality Games**
Yonghyun Baek, Taegyu Lee and Young-cheol Park (Yonsei University, Korea)
In this paper, we propose a low-complexity acoustic distance rendering (ADR) algorithm useful for the internet-based mobile virtual reality (VR) game. The proposed algorithm approximates the binaural distance variation function (DVF) transforming the far-field HRTFs to near-field ones.

11:30 **Software-based Single-node Multi-GPU Systems for Multiple Display Environments**
Junghan Kim, Inhyeok Kim, Taehyoung Kim and Young Ik Eom (Yonsei University, Korea)
We suggest a novel multi-GPU scheme that can provide flexible interconnections between multi-GPUs and displays with no additional hardware by implementing new soft-ware features, while avoiding system overhead. Our proposed scheme offers the complete concept of windowing system and GPU driver for single-node multi-GPU system on multiple display environments.

**RT03C: AV Systems, Image/Video Processing**

**Room:** N261  
**Chair:** Bingo Wing-Kuen Ling (Guangzhou, P.R. China)

10:30 **Positional Ternary Pattern (PTP): An Edge Based Image Descriptor for Human Age Recognition**
Md. Tauhid Iqbal, Byungyong Ryu, Gihun Song and Oksam Chae (Kyung Hee University, Korea)
This paper presents a new edge based local feature descriptor, for age group recognition, named Positional Ternary Pattern (PTP). PTP code inherits the craniofacial shape, along with wrinkle and micro texture pattern, which proves its preeminence in aging process.

10:50 **Evaluation of Q-Learning Approach for HTTP Adaptive Streaming**
Virginia Martin, Julián Cabrera and Narciso Garcia (Universidad Politécnica de Madrid, Spain)
We propose a Q-Learning-based algorithm for an HTTP Adaptive Streaming (HAS) Client that maximizes the perceived quality, taking into account the relation...
between the estimated bandwidth and the qualities and penalizing the freezes. The results will show that it produces an optimal control as other approaches do, but keeping the adaptiveness.

11:10 **Hierarchical Motion Estimation for Targeted Content and Beyond**  
Dietmar Hepper (Technicolor, Germany)  
Inserting content in video sequences requires defining points marking the insertion area in a frame and tracking them in forward and backward directions. A hierarchical motion estimator has been enhanced to meet these requirements, using large search range, sub-pel vectors, and DFD-based segmentation to avoid distraction by nearby moving objects.

11:30 **Intra-Frame Sharing for Low-Complexity Decoding of SHVC Video**  
Luong Pham Van, Johan De Praeter and Glenn Van Wallendael (Ghent University - iMinds, Belgium); Patrice Rondao Alface (Bell Labs, Alcatel-Lucent, Belgium); Peter Lambert (Ghent University - iMinds, Belgium)  
We propose a method to reduce the decoding complexity of the scalable video (SVC) stream by sharing the intra-frame between layers and eliminating all inter-layer dependencies. The method results in video streams with a lower bitrate than a simulcast approach. Additionally, this approach reduces the decoder complexity compared to SVC.

11:50 **Reconstruction of an All-in-Focus Image by Region-Adaptive Fusion of Limited Depth-of-Field Images**  
Jae Young Lee, Sung Oh Park and Rae-Hong Park (Sogang University, Korea)  
This paper proposes an all-in-focus image reconstruction method to reduce artifacts by applying proper fusion rules depending on the type of the region: non-textured region, normal region, and occlusion boundary. Compared with the existing methods, the proposed method shows reduced artifacts.

**RT06B: Health and Wellness**

Room: N264  
Chairs: Jianwen Chen (Harvard University, P.R. China), Narisa Chu (CWLab International, USA)

10:30 **Universal System for Integrating Commercial Medical Devices with Standardized Digital TV System**  
Vandermi Silva (Universidade Federal do Amazonas, Brazil); Orlewilson Bentes Maia (Centro Universitário do Norte (Uninorte), Brazil); Marlos Rodrigues (Serviço Nacional de Aprendizagem Industrial - SENAI - Amazonas & University of Amazonas - UFAM - Brazil, Brazil); Vicente F. Lucena, Jr. (University of Amazonas, Brazil)  
An approach to integrate the idTV technology with medical devices running into one residential gateway will be presented. Conventional medical devices are used to collect physiological information. Integration forms of those different devices, e.g., temperature sensor, blood pressure meter, and pulse oximeter with conventional consumer electronic devices are presented.

10:50 **Design Optimization of Tapered Cap Floating Sleeve Antenna for Interstitial Microwave Ablation for Liver Tumor**  
Surita Maini (SLIET Longowal, India)  
Microwave ablation (MWA) is relatively safe and efficient treatment for patients with liver tumors and antenna is its integral part. The optimized design of antenna play important role in investigating its performance parameters. Tapered Cap Floating Sleeve Antenna was simulated, designed and optimized to treat the malignant liver tumors.

11:10 **SVM Based Dynamic Classifier for Sleep Disorder Monitoring Wearable Device**  
Jaihyun Park (Korea University, Korea); Daehun Kim (Korea University, Korea); Cheoljong Yang (Vision Information Processing & Korea University, Korea); Hanseok Ko (Korea University, Korea)  
This paper describes a method for sleep time estimation using accelerometer embedded wrist-worn device. Performance of the proposed method is evaluated using 50 real data sets and its superiority is verified.

11:30 **Evaluation of HEVC Compression for High Bit Depth Medical Images**  
Saurin Parikh (Florida Atlantic University & Nirma University, USA); Hari Kalva and Velibor Adzic (Florida Atlantic University, USA)  
We evaluate performance of HEVC Intra and Inter coding of DICOM standard based medical images in lossless and lossy mode compared to JPEG2000. Our results show significant reduction in compressed file size ranging from 39% to 94%. This gain reduces transmission and storage cost especially in cloud based e-healthcare scenario.

11:50 **Real Time Step Length Estimation on Smartphone**  
Lucia Pepa, Giacomo Marangoni and Matteo Di Nicola (Università Politecnica delle Marche, Italy); Lucio Ciabattoni and Federica Verdini (Università Politecnica delle Marche, Italy); Luca Spalazzi and Sauro Longhi (Università Politecnica delle Marche, Italy)
Smartphones are particularly suitable for health related applications during daily living, given their diffusion into society and computational capabilities. We proposed a smartphone application for real-time step length estimation, using inverted pendulum model. We tested the proposed solution on 5 healthy subjects, comparing the smartphone estimation with a stereophotogrammetric system.

**Tutorial 3 - Elie Track: Rebooting Computing**

Room: N253

**Sunday, January 10, 12:10 - 13:10**

Lunch/Ibuka Award: Steven Sasson

Room: N255/257/259

**Sunday, January 10, 13:10 - 14:10**

Martin G. Kienzle, Ph.D, IBM IoT Research Division, "Using Cognitive Technologies in Internet-of-Things Solutions"

Room: N255/257/259
Chair: Richard Doherty (The Envisioneering Group, USA)

**Sunday, January 10, 14:10 - 15:50**

**CT02B: Devices in the Internet of Me**

Room: N256
Chair: Chao-Hsien Lee (National Taipei University of Technology, Taiwan)

14:10 *Improving Failure Prediction Accuracy in Smart Environments*
Sila Ozen Guclu, Ehsan Ullah Warriach, Tanir Özçelebi and Johan J. Lukkien (Eindhoven University of Technology, The Netherlands)
Smart Environments and Internet of Things are two concepts that connect consumer electronics to each other and to the Internet domain. Application failures due to fluctuation of resources and environmental factors must be prevented. We propose a failure prediction method that makes a distinction between potential failures and outliers.

14:30 *Eye-Gaze Systems - An Analysis of Error Sources and Potential Accuracy in Consumer Electronics Use Cases*

Anuradha Kar (National University of Ireland Galway, Ireland); Shabab Bazrafkan (NUI Galway, Ireland); Claudia Costache (National University of Ireland, Galway, Ireland); Peter Corcoran (National University of Ireland Galway & National University of Ireland Galway, Ireland)
Several CE use cases and corresponding techniques for eye-gaze estimation are reviewed. The optimal approaches for each use case are determined from recent literature. The most probable error sources for eye-gaze estimation are determined and their impact quantified. An analysis of the research outcome is given and future work outlined.

14:50 *Quality-Energy Aware Adaptation for Mobile Streaming Clients*

Hung Thai Le (University of Aizu, Japan); Duc V. Nguyen (The University of Aizu, Japan); Pham Ngoc Nam (HUST, Vietnam); Anh T. Pham and Truong Cong Thang (The University of Aizu, Japan)
Streaming service is one of the most popular services via mobile devices now. In this paper, We study the dependence of consumed power on video bitrates. An adaptation method is then presented to balance the requirements for high video quality and low power consumption.

15:10 *FS-LRU: A Page Cache Algorithm for Eliminating Fsync Write on Mobile Devices*
Dong Hyun Kang and Young Ik Eom (Sungkyunkwan University, Korea)
In mobile environments, frequent fsync system calls negatively impact both performance and endurance of NAND-based storage. In this paper, we propose a novel page cache algorithm, called FS-LRU, that reduces the negative effect of fsync call by using hybrid DRAM and NVRAM memory architecture.

15:30 CURAP: CURating Geo-Related Information on a mAP
Takuya Kanehira (Nara Institute of Science and Technology, Japan); Yutaka Arakawa (Nara Institute of Science and Technology & NAIST, Japan); Keiichi Yasumoto (Nara Institute of Science and Technology, Japan); Takeshi Wada (Osaka Prefecture University College of Technology, Japan)
In this study, we design and implement CURAP: a unique geo-related information sharing platform. Google Maps’ My Maps function is currently a widely used platform for the same purpose, but its sharing features have restrictions. In contrast, CURAP can search for and share geo-related information directly.

IT05 - Event Detection

14:10 Shared-Use Motion Vector Algorithm for Moving Objects Detection for Automobiles
Chup-Chung Wong (University of Warwick & Hong Kong Productivity Council, Hong Kong); Wan-Chi Siu (Hong Kong Polytechnic University, Hong Kong); Stuart Barnes and Paul Jennings (University of Warwick, United Kingdom); Bernard Fong (Hong Kong Productivity Council, New Zealand)
A new motion vector based moving object detection system is proposed. Moving objects are detected by evaluating the planar parallax residuals of motion vectors from the H.264/AVC encoder. Novel "APD" constraints for hypothesis generation, followed by a template matching technique are proposed to detect moving object effectively.

14:30 Robustness Estimation of Electrical Deterioration Sensor
Toshiyasu Higuma (Mitsubishi Electric Corp, Japan)
We have been developing to the electrical deterioration sensor to detect indication of the electrical fire. In this paper describes improvement robustness for the surge and tangent current on the power line and prototype of the sensor.

14:50 Fall Risk Estimation Based on Co-contraction of Lower Limb During Walking
Souksakhone Bounyong and Shinobu Adachi (Panasonic Corporation, Japan); Jun Ozawa (Panasonic, Japan); Yosuke Yamada (National Institute of Biomedical Innovation, Health and Nutritions, Japan); Misaka Kimura (Kyoto Gakuen University Faculty of Health and Medical Sciences, Japan); Keiichi Yokoyama (Kyoto Gakuen University, Japan)
This paper proposes an application using wearable EMG sensors that estimates the fall risk of healthy elderly people based on co-contraction of the lower limb during walking. The results showed that tight co-contraction during the stance phase can be predictive of falling experience with 65% accuracy.

15:10 A New Approach for Non-Contact Pulse Transit Time Measurement Using Microwave and Image Sensors
Mototaka Yoshioka (PANASONIC, Japan); Kenta Murakami (Panasonic, Japan)
A new approach for non-contact based pulse transit time (PTT) measurement is proposed. The microwave sensor detects heartbeats using reflected signal from a subject’s chest, and the image sensor obtains pulse-arrival times using a subject's face image. By temporally synchronizing these sensors, the proposed system remotely obtains PTT.

RT01B: RF & Wireless & Network Technologies

14:10 A Study on ICI Canceller Using Iterative Detection in ISDB-T
Kota Aoki and Akira Nakamura (Tokyo University of Science, Japan); Kohei Ohno (Meiji University, Japan); Makoto Itami (Tokyo University of Science, Japan)
In mobile reception of OFDM, reception characteristics are degraded by ICI. ICI canceller using iterative detection has been proposed. However, In ISDB-T, error-correcting codes are adopted. In this paper, a combination of ICI canceller and the error-collecting code is proposed. As the results, it is possible to improve the characteristics.

14:30 Impulsive Noise Mitigation Scheme That Combines Nulling and Time Sample Replacement
Hirotomo Yasui, Akira Nakamura and Makoto Itami (Tokyo University of Science, Japan)
In this paper, a combination of the conventional nulling scheme and time sample replacement scheme is proposed to reduce the influence of the impulsive noise.

14:50 **A Novel STBC-DCSK Transmission Scheme for Scalable Video with Unequal Error Protection Property**
Shuying Li and Yaqin Zhao (Harbin Institute of Technology, P.R. China); Liang He (HIT, P.R. China); Zhilu Wu (Harbin Institute of Technology, P.R. China); Yuanyuan Li (China Academy of Launch Vehicle Technology R&D Center, Beijing, P.R. China)
In this paper, we propose a new space-time block code (STBC) design in differential chaos shift keying (DCSK) communication system for scalable video transmission with unequal error protection (UEP) property. Extensive simulations are provided to demonstrate the performance gain of the proposed STBC-DCSK for scalable video transmission.

15:10 **Performance Anomaly of Neighbor Discovery in Bluetooth Low Energy**
Hojin Lee (Samsung Electronics, Korea); Dongseok Ok (S/W R&D Center & Samsung Electronics, Korea); Joonsub Han, Iksoon Hwang and Kangtae Kim (Samsung Electronics, Korea)
We find that neighbor discovery in Bluetooth Low Energy (BLE) exhibits performance anomaly; more frequent advertise can lead to longer discovery delay. By analyzing the reason, we derive the principle to configure the neighbor discovery parameters, which makes things in BLE achieve low neighbor discovery delay with high energy efficiency.

15:30 **Named Data Networking for Infrastructure Wireless Networks**
Cheoleun Moon (Korea Advanced Institute of Science and Technology, Korea); Sungwon Han and Honguk Woo (Samsung Electronics, Korea); Dohyung Kim (Sungkyunkwan University, Korea)
Named Data Networking (NDN) has emerged to support content-oriented services that are currently prevalent in the Internet. It successfully minimizes redundant transmission on wired links by adopting name-based access and in-network caching. In this paper, we discuss NDN in the IOT world, and propose its enhancement for efficient usage in IOT.

**RT03D: AV Systems, Image/Video Processing**

Room: N261
Chair: Wen-Chung Kao (National Taiwan Normal University, Taiwan)

14:10 **Optimization of Unequal Error Protection AL-FEC Scheme Via Adapted Simulated Annealing**
César Díaz, Julián Cabrera, Fernando Jaureguizar and Narciso García (Universidad Politécnica de Madrid, Spain)
We adapt simulated annealing for speeding up the search of optimal configurations for protecting video transmission over IP networks. The considered protection scheme is a version of the Pro-MPEG COP3 FEC codes, consisting in using several matrices of unequal size per FEC block.

14:30 **Perceptual Distortion Measurement in the Coding Unit Mode Selection for 3D-HEVC**
Sima Valizadeh (University of British Columbia, Canada); Panos Nasiopoulos (The University of British Columbia, Canada); Rabab Ward (University of British Columbia, Canada)
In this paper, we propose to integrate a perceptual video quality metric inside the rate distortion optimization process of the 3D-HEVC. Specifically, in the coding unit (CU) mode selection process, PSNR-HVS is used as a measure for distortion. Our proposed approach improves the compression efficiency of the 3D-HEVC.

14:50 **Removing Non-uniform Camera Shake Using Blind Motion Deblurring**
Jinok Kim, Jongsuk Oh and Rae-Hong Park (Sogang University, Korea)
Images taken in low-light environments are often degraded by camera shake and pixel saturation. In this paper, a motion deblurring method using a maximum a posteriori approach is proposed. To reduce ringing artifacts, the proposed method takes pixel saturation into account. Experimental results demonstrate the effectiveness of the proposed method.

15:10 **CTU Level Decoder Energy Consumption Modelling for Decoder Energy-Aware HEVC Encoding**
Thanuja Mallikarachchi (University of Surrey & University of Surrey, United Kingdom); Hemantha Kodikara Arachchi, Dumisu T. Talagala and Anil Fernando (University of Surrey, United Kingdom)
Accurate modelling of the decoding energy of a CTU is essential to determine the appropriate level of quantization required for decoder energy-aware video encoding. The proposed method predicts the number of nonzero DCT coefficients, and their energy requirements with an average accuracy of 4.8% and 11.19%, respectively.
Program for 2016 IEEE International Conference on Consumer Electronics (ICCE) [2016 ICCE]

15:30 **Design and Analysis of Multi-frame Super Resolution Using OpenCV**
Tsu-Ming Liu, Chih-Kai Chang, Yu-Hao Huang and Chi-Cheng Ju (Mediatek Inc., Taiwan)
This paper presents an OpenCV-based multi-frame super resolution and explores a sharpness index to optimize the low-resolution images. The experimental results reveal that the proposed frame selection design has considerable effectiveness and seventy to ninety iterations are required for convergence to desired image quality.

**RT07B: EnergyManagement**

Room: N264
Chair: Stefan Mozar (UNSW, Sydney & Dynexsys Pty Ltd, Australia)

14:10 **Real-time Power Consumption Control System for Multimedia Mobile Devices**
Qiong Tang and Angel Groba (Universidad Politécnica de Madrid, Spain)
A real-time power consumption control system for multimedia mobile devices, fed-back through an OS-level power estimator, is presented. The target system is a video decoder running in an embedded platform. The implementation and simulation results match and show how the system achieves null average steady-state error with short settling times.

14:30 **An Efficient Energy Monitoring Method Based on Bluetooth Low Energy**
Moonok Choi, Jinsoo Han and Il-Woo Lee (ETRI, Korea)
This paper describes an energy monitoring method that is applicable to home energy management system (HEMS). The proposed method can enhance the energy efficiency of data communication, and make it possible to aggregate the energy consumption data of multiple home appliances simultaneously.

14:50 **Development and Evaluation of a Photovoltaic Emulation System**
Kurokawa Kyohei, Takashi Inui, Lei Lin and Masahiro Fukui (Ritsumeikan University, Japan)
This paper discusses transient response speed, accuracy, etc., after comparing with an understanding of the characteristic of a photovoltaic panel, and the realization method by the microcomputer which used the equivalent circuit and a commercial imitation electric power system.

15:10 **Electric Field Wireless Power Transfer with Impedance Transformation**
Kang Hyun Yi (Daegu University, Korea)
This paper is about the electric field wireless power transfer and proposes the electric field WPT system at 6.78MHz. The system was analyzed and verified using a 5.5W prototype for charging mobile devices.

**Tutorial 4: Xiaoyu Sun (Sabic): CE Materials**

Room: N253

**Sunday, January 10, 15:50 - 16:20**

**Break and Poster Session - 3**

Room: Hall Area
Chair: Bingo Wing-Kuen Ling (Guangzhou, P.R. China)

15:50 **Front Moving Object Detection for Car Collision Avoidance Applications**
Yeong-Kang Lai, Yao-Hsien Huang and Jian-Wen Li (National Chung Hsing University, Taiwan)
This paper proposed a technique to avoid collisions in the image sequences captured by stereo camera. It has to filter out the independently moving objects by performing ego-motion computation of the vehicle, so that the front moving objects and possible dangerous conditions may be detected using this collision avoidance system.

Yeong Yu, Sanghoon Lee, Jaekeun Lee, Keonhee Cho and Sehyun Park (Chung-Ang University, Korea)
The WDDS suggested in this paper can resolve these problems. With the WDDS, users can prevent absence of surveillance drones and can observe large areas without blind spots in IoT environments cost effectively.

15:53 Optimizing Convolutional Neural Network on DSP
Shyam Jagannathan and Mihir N Mody (Texas Instruments, India); Manu Mathew (Texas Instruments (Indi) Ltd, India)
Deep learning techniques like Convolutional Neural Network (CNN) are getting traction for classification of objects in Advanced Driver Assistance Systems (ADAS). The paper proposes optimization techniques to efficiently map on Digital Signal processors (DSP). The proposed solution is simulated on Texas Instruments (TI)'s TDA3 platform showing maximum utilization C66x-DSP.

15:54 Application of Bezier-Splines in Navigation Algorithms by Means of the Product Usage Chain
Sigmund Schimanski and Sebastian Runge (University of Wuppertal, Germany)
This paper discusses the application of Bezier-Splines for the approximation of circuits for usage-centric route planning. We draw splines in a normalised coordinate system and use provided geo-data to transform them onto a map. We then determine sampling points on the transformed curve where navigation occurs.

15:56 On the Accuracy of Wi-Fi Localization Using Robot and Human Collected Signatures
Luyao Niu and Yingyue Fan (Worcester Polytechnic Institute, USA); Kaveh Pahlavan (WPI, USA); Guanxiong Liu (Worcester Polytechnic Institute, USA); Yishuang Geng (Worcester Polytechnic Institute, MA, USA)
We collected two Wi-Fi databases using human and robot respectively. Based on the two databases, we use an offline process to generate Wi-Fi RSS maps. Using the Wi-Fi maps, any arbitrary position can be estimated based on the RSS readings. Furthermore, a performance comparison is provided and analyzed.

15:57 Abnormal Moving Vehicle Detection for Driver Assistance System in Nighttime Driving
Cuong Nguyen Khac (YEUNGNAM University, Korea); Ho Youl Jung and Ju Hyun Park (Yeungnam University, Korea); Sangmoon Lee (Daegu University, Korea)
This paper proposes a real-time approach for frontal collision warning in nighttime driving using monocular vision. Motion, empirical threshold, K-means are used to segment vehicle candidates. An analysis is performed carefully finding optimal initial K. Vehicle candidates are classified by SVM. Proposal method is high ability detecting abnormal moving vehicles.

15:59 Monitoring System for Potential Users with Depression Using Sentiment Analysis
Demostenes Zegarra Rodriguez (University of Sao Paulo & Nokia Technology Institute, Brazil); Renata Rosa (University of Sao Paulo, Brazil); Graca Bresan (University of Sao Paulo, Brazil)
This paper presents a monitoring solution for users with potential psychological disturbs, specifically stress. The phrases extracted from Social Networks are filtered by mood and scored using a sentiment-analysis-metric that considers personal characteristics, such as gender and age. The solution informs, to authorized persons, the emotional changes of the users.

16:00 Efficient Power Strip Architecture for Metering and Controlling Electrical Power Consumption
Jiho Kim (Chung-Ang University, Korea)
In this paper, we propose a new architecture for a smart power strip that measures the power consumption of each outlet and controls its switching. Also, we present an energy efficient algorithm for wireless transmission between a smart power strip and a coordinator.

16:02 Multi-stage Speech Enhancement for Automatic Speech Recognition
SeungYeol Lee (Samsung Electronics Co. Ltd., Korea)
In this paper, we propose a multi-stage speech enhancement technique for speech recognition. This method can improve the quality of speech signal which maximizes the advantage of each speech enhancement technique. The experimental result shows that the proposed technique is superior to conventional multi-stage speech enhancement algorithms.

16:03 Seamless Ethernet Approach
Saad Allawi Nsaif and Jong Rhee (Myongji University, Korea)
We introduce a novel approach called seamless Ethernet to allow Ethernet switches to provide seamless redundancy with zero recovery time and without the need to modify the standard Ethernet frame layout or even use RSTP protocol. Our approach shows a traffic reduction of 50% compared to the standard HSR protocol.

16:05 Real-Time Evaluation of Speech Quality in Mobile Communication Services
Demostenes Zegarra Rodriguez (University of Sao Paulo & Nokia Technology Institute, Brazil); Renata Rosa (University of Sao Paulo, Brazil); Carlos Pereira (Universidade Federal de Lavras, Brazil)
This paper presents a mechanism to provide a real-time evaluation of speech quality. This solution consists of a voice-quality-server (VQS) based on the ITU-T P.563 algorithm with modifications to treat natural silences of human speech and packet losses on the network. Furthermore, an application is implemented
16:06 **Performance and Interoperability Evaluation of Radiofrequency Home Automation Protocols and Bluetooth Low Energy for Smart Grid and Smart Home Applications**

Stanis Courrèges (HAGER CONTROLS, France); Salma Oudji and Vahid Meghdadi (University of Limoges, France); Christian Brauers and Ruediger Kays (TU Dortmund University, Germany)

The paper presents the performances and the coexistence of home automation radiofrequency standard protocols such as KNX-RF Multi, ZigBee, EnOcean with Bluetooth Low Energy available in smartphones for smart grid and smart home. This work allows describing an overall interoperable, efficient RF system, using the strengths of each RF standard.

16:08 **Detecting System of Approaching Vehicles Using an Ultrasonic Wave**

Yoshihiro Furuno, Yuto Tanaka and Yoshiiisa Nakato (Kyushu Institute of Technology, Japan)

We proposed the technique to detect approaching vehicles on the sidewalk using a supersonic wave loudspeaker attached to a vehicle. We found that we could detect areas around 50 m with a high probability of more than 80% by using a tone burst as input to the supersonic wave loudspeaker.

16:09 **Singing Support System Using LPC Residual Wave for Laryngectomee**

Takashi Himeno, Yuto Tanaka and Mitsuori Mizumachi (Kyushu Institute of Technology, Japan); Kenji Matsui (Osaka Institute of Technology, Japan); Yoshiiisa Nakato (Kyushu Institute of Technology, Japan)

In this paper, we propose a singing system by Electric-Larynx Using LPC residual wave. But LPC residual wave has a problem that the signal-power of the vowels /i/ and /u/ are largely reduced. Therefore we tried to improve the quality of sound by adding signal-power compensation to it.

16:11 **Study of Volume Limit for Headphone Hearing Loss Prevention on Portable Music Player**

Teruhisa Higashi (Kyusyu Institute of Technology, Japan); Yuto Tanaka and Yoshiiisa Nakato (Kyushu Institute of Technology, Japan)

Our purpose is to develop system of volume limit what can’t notice by the listener for prevent of headphones hearing loss on portable music player. In this paper, we researched whether listener can notice or not when sound volume was gradually turned down.

16:12 **A Super-resolution Method Using Registration of Multi-scale Components on the Basis of Color-sampling Patterns of UHDTV Cameras**

Yasutaka Matsuo (Japan Broadcasting Corporation (NHK), Japan); Shinichi Sakaida (NHK, Japan)

An UHDTV image has high self-similarity. A super-resolution method using single-frame registration of an original image and its n-level wavelet multi-scale components is therefore proposed. Accuracy of the registration is enhanced by compensating the registration results in consideration of color-sampling patterns of UHDTV cameras.

16:14 **A Power Saving Scheme for Cloud Service Into Set-Top Box**

Eunjung Kwon (ETRI, Korea); Sungwon Byon (Electronics and Telecommunication Research Institute, Korea); Yong-Tae Lee (Electronics and Telecommunications Research Institute, Korea); Won Ryu (ETRI, Korea)

As STB tends to become a potential converged system thanks to cloud technology, it became to increase the power consumption in home. So, we propose a novel power saving scheme for guaranteeing QoS of cloud services to STB supporting energy efficient mode.

16:15 **An Implementation of STB State Management Through UDP and WOL**

Sungwon Byon (Electronics and Telecommunication Research Institute, Korea); Eunjung Kwon and Eui-Suk Jung (ETRI, Korea); Yong-Tae Lee (Electronics and Telecommunications Research Institute, Korea); Won Ryu (ETRI, Korea)

With the implementation, IPTV STB can be suspended while TV is not being watched. Also, the STB can be waked up from remote site when there are required tasks to be performed. Power consumption decreases to 10%~67% of traditional standby.

16:17 **A Data Management Platform for Recommending Services to Consumers in the UCWW**

Ivan Ganchev and Zhanlin Ji (University of Limerick, Ireland); Máirtín O’Droma (University of Limerick & Director, Telecommunications Research Centre, University of Limerick, Ireland)

This paper presents a cloud-based Data Management Platform (DMP) for use in a Ubiquitous Consumer Wireless World (UCWW) environment for managing the raw data, i.e., turning the 'big data' logs into actionable analytic datasets.

16:18 **Interval Type-2 Fuzzy Logic Quality Prediction Model for Wireless 4KUHD H.265-coded Video Streaming**

Mohammed Alreshoodi, Anthony O.T Adeyemi-Ejeye, John Woods and Stuart D Walker (University of Essex, United Kingdom); Jeewan Pokhrel (Montimage, France)

This paper proposes a prediction model for the perceptual quality of wireless 4KUHD H.265 video streaming using Interval Type-2 Fuzzy Logic System. The results show good prediction accuracy. This study should help in the development of a reference-free video quality prediction model and QoS control methods for 4KUHD video streaming.
Monday, January 11

Sunday, January 10, 16:20 - 18:00

CT03B: Infrastructure and Enabling Technologies of the Internet of Me Go To Top

Room: N256
Chair: Joseph V. Lillie (IEEE CES BoG, USA)

16:20 In-Situ AR Manuals for IoT Appliances
Dongsik Jo (Electronics and Telecommunications Research Institute, Korea); Gerard J. Kim (Korea University, Korea)

We propose a generic augmented reality AR framework supported by the IoT infrastructure called the ARIoT. Through ARIoT, potential target objects are dynamically identified, important feature information are obtained, and augmented as a service to the client. We demonstrate the utility of ARIoT in realizing in-situ AR manuals for appliances.

16:40 A Load-Balancing Approach Based on Modified K-ELM and NSGA-II in a Heterogeneous Cloud Environment
Qi Liu, Weidong Cai, Jian Shen and Dandan Jin (Nanjing University of Information Science and Technology, P.R. China); Nigel Linge (University of Salford, United Kingdom)

MapReduce is a popular programming model widely used in distributed systems. Regarding large-scale applications, e.g. City-wide HEMS, load-balancing becomes critical. In this paper, a scheme including modified K-ELM and NSGA-II is proposed. Results show that our method can assign tasks evenly, and effectively improve the performance of a cloud system.

17:00 On Service Personalization Analysis for the Internet of Me Based on PN2
Mohd Anuaruddin Bin Ahmadon and Shingo Yamaguchi (Yamaguchi University, Japan)

We proposed an approach for modeling services and service personalization analysis based on PN2 (Petri nets in a Petri net). We showed that Internet of Me environment can be modeled with PN2. We also proposed a verification method. We show an example of an IoM and its service personalization.

IT06 - Ultra High Definition Video Go To Top

Room: N254
Chair: Fernando Pescador (Universidad Politécnica de Madrid, Spain)

16:20 Real-time Encoding/Decoding of HEVC Using CUDA Capable GPUs
Tony James (Smartplay Technologies Pvt Ltd, Georgia)

HEVC is latest video standard from JCT-VC. It offers better compression performance compared to H.264. However, the computational complexity is highly demanding for real-time applications especially at UHD resolutions. In this paper, we propose few optimisation methods to achieve real-time encoding/decoding on CUDA capable GPUs. Experimental results validate our proposal.

16:40 Synchronization of FTN Systems for UHDTV
Myungchul Park (Kyungpook National University, Korea); Bong Gyun Jo (School of Electronics Engineering, Kyungpook National University, Korea); YoungSu Kim (Electronics and Telecommunications Research Institute, Korea); Hyoungsoo Lim (Electronics and Telecommunications Research Institute (ETRI), Korea); Dong Seog Han (Kyungpook National University, Korea)

Multicarrier faster-than-Nyquist (MFTN) signaling compresses the separation of subcarriers to improve the spectral efficiency. The MFTN scheme is suitable for UHDTV transmission. However, MFTN signaling occurs the intercarrier interference (ICI) which degrades the synchronization performance. In this paper, pilot pattern is proposed to improve the synchronization performance by reducing ICI.

17:00 Low-Complexity Intra Coding Algorithm in Enhancement Layer for SHVC
Takafumi Katayama (University of Tokushima, Japan); Tian Song (University of Tokushima & Synthesis, Japan); Wen Shi (Tokushima University, Japan); Takashi Shimamoto (University of Tokushima, Japan)

In this paper, we propose an improved low complexity algorithm for the SHVC using the information of Rate-Distortion cost and the coding unit size in the
base layer. The simulation results show that the proposed algorithm can achieve over 60% computation complexity reduction comparing to the original SHVC algorithm.

17:20 Multi-screen Broadcast-broadband Synchronization System Using Hybridcast
Masayoshi Onishi (Japan Broadcasting Corporation(NHK), Japan); Yuki Hironaka (Japan Broadcasting Corporation & NHK STRL, Japan); Hisayuki Ohmata (NHK (Japan Broadcasting Corporation), Japan); Kinji Matsumura (Japan Broadcasting Corporation (NHK), Japan); Keigo Majima (NHK Science & Technology Research Laboratories, Japan)
This paper proposes a system design for synchronized multi-screen presentation of video streams from broadcast and broadband that are displayed on a TV and a mobile device respectively. The synchronization function defined in the Hybridcast v2.0 specification is used in the system.

Panel Discussion: "Internet of Things" (Soumya Kanti Datta from Eurocom) Go To Top

Room: N253

RT02B: Entertainment, Game & Services Go To Top

Room: N264
Chair: Dietmar Hepper (Technicolor, Germany)

16:20 Development of Photoplethysmogram Sensor-embedded Video Game Controller
Erika Abe (Kyoto University, Japan); Hiroshi Chigira (NTT Corporation & NTT Service Evolution Laboratories, Japan); Koichi Fujiwara (Kyoto University, Japan); Toshitaka Yamakawa (Kumamoto University, Japan); Manabu Kano (Kyoto University, Japan)
When a heart rate (HR) during video game playing can be measured, a new game interaction system can be developed. The present work developed a new game controller measuring a player HR naturally based on a photoplethysmogram. The experiment result demonstrated high HR measurement accuracy of the developed game controller.

16:40 Cost-Effective Raster Operation with Enhanced Shared-Edge Sampling for 3D Graphics Gaming Applications
Yeong-Kang Lai and Yu-Chieh Chung (National Chung Hsing University, Taiwan)
This paper proposed a novel cost-effective strategy for the shared-edge sampling of the primitive in raster operation. No expensive sampling action is involved, and no irregular sampling point is produced in the entire process.

17:00 Development of Real-time Magic Square Solver
Akiyoshi Wakatani and Tomoya Kitagawa (Konan University, Japan)
In order to improve the ability of arithmetic of school children, we develop a real-time magic square solver based on NVIDIA Jetson TK1, which recognizes user's puzzle image and then shows several hints and an answer of the puzzle in real-time.

17:20 Full FPGA Game Machine
Takumi Fujimori and Minoru Watanabe (Shizuoka University, Japan)
This paper presents one development of such FPGA game solvers, the Blokus Duo FPGA solver, and discusses how a processor on a game machine is replaced with an FPGA in the future consumer game machines.

RT03E: AV Systems, Image/Video Processing Go To Top

Room: N261
Chair: Joonki Paik (Chung-Ang University, Korea)

16:20 A Real-Time Second-Order Derivative-Based Image Interpolation
Kwang Hyun Uhm, Seung-Jun Lee, Mun-Cheon Kang, Sung-Ho Chae and Sung-Jea Ko (Korea University, Korea)
Curvature, the second-order directional derivative of an image, has been widely used for image interpolation. In this paper, a novel fast curvature-based interpolation method is proposed which can precisely estimate the local curvature using the geometric relationship between the curvatures of the low-resolution and high-resolution images.
16:40 **An Implementation of an Affine BRISK for Mobile Heterogeneous Parallel Processors**  
Chulhee Lee (Seoul National University, Korea); Chae Eun Rhee (Inha University, Korea); Hyuk-Jae Lee (Seoul National University, Korea)  
The viewpoint-invariant feature extraction is important for computer vision applications on a mobile. This paper proposes a fast fully affine feature extractor for a mobile device, adopting a low-complexity BRISK and taking advantage of a heterogeneous computing environment.

17:00 **Image Re-ranking Using Graph Based Spanning Structures and Reciprocal Nearest Neighbors**  
Bogdan Mocanu (Institut TELECOM, France); Ruxandra Tapu (Institut Telecom / Telecom SudParis, France); Titus Zaharia (Institut TELECOM, France)  
The paper proposes a novel method to improve the performance of image retrieval at VLAD descriptor level. Our re-ranking algorithm uses relational graphs and the top-k neighborhood candidates to adaptively modify images similarity scores. The method increases the accuracy, without relying on low-level information or features geometrical verification.

17:20 **An Encapsulation Scheme of Variable-Length Packets for UHDTV Distribution Over Existing Cable TV Networks**  
Yoshitaka Hakamada (Japan Broadcasting Corporation (NHK), Japan); Takuya Kurakake (Nhk(Japan Broadcasting Corporation), Japan)  
This paper proposes an efficient encapsulation scheme for transmitting variable-length packets carrying UHDTV over existing cable TV networks. The 8K UHDTV signal is stably transmitted and received error-free at our prototype set-top box for cable TV.

17:40 **Enhancing Underwater Color Images of Diving Mask Mounted Digital Camera Via Non-local Means Denoising**  
Dubok Park (Korea University, Korea); K. Han David (Office of Naval Research, USA); Hanseok Ko (Korea University, Korea)  
This paper proposes a novel framework for enhancing underwater images captured by digital camera embedded into underwater diving mask. We adjusts the color balance using biasness and mean of luminance. Scene visibility is enhanced using underwater image model. Magnified noise in enhanced images is alleviated by Non-local means denoising.

RT05B: Sensors, MEMS and Enabling Technologies

Room: N262  
Chair: Scott L Linfoot (MASS, United Kingdom)

16:20 **Optimal Iris Region Matching and Gaze Point Calibration for Real-Time Eye Tracking Systems**  
Wen-Chung Kao, Chun-Yi Lin, Chen-Chien Hsu, Chia-Yi Lee, Bai-Yueh Ke and Ting-Yi Su (National Taiwan Normal University, Taiwan)  
This paper presents a high speed gaze tracking system without IR light sources. An advanced iris model-based matching algorithm based on particle swarm optimization (PSO) has been improved and the overall performance of image analysis sytems can reach to 200 frames/s.

16:40 **Fast Ellipse Fitting Based Pupil Tracking Design for Human-Computer Interaction Applications**  
Chun-Wen Cheng, Wei-Liang Ou and Chih-Peng Fan (National Chung Hsing University, Taiwan)  
The proposed scheme uses the two-stage RANSAC based fast ellipse fittings for human-machine interaction applications. To select the candidate edge points by the binaried pupil contour, the Canny edge based ellipse model is calculated to increase the fitting accuracy further, and the computational time is reduced effectively.

17:00 **Initialization Action Detection Method for Gesture Recognition System**  
Kook-Yeol Yoo (Yeungnam University, Korea); Byoung-Ju Yun (Kyungpook National University & IT College, Korea)  
We analyze gestures for the initialization of HCI system, such as ‘hand-shaking’ and 'hand-pushing', especially in the aspects of robustness and sensing methods. For the detection of derived 'hand-pushing' action, temporal variation of depth histogram is used. The proposed method is empirically verified.

Monday, January 11, 08:30 - 09:00  
Breakfast

Room: N255/257/259  
Monday, January 11, 09:00 - 10:00
Keynote 3: Ariel Garten (InteraXon) Tim Mullen (Sytrogi): Brain Computer Interface: Present and Future

Ariel Garten, CEO, InteraXon, Toronto, Canada; Tim Mullen, CEO, Sytrogi, San Diego, USA
Room: N255/257/259
Chair: Narisa Chu (CWLab International, USA)

Monday, January 11, 10:00 - 10:30

Break

Monday, January 11, 10:30 - 12:10

CT01C: Services in the Internet of Me

Room: N256
Chair: Soumya Kanti Datta (EURECOM & Co-Founder, Future Tech Lab, France)

10:30 Intelligent Traffic Light Controller Design Using FPGA
Jing Pang (California State University, Sacramento, USA)
This paper is to design an intelligent traffic light controller using Spartan 3E FPGA (Field Programmable Gate Array) with five-phase traffic control. It adapted to the traffic patterns during the peak and off peak intervals of a day, as well as the traffic patterns during the vacation time.

10:50 A Method of Gathering Probe Data with Smartphones for Telematics Services in Urban Areas
Hirohito Kakizawa and Ryuichi Iwakiri (Kanagawa Institute of Technology, Japan); Ryozo Kiyohara (Kanagawa Institute of Technology, Japan)
Smartphones are widely used as telematics terminals and on-vehicle information devices. We show a model for probe data and propose a compression method for probe data that is different from general compression tools. In addition, we show the results of our evaluation of this proposed method.

11:10 Application of ECHONET Lite Which is Open Standard Into Energy Management System
Takashi Murakami (Panasonic Corporation, Japan); Hiroshi Sugimura (Kanagawa Institute of Technology, Japan); Masao Isshiki (Kanagawa Institute of Technology and Keio University, Japan)
ECHONET Lite which is an open standard is developed to solve the issues, such as "earth environmental issue", by connecting networked appliances. In this paper I describe that it is possible for ECHONET Lite to build the smart home, smart store etc. easily by combining the appliances in the market.

11:30 Home Energy Management by Handling Life Event
Noriyuki Kushiro and Takahiro Kondo (Kyushu Institute of Technology, Japan); Yuki Ogawa (Mitsubishi Electric Corporation, Japan); Toshiyasu Higuma (Mitsubishi Electric Corp, Japan)
This paper describes an attempt for establishing an intelligent home energy management algorithm, which can react to residents' life pattern. A long-term data collection system has been constructed. Capability of demand prediction and feasibility of energy management by handling life events are discussed on the field data.

11:50 Development of a Low-Cost Indoor Environment Monitoring System Based on a Hybrid Wireless Sensor Network
Jaejun Han, Jeongmin Lee, Eunae Lee and Dong Sik Kim (Hankuk University of Foreign Studies, Korea)
A hybrid wireless sensor network is implemented for the room temperature, humidity, and CO2 gas measurements based on the 917MHz band with a mesh network and the 447MHz band with a star connection. Duty-cycling receiver and digital temperature compensation algorithms is implemented for designing low-power and low-cost wireless sensor nodes.

CT04B: Security and Privacy in the Internet of Me
10:30 **Palmprint as a Smartphone Biometric**  
Hossein Javidnia, Adrian-Stefan Ungureanu and Claudia Costache (National University of Ireland, Galway, Ireland); Peter Corcoran (National University of Ireland, Galway & National University of Ireland Galway, Ireland)  
This paper focuses on smartphone palmprint-based authentication. Various challenges in unconstrained acquisition and processing are addressed: segmentation of palm images in cluttered backgrounds, variable illumination conditions. The main contribution is quantifying these challenges and presenting preliminary results and evaluation studies on the potential of palmprints as alternative biometric for smartphones.

10:50 **Blockchain Contract: Securing a Blockchain Applied to Smart Contracts**  
Hiroki Watanabe, Shigeru Fujimura, Atsushi Nakadaira, Yasuhiro Miyazaki and Akihito Akutsu (NTT, Japan); Junichi Kishigami (Muroran Institute of Technology, Japan)  
A new mechanism is proposed for securing a blockchain applied to contracts management such as digital rights management. This mechanism includes a new consensus method using a credibility score and creates a hybrid blockchain by alternately using this new method and proof-of-stake.

11:10 **A Novel ICMetric Based Framework for Securing the Internet of Things**  
Ruhma Tahir, Hasan Tahir and Klaus McDonald-Maier (University of Essex, United Kingdom); Anil Fernando (Center for Communications Research. University of Surrey, United Kingdom)  
Security at both the device and network level is critical to the operation of IoT. Our proposed novel ICMKeyStream framework aims to safeguard against threats at the device and network level; thereby providing authentication, confidentiality and non-repudiation for continuous data streams using the ICMetric technology.

11:30 **Performance Evaluation on Secure Data Management Approach for Multiple Clouds Using Secret Sharing Scheme**  
Atsushi Kanai (Hosei University, Japan); Shigeaki Tanimoto (Chiba Institute of Technology, Japan); Hiroyuki Sato (The University of Tokyo, Japan)  
Secret sharing data management approaches for multiple clouds to maintain confidentiality that involves a secret sharing scheme have been proposed. In this paper, a prototype is developed for evaluation, and the performance is evaluated by using a public cloud service.

**IT07- Consumer Health**  
Room: N254  
Chair: Reinhard Moeller (University of Wuppertal, Germany)

10:30 **Respiration Monitoring Using a Wireless Network with Space and Frequency Diversities**  
Yang Zhao (GE Global Research Center, USA); Jeff Ashe (GE Global Research, USA); Ting Yu (General Electric Global Research Center, USA)  
We use received signal strength indicator from a wireless network to perform non-contact respiration monitoring. We propose a low-cost system and a maximum likelihood estimator to estimate respiration rate from RSSI on multiple links and multiple channels. Our system is over 40% more accurate than previous systems for eight experiments.

10:50 **Fully Automated Contactless Respiration Monitoring Using a Camera**  
Mukul Rocque (Philips Research, The Netherlands)  
Reliable monitoring of respiration rate in low acuity settings can be an early predictor of physiological deterioration. A fully automated low cost respiration monitoring algorithm developed using a contactless camera is presented in this article. The algorithm was evaluated on adults and neonates to test home wellness applications.

11:10 **A Wireless Photoplethysmography Signal Processing System for Long-term Monitoring**  
Chih-Chin Wu and Shu-Han Fan (National Chiao Tung University, Taiwan); Shang Chuang (NCTU, Taiwan); Jia-Ju Liao, Chia-Ching Chou and Wai-Chi Fang (National Chiao Tung University, Taiwan)  
This paper has presented a PPG signal processing system based on EEMD method. This paper adopts EEMD to solve the mode mixing problem by adding different sets of white noise and decompose signal into meaningful IMFs. The results showed that it can effectively solve the mode mixing problem.

**RT03F: AV Systems, Image/Video Processing**  
Room: N254  
Chair: Daniel Díaz-Sánchez (Universidad Carlos III de Madrid, Spain)
Room: N261
Chair: Fernando Pescador (Universidad Politécnica de Madrid, Spain)

10:30 Efficient Local Stereo Matching Technique Using Weighted Guided Image Filtering (WGIF)
Gwang-So Hong, Min-Su Koo, Avishek Saha and Byung-Gyu Kim (SunMoon University, Korea)
We propose new local stereo matching method based on the weighted guided image filtering (WGIF). We utilize the WGIF by using local variance window of pixel in a guidance image which is applied to calculate local weights for cost volume filtering. The proposed method shows better performance.

10:50 Depth-Map Based on Single-Passive Sensor
Jongho Choi (eWBM Inc., Korea); Dongil Han (Sejong University, Korea)
We propose a novel means of single passive sensor based on depth map using PSF model. Depth map is generated with using converted images based this model. In considering operation and performance, we compared various equations of correlation, also applied a histogram stretching for robust to variable lighting.

11:10 Perceptual Coding for a Super High-Definition Video Based on Subjective Assessment of Viewing Distance
Ayumu Ohike, Naoyuki Awano and Kenji Sugiyama (Seikei University, Japan)
Very high resolution video system such as 4k enables very close viewing distance. However, very short distance causes significant different view in a picture. We propose the perceptual coding with quantization control. To realize rational control, we use the results of subjective assessments. The bit rate reduction is checked.

11:30 Pixel Similarity Based Betacam Dropout Detection of Degraded Archived Media in Instant QC System
Kiok Ahn, Gihun Song, Md. Tauhid Iqbal, Jaemyun Kim and Oksam Chae (Kyung Hee University, Korea)
We propose a pixel similarity based Betacam dropout detection method. Proposed method aims at detecting errors, having vertically similar pattern without considering sequential frame when archiving a tape-based content to a file-based system. Moreover, this method works along with a real-time instant Quality Control(QC) system with less false-alarm.

11:50 Time Domain Channel and SNR Estimation for Digital Video Broadcasting Mobile Receivers
Abid Khan (Universiti Technology Petronas, Malaysia); Varun Jeoti (University Teknologi PETRONAS, Malaysia)
In this paper, an improved low complexity and efficient time domain channel estimation algorithm is proposed for DVB Mobile Receivers. Presence of guard band causes computational problems in time-domain estimation methods. Herein, we propose a method where a solution based on no guard band is used as an initial estimate.

RT08B: Other CE Related Innovations and ApplicationsGo To Top

Room: N262
Chair: Stefan Mozar (UNSW, Sydney & Dynexsys Pty Ltd, Australia)

10:30 Transformable Plate Ware - An Application of Sheet Type Transformable Robots
Mitsuharu Matsumoto (University of Electro-Communications, Japan); Masaaki Shirasaki (University of Electro-communications, Japan)
Sheet type transformable robots are robots, which can transform their shape from planar sheet to three dimensional structure. They can form several structures like Origami, a Japanese paper art. We propose transformable plate wares as another application of sheet type transformable robots, and developed some prototype to show our scenario.

10:50 Blind: Power Saving Color Transform Method for OLED Displays
Seikwon Kim (Samsung Electronics, Korea); Shinyeong Hyun and Taekyung Heo (KAIST, Korea); Daegil Im (Samsung Electronics, Korea); Jaehyuk Huh (KAIST, Korea)
To reduce power consumption on OLED display, this paper proposes a color management scheme, which exploits the human color perception inaccuracy. The scheme changes a color space to another imperceptibly different color space with higher energy efficiency.

Khattab M. Ali (University of Essex, United Kingdom); Anna Gruerler (University of Tsukuba, Japan); Klaus McDonald-Maier (University of Essex, United Kingdom); Anil Fernando (Center for Communications Research. University of Surrey, United Kingdom)
We propose a security system to protect communications for self-driving cars. It can detect malicious vehicles in the urban scenario. The detection system is
based on fuzzy petri nets to detect packet dropping attacks in VANETs, the experimental results show the proposed FPN-IDS can successfully detect DoS attacks.

11:30  **A HDMI-to-MHL Video Format Conversion System-on-Chip (SoC) for Mobile Handset in a 130-nm CMOS Technology**
Hyochang Kim (Hanyang University and AlphaChips, Korea); Jaewoo Park, Woosang Han, Kyuhwan Oh, Taekjun Ann, Jun-Gi Jo and Ook Kim (AlphaChips, Korea); Changsik Yoo (Hanyang University, Korea)
A system-on-chip (SoC) has been develop in a 130-nm CMOS that converters HDMI input to MHL output. The SoC allows a mobile handset to display its video contents on a large screen display. The functionalities of the SoC have been verified by compliance tests.

**Tutorial 5: Brian Zahnstecher (PowerRox): Power-Driven Consumer Market Disruption**

Brian Zahnstecher, Principal of PowerRox
Room: N253
Chair: Nicholas C H Vun (Nanyang Technological University, Singapore)

Whether realized or not, power solutions are driving what is possible for consumer electronics at every level from smartphones to the latest in wearable technology. Furthermore, power solutions are enabling game changing paradigm shifts in the way consumer electronic products are designed, manufactured, and marketed. Even today, you can eliminate your AC wall adapter, charge your device wirelessly, and potentially run a wearable device for many years off a small cell battery. This tutorial will provide an in depth look at power technology to give an attendee an understanding of what drives power solutions (today & tomorrow) and how those solutions enable leading edge consumer products. The content is for a target audience of engineers, design managers, program managers, commodities managers, and sales/marketing personnel. Part one will focus on many fundamental aspects of power solutions to help one understand the importance of power efficiency, key design tradeoffs (i.e. cost, efficiency, manufacturability, etc.), and how intelligent design in both the HW and SW space maximizes the use of every last milliwatt. Part two will build upon the content learned in the first part to bridge this information with the consumer electronics application space and highlight several technologies and markets driven by power electronics.

**Monday, January 11, 12:10 - 13:20**

**Lunch/Keynote: Donghoon Lee, Executive VP IC Segment, SK Hynix Corp., KR**
Room: N255/257/259
Chair: Francisco J. Bellido Outeiriño (University of Córdoba, Spain)

**Monday, January 11, 13:20 - 14:10**

**Awards Luncheon**
Room: N255/257/259

**Monday, January 11, 14:10 - 15:50**

**IT08 - Privacy and Personal Security**
Room: N254
Chair: Daniel Díaz-Sánchez (Universidad Carlos III de Madrid, Spain)

14:10  **Towards Securing Discovery Services in Internet of Things**
Soumya Kanti Datta (EURECOM & Co-Founder, Future Tech Lab, France)
Adopting adequate mechanisms for security and privacy are critical to the success of Internet of Things (IoT). This paper attempts to provide secure solutions for thing authentication and access control for thing discovery. A prototype, early performance evaluation results and its deployment in a smart home is also described.

14:30 **Format Preserving Speech Encryption for Secured Voice Service on 3G/LTE Network**
Han-gil Moon (Samsung Electronics, Korea); Kiho Cho and Soonho Baek (Samsung Electronics co. Ltd., Korea)
The speech encryption for 3G/LTE service is proposed. In the presented method, encryption is applied to the payload part of the codec bit-stream. With this approach, the bit-stream structure is preserved and it can travel on commercial network. Interoperability and compatibility test, call latency and voice quality test are performed

14:50 **Finger Vein Biometric: Smartphone Footprint Prototype with Vein Map Extraction Using Computational Imaging Techniques**
Shabab Bazrafkan (NUI Galway, Ireland); Tudor Nedelcu (National University of Ireland Galway, Ireland); Claudia Costache (National University of Ireland, Galway, Ireland); Peter Corcoran (National University of Ireland, Galway & National University of Ireland Galway, Ireland)
A new vein structure based biometric approach is introduced in this paper. The idea is to use the finger vein structure in the intermediate phalange to identify or authenticate individuals. The concept of the hardware is to be implementable in handheld devices. Hardware configuration and software implementation are presented.

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RT01C: RF & Wireless & Network Technologies

Room: N256
Chair: Reinhard Moeller (University of Wuppertal, Germany)

14:10 **SM-MIMO Scheme with FTN Signalling for UHDTV**
Bong Gyun Jo (School of Electronics Engineering, Kyungpook National University, Korea); Myungchul Park and Dong Seog Han (Kyungpook National University, Korea)
In this paper, a faster-than-Nyquist (FTN) based spatial modulation-multi-input multi-output (SM-MIMO) scheme is proposed to improve the channel capacity. The maximum throughput of the proposed scheme is up to twice that of the SM-MIMO scheme. It is also robust in the correlated channel environments.

14:30 **Load Modulation Based MIMO Communication for the Low Complexity and Low Power Consumption**
Changyoung An and Heung-Gyoon Ryu (Chungbuk National University, Korea); Seung Hwan Lee (ETRI, Korea); Masahiro Umehira (Ibaraki University, Japan); Tokumi Yokohira (Okayama University, Japan)
In this paper, we design LM-MIMO system using high-order m-PSK modulation and evaluate performance of the system. As simulation results, we can confirm that LM-MIMO system with high-order m-PSK modulation has a similar performance to conventional MIMO system with a number of RF chains.

14:50 **System Level Approach for Low Energy Consumption in Wireless Personal Area Networks**
Dae-Hyun Kim (Samsung Electronics, Korea); Kitaek Bae (Samsung Electronics Co., Ltd, Korea)
In this paper, we discuss the total energy consumption in terms of both bandwidth and transmission time and provide an intuitive system level methodology for low energy consumption in WPAN.

15:10 **An Implementation of Link Analysis Jitter Algorithm in the Presence of Receiver Non-Linearity**
Tapan Khilnani (Penn State Harrisburg, USA); Sedig S Agili (Penn State University, USA); Aldo Morales (Penn State Harrisburg, USA); Jeremy Blum (Penn State University, Harrisburg, USA); Mike Resso (Keysight Technologies, USA)
A hashmap implementation of the link analysis technique for obtaining jitter is proposed, under non-linear receiver conditions. The jitter PDF obtained from the link analysis, which typically assumes an LTI system, is passed through the I/O non-linear CMOS receiver voltage characteristics, obtaining the final jitter distribution. Simulations show promising results.

15:30 **An Efficient Fault Tolerance Path Finding Algorithm for Improving the Robustness of Multichannel Wireless Mesh Networks**
Liang-Bi Chen (BXB Electronics Co., Ltd. & National Sun Yat-Sen University, Taiwan); Bo-Chuan Cheng (ASE Group, Taiwan); You-Chiu Wang and Katherine Shu-Min Li (National Sun Yat-Sen University, Taiwan); Jing-Jou Tang (Southern Taiwan University of Science and Technology, Taiwan)
This paper presents fault-tolerance path-finding algorithm for resilient communication paths among routers to improve network robustness. Simulation results show that the proposed algorithm achieves 100% robustness and fault tolerance when only one link fails. In addition, it can tolerate around 29.71%-45.61% of link failure in the network.
RT03G: AV Systems, Image/Video Processing

Room: N261
Chair: Bingo Wing-Kuen Ling (Guangzhou, P.R. China)

14:10 *Mobile Authoring Platform and Mobile App for High Quality Stereoscopic Contents*
Seongjin Park and Il Kyu Park (Electronics and Telecommunications Research Institute, Korea); Seong-Jun Bae (ETRI, Korea); DoHyung Kim (Electronics and Telecommunications Research Institute, Korea)
We propose the design method for 3D image authoring platform and mobile apps using the platform. The 3D image authoring platform provides three functions: object recognition and segmentation, hole filling in occlusion area, and object removal and hole filling in the removed area.

14:30 *SATD Based Intra Mode Decision Algorithm in HEVC/H.265*
Jongho Kim (ETRI, Korea)
HEVC which is the next generation video coding standard provides up to 35 intra prediction modes to improve the coding efficiency. These various prediction modes bring a high computation burden. In this paper, the fast intra mode decision algorithm is proposed.

14:50 *An Adaptive Selection of an SRAM Cell Size for Power Reduction in an H.264/AVC Encoder*
Hyun Kim (Seoul National University, Korea); IK Joon Chang (Kyung Hee University, Korea); Hyuk-Jae Lee (Seoul National University, Korea)
This paper proposes a novel method to select the appropriate SRAM cell sizes in an H.264/AVC encoder according to the sensitivities of the SRAMs to the quality loss caused by SRAM failures. The proposed scheme achieves a significant PSNR improvement, an average of 2.2dB at 900 mV operation.

15:10 *A Review and Comparative Study of Skin Segmentation Techniques for Handheld Imaging Devices*
Adrian-Stefan Ungureanu, Hossein Javidnia and Claudia Costache (National University of Ireland, Galway, Ireland); Peter Corcoran (National University of Ireland, Galway & National University of Ireland Galway, Ireland)
A number of well-known algorithms for skin segmentation in unconstrained acquisition conditions are tested across known and less known color spaces. A comparative analysis and discussion of the results are presented when taking into account images acquired with various handheld devices under realistic lighting and background conditions.

RT04B: Automotive Electronics and Entertainment

Room: N262
Chair: Carsten Dolar (Robert Bosch GmbH, Germany)

14:10 *Effective Character Segmentation for License Plate Recognition Under Illumination Changing Environment*
Daehun Kim and Taeyup Song (Korea University, Korea); Younghyun Lee (Hanwha Techwin, Korea); Hanseok Ko (Korea University, Korea)
In this paper, we propose a novel image segmentation algorithm for license plate (LP) recognition in video based traffic surveillance system.

14:30 *Real Time Traffic Light Recognition Based on Saliency Map*
SangGi Kim (Kyungpook National University, Korea); Seunghwa Hyun (eKdac, Korea); Eunjeong Jang and Dong Seog Han (Kyungpook National University, Korea)
a traffic light recognition system for real-time processing has been proposed. The conventional saliency map is hardly applicable to traffic light recognition systems due to its high complexity. The proposed system is made for a real-time traffic light recognition system by optimizing the saliency map.

14:50 *Linear Programming Algorithms for Sensor Networks Node Localization*
Kun Xu and Hongli Liu (HuNan University, P.R. China); Dawei Liu (Xi'an Jiaotong-Liverpool University, P.R. China); Xin Huang (Xi'an Jiaotong-Liverpool University, P.R. China); Fen Hou (University of Macau, Macao)
Localization with a small number of beacons is a challenging problem in wireless network. we propose a linear programming algorithm to address the problem. We formulate the nonlinear problem as a simple linear programming using linear approximation. Simulation results demonstrate that the proposed algorithm can maintain a better positioning accuracy.

RT07C: Energy Management
14:10 **Design and Implementation of a Home Automation System for Smart Grid Applications**  
Abdelhakim Ahmim, Tam Le, Esther Ososanya and Sasan Haghani (University of the District of Columbia, USA)  
A home automation system for smart grid is designed and implemented. The system monitors temperature and humidity and controls HVAC, lights and appliances. The MQTT protocol and Django web framework are used. A graphical user interface is developed to enable the user to control the devices remotely via a website.

14:30 **Experimental Performance Analysis of DER Network Communication in IEC 61850 Server**  
Yoon-Sik Yoo and Il-Woo Lee (ETRI, Korea); Jun Kyun Choi (KAIST, Korea)  
This paper proposes DER network interface for improving the data transfer performance in the IEC 61850 server, and analyzes data acquisition, processing and transfer performance between the legacy and the proposed architecture. The proposed scheme is to reduce the data delivery time using an enhanced DER network interface.

14:50 **Modular Energy Management System Applicable to Residential Microgrids**  
Adriana Luna and Nelson Diaz (Aalborg University, Denmark); Moisés Graells (Universitat Politècnica de Catalunya, Spain); Josep M. Guerrero and Juan Vasquez (Aalborg University, Denmark)  
In this paper, an energy management system is defined as a flexible architecture. This proposal can be applied to home and residential areas when include generation units. The system has been integrated and tested in a grid-connected microgrid prototype, where optimal power generation profiles are obtained by considering economic aspects.

15:10 **Development and Integration of a HEMS with an Advanced Smart Metering Infrastructure**  
Enrique Rodriguez-Diaz (Aalborg University, Denmark); Emilio J. Palacios-Garcia (University of Cordoba, Spain); Mehdi Savaghebi, Juan Vasquez and Josep M. Guerrero (Aalborg University, Denmark)  
Advanced metering infrastructures are required for the future smart grid operation by providing useful information of user’s consumption and power quality. This paper shows the development of a LabVIEW application for user-interface and implementation of a Home Energy Management System (HEMS) with an advanced smart metering infrastructure.

**Tutorial 6: Patrice Roulet (ImmerVision): Create, share and experience in 360° - the next generation of visual connectivity.**  
Go To Top

Patrice Roulet Fontani, Co-founder of Technology and Director, Engineering at ImmerVision  
Room: N253  
The first selfie (image of me), captured by a J-SH04 phone from J-Phone (now SoftBank) in Japan in November 2000, was a 0.11-megapixels narrow field of view image with the ability to send the photos electronically. With the combination of a camera and connectivity in the same device, the era of visual communications started, opening a small keyhole into people's day-to-day lives. Since then, a variety of electronic products embedding cameras, such as wearables, mobile phones, web cams, home cams, tablets, sports cameras, drones and cars, have appeared in the consumer market. This availability has driven the growth of video communications and the demand for high resolution sensor and lens technology. Today, most connected devices still offer a narrow field of view experience, while most camera designs are an incremental improvement on the original late 90's design. On the back of the race to higher resolution and better image quality, another trend is emerging: to capture, share and experience immersive content. One of the challenges of the 360° and virtual reality (VR) industry is to define a video standard between devices and software that ensures a plug and play immersive experience. This presentation will introduce different initiatives to capture, share and experience 360° content, and will present the future user experience resulting from a complete standardized ecosystem of interconnected 360° devices and software. Users are ready to move away from narrow angle keyhole capture devices and open a large 360° window to share experiences of their daily lives.

**Monday, January 11, 15:50 - 16:20**  
Go To Top

Room: Hall Area
Tuesday, January 12

Monday, January 11, 16:20 - 18:00

IT09 - Home Video

Room: N254
Chair: Nicholas C H Vun (Nanyang Technological University, Singapore)

16:20 **Smooth Playback Method in the Trick Mode for Home Network**
Masaaki Shimada, Kosuke Yagi and Nobuo Takeshita (Mitsubishi Electric Corporation, Japan)
When playing back videos with trick mode such as fast-forward and fast-rewind via home network, viewer may feel uncomfortable because of its unstable frame rate. This paper proposes the smooth playback method which has achieved a stable frame rate with statistical picture selection algorithms.

16:40 **In-Source Video Summarization**
Kousik Ramasubramaniam Sankar and Ganeshkumar Annamalai (CISCO Video Technologies, India)
As newer applications/services - under the Internet-of-Things -- get enabled, it becomes infeasible to use the traditional video summarization meta-data. This paper presents a mechanism to define/efficiently utilize the meta-data for summarization. The main advantage is portability across various platforms/decoder implementations. Overheads due to such a change are also depicted.

RT03H: AV Systems, Image/Video Processing

Room: N261
Chair: Yeong-Kang Lai (National Chung Hsing University, Taiwan)

16:20 **Hybrid Visible + Near Infrared Color Filter Array for Handheld Consumer Imaging Applications**
Tudor Nedelcu (National University of Ireland Galway, Ireland); Shejin Thavalengal (National University of Ireland, Galway & FotoNation, Ireland); Peter Corcoran (National University of Ireland, Galway & National University of Ireland Galway, Ireland)
The joint acquisition of multispectral images raised a lot of interest due to the applications that can be performed using long spectrum. We will propose a hybrid color filter array, which is able to acquire a good quality image form near infrared spectrum and satisfactory quality for the visible one.

16:40 **Real-time Eye Tracking Technique for Multiview 3D Systems**
Suk-Ju Kang (Sogang University, Korea); Yong-woo Jeong (Dong-A University, Korea); JaeJung Yun (Daegu University, Korea); Sungwoo Bae (Yeungnam University, Korea)
This paper presents a real-time eye tracking technique for multiview systems. It used the Haar-based face detection and HoG-based classification. Then, it extracts eye positions using biological proportion and the pre-calculated database. Simulation results showed the proposed method enhanced the average F1 score up to 0.312, compared with conventional methods.

17:00 **Semi Heuristic Optimization of Search Algorithm for Satellite Broadcasting Receiver: Reducing Channel Setting Time**
JunHee Woo (Samsung Electronics Co., Ltd. & KAIST, Korea); SangYoon Min (KAIST, Korea)
This paper is to reduce the time that the receiver device takes to find the transmission frequency for the initial channel setting of receiving devices such as Digital TV which uses satellite broadcast. We propose two search algorithms based on the frequency allocation information of the transmission frequency of SCRs.

17:20 **Multi-Microphone Approach for Reliable Acoustic Data Transmission**
Kiho Cho and SooHo Baek (Samsung Electronics Co. Ltd., Korea); Han-gil Moon (Samsung Electronics, Korea); Nam Soo Kim (Seoul National University, Korea)
Acoustic data transmission (ADT) is an audio watermarking technique enabling data communication in short-range aerial space. In this paper, we extend our ADT method to multichannel approaches utilizing multiple microphones. From the experimental results, the proposed approach is effective in reducing bit
errors in real room environments.

17:40 **Content Dependent Intra Mode Selection for Medical Image Compression Using HEVC**
Saurin Parikh (Florida Atlantic University & Nirma University, USA); Damian Ruiz (Universitat Politècnica de València, Spain); Hari Kalva (Florida Atlantic University, USA); Gerardo Fernandez (University of Castilla La Mancha, Spain)
This paper presents a method for complexity reduction in medical image encoding that exploits the structure of medical images. The HEVC lossless intra coding of medical images of CR modality, shows reduction up to 52.47% in encoding time with a negligible penalty of 0.22%, increase in compressed file size.

**RT06C: Health and Wellness**

Room: N256
Chair: Jianwen Chen (Harvard University, P.R. China)

16:20 **A Multi-Holding-Pose Enrollment Method for Robust ECG Identification**
Jeffry Bonar Fernando and Koji Morikawa (Panasonic Corporation, Japan)
A new enrollment method for ECG identification is proposed. ECG is enrolled when user holds ECG sensor in the center, left side, right side, upside, and downside of the body. Experiments show that identification accuracy with the proposed enrollment method is improved from 3 to 13 percentage points.

16:40 **Preliminary Development of A Soft Robotic Ultrasound Steering System**
Hongliang Ren (NUS, Singapore)
The project aims to develop and design an apparatus to automate the Ultrasound scanning procedures based soft robotics technology. A soft robotics probe was developed for the purpose and is able to manipulate the ultrasound probe on a single targeted surface to obtain an ultrasound image.

17:00 **Smart Brief Monitoring System for Assisted Living**
Mohammad Taghi Mohebbi, Florian Luaire, Douglas Jackson and John Naber (University of Louisville, USA)
A system for monitoring the moisture level and temperature of an adult brief is designed and tested. The system uses an inexpensive disposable moisture sensor patch combined with a re-usable temperature sensor and BLE transceiver. The data can be processed locally or stored on a server to be analyzed globally.

17:20 **Medication Adherence by Using a Hybrid Automatic Reminder Machine**
Y. W. Bai and Ting-Hsuan Kuo (Fu Jen Catholic University, Taiwan)
This medication reminder machine includes both the pill and the continuous medical tablet/powder bag reminder modules. Both modules use MCUs with software to control the LED and the buzzer to remind the user according to the schedule. In addition, the Bluetooth bracelet will sound and flash to remind the user.

**RT07D: Energy Management**

Room: N264
Chair: Stefan Mozar (UNSW, Sydney & Dynexsys Pty Ltd, Australia)

16:20 **Data Flow CAD Tool for Firmware Development and Power Consumption Estimation in Multi-core Hearing Aids**
Momcilo Krunic and Ivan Povazan (RT-RK Institute for Computer Based Systems, Serbia); Miroslav Popovic and Jelena Kovacevic (University of Novi Sad, Serbia)
This paper depicts highlights of data flow CAD tool used for firmware development at the highest level of abstraction, with the ability of source code profiling and power consumption estimation for heterogeneous multi-core hearing aids.

16:40 **High Efficient Multiple-input Buck-Boost Converter for Energy Harvesting Systems**
Sungwoo Bae (Yeungnam University, Korea); JaeJung Yun (Daegu University, Korea)
This paper proposes a high efficient multiple-input buck-boost converter which can be used in the energy harvesting systems. The higher energy conversion efficiency compared with the previous multiple-input converter is obtained with soft switching technology in the proposed topology. This soft switched multiple-input converter was verified with simulation results.

17:00 **Energy Load Management for Residential Consumers in Smart Grid Networks**
Saba Al-Rubaye (Quanta Technology, LLC., Canada); Bong Jun David Choi (The State University of New York (SUNY) Korea & Stony Brook University, Korea)

We propose an energy demand scheduling optimization for residential smart grid networks using an integer linear programming (ILP). Then, we introduce a new algorithm that can prioritize load appliances according to the real-time energy demand. Simulation results confirm that the proposed model can manage energy demand while considering consumers preferences.

17:20 **Reduction of the Standby Power Consumption of an Automatic Door System**
Cheng-Hung Tsai (National Taiwan University of Science and Technology, Taiwan); Y. W. Bai and Po-Chen Chen (Fu Jen Catholic University, Taiwan); Roger Jia Rong Jhang (National Taiwan University of Science and Technology & Fu Jen Catholic University, Taiwan); Ming-Bo Lin (National Taiwan University of Science and Technology, Taiwan)

This paper presents a way to reduce the standby power consumption to 50 mW of an automatic doors in the standby state.

**RT08C: Other CE Related Innovations and Applications**

Room: N262
Chair: Bingo Wing-Kuen Ling (Guangzhou, P.R. China)

16:20 **Challenges of Integrating Android to a TV Service Operators’ Ecosystems**
Milan Z. Bjelica (University of Novi Sad, Serbia); Nenad Jovanovic (RT-RK Institute for Computer Based Systems, Serbia); Gordana Velikić (RTRK Computer Based Systems LLC, Serbia); Nikola Teslic (University of Novi Sad, Serbia)

To make an offering to service operators, suppliers of Android-based end-to-end systems need to address challenges such as user experience streamlining vs differentiation, for example, with regard to AOSP applicability versus the use of GMS. This paper discusses the most rewarding options to integrate Android into the operators' ecosystems.

16:40 **Energy Detection Analytical Model for Handoff Process to Support Mobile Cloud Computing Environment**
Qassim Bani Hani and Julius Dichter (University of Bridgeport, USA)

Mobile devices play an integral role in our day lives and have brought the revolutionary change in business, education, and entertainment. Moreover, the emergence of cloud computing technology greatly extended the significance of smart device. On the other hand, the smart devices experience the problem when obtaining the multiple cloud services during the handoff process. In this paper, we propose an energy detection (ED) analytical model for handoff process that calculates the energy consumption for each handoff process in the cloud computing environment. Our ED analytic model is developed to examine the consumed energy for different handoff processes in cloud computing. The model helps the mobile users to get prior information for the status of the mobile when executing the handoff process. To reconfirm the validity of ED analytical model, we have test programmed in NS2. The results demonstrate that the ED analytical model efficiently detects the energy consumption of mobile devices during the handoff process in cloud computing environment.

17:00 **Cooperative Management for a Cluster of Residential Prosumers**
Adriana Luna and Nelson Díaz (Aalborg University, Denmark); Moisés Graells (Universitat Politècnica de Catalunya, Spain); Josep M. Guerrero and Juan Vasquez (Aalborg University, Denmark)

This paper proposes an energy management system for coordinating distributed prosumers. The prosumers are residential microgrids which internally produce and consume energy for autonomous operation. However, better performance is achieved by cooperative operation with other prosumers neighbors. Experimental results validate the proposed strategy.

17:20 **Accurate, wearable, wireless and pinless blood glucose measurement system modeled by a set of fractional differential equations**
Bingo Wing-Kuen Ling (Guangzhou, P.R. China); Xiao-Chi Zhang (Guangdong University of Technology, P.R. China); Jun Xiao (Gungagdong University of Technology, P.R. China); Kim Fung Tsang (City University of Hong Kong, Hong Kong)

This paper models the relationship between the blood glucose concentration and the measurements by a set of fractional differential equations. Since the fractional differential equation model is a generalization of the integer differential equation model, the accuracy of the model can be significantly improved.

**Monday, January 11, 18:00 - 18:15**

**Closing**

Room: N255/257/259