

# **2013 IEEE Third International Conference on Consumer Electronics - Berlin**

**(ICCE-Berlin 2013)**

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Sunday, September 8 and Monday, September 9

## 2013 ICCE-Berlin Technical Program

12:00 - 18:00

### Doctoral Workshop

Room: B

Chair: Carsten Gremzow (University of Wuppertal, Germany)

Monday, September 9

09:00 - 09:30

### Opening

Room: A

09:30 - 10:15

### Keynote: Birger Kollmeier: Cocktail Parties and Binaural Hearing Aids: How hearing technology gets us connected

Room: A

Chair: Petra Friedrich (Hochschule Kempten, University of Applied Sciences, Germany)

10:15 - 11:15

### 1.1: Information and Communication Technology for People with Special Demands

Room: A

Chair: Sunish Gupta (MIT, USA)

#### **10:15 Smart Phone Based Assistive Speech Therapeutic System for Aphasia \*\*\*\*\***

**Kuo-Sheng Cheng** (National Cheng Kung University, Taiwan); **Cheng-Lin Shih** (National Cheng Kung University, Taiwan); **Jue-Long Wang** (Kaohsiung Veterans General Hospital, Taiwan); **Bing-Sin Jhang** (Kaohsiung Veterans General Hospital, USA); **Chun-Han Yang** (Kaohsiung Veterans General Hospital, USA)

Aphasia is one of the mostly common disease occurred in stroke survivors. It may impair the person's ability in listening, speaking, reading, and writing, but not the intelligence. The patient with aphasia needs to receive speech therapy as early as possible. However, the formal speech therapy may have some limitations and drawbacks. It is a time-consuming task for this one-to-one treatment, and the shortage of speech therapists for aphasic outpatients. In this study, a smart phone based system is proposed and develop to assist the speech therapy at home for Chinese. The experimental procedure here is a typical procedure called ABA experimental design. Two sets of words with each containing 30 words are employed in this study for system performance test. Basing on the correct rate and reaction time of these tests for two participants, it is demonstrated that the proposed system with the implemented program is feasible for speech therapy in home use. The more frequent the speech therapy, the better will be the recovery of aphasia.

#### **10:35 The application of robots and eye tracking devices in a general dentist's clinic \*\*\*\*\***

**Lisa L. Chen** (Dental Office of Andrew Hsieh, DDS & Lisa Chen, DDS & American Dental Association, California Dental Association, International Association for Orthodonti, USA)

A general dentist's clinic needs to deal with a large array of instruments which need to be cleaned, sorted, packaged, sterilized and set up on trays on a daily basis. In order to maximize efficiency, reduce cross contamination, reduce risk of work hazard accidents, and expand areas of service, we have proposed to take advantage of robots and eye tracking technology. Preliminary results seem to suggest that such technologies have the potential of improving the quality of care in a general dentist's clinic.

**10:55 Telematic Rehabilitation 2.0**

Kai-Uwe Hinderer (Hochschule Kempten, Germany); Petra Friedrich (Hochschule Kempten, University of Applied Sciences, Germany); Otto Höbel (Medica Medizintechnik GmbH, Germany); Bernhard Wolf (Technische Universität München, Germany)

This project is motivated due to the facts that first, the compliance of device-based therapy for extended periods lies often below 50 percent [1] and second, every second household is equipped with both a powerful computer and a flat-screen TV ([3], [4]). To connect these facts, comprises the concept of this project. For an increased motivation to use the daily hours of media consumption simultaneously for rehabilitation, a data animation is combined with a browser window or media player. Further, with the COMES(R)-interface, a therapist has the possibility to interact with the user and animation. The objective of this project is to reduce the motivational threshold of a daily training and thus increase the compliance in long term rehabilitation.

## 1.2: Source Coding I

Room: B

Chair: Dan Grois (Fraunhofer Institute for Telecommunications - Heinrich Hertz Institute, Germany)

**10:15 Bézier Spline Fitting Approach for Rotational Animation Encoding in MPEG 4 Part 25**

Juergen Wuenschmann (Universitaet Ulm, Germany); André Burkard (Universitaet Ulm, Germany); Christian Feller (University of Ulm, Germany); Albrecht Rothermel (University of Ulm, Germany)

Object-based video representation and coding promises to keep the largest amount of scene information during video transmission and processing for animated video. We propose a new codec for rotational animation in MPEG 4 Part 25, that is more connected to the input format and can therefore avoid drawbacks of the current implementation. The codec uses Bézier spline fitting to approximate the animation curves. With that approach a mean saving of over 60% is achieved.

**10:35 Higher Compression Rates for Conjugate Structure Algebraic Code Excited Linear Prediction**

Islam Amro (Al-Quds Open University, Palestine)

In this paper, we used the lossless compression algorithm of Hamming Correction Code Compressor (HCDC) in compressing the parameters of the ITU-T G.729 CODEC, which is the Conjugate Structure Algebraic Code Excited Linear Prediction. This standard has two rates; the standard rate with 8 Kbps and Annex D rate with 6.4 Kbps. The CODEC Parameters were generated using the standard ITU source Codes. These parameters includes linear prediction coefficients represented as LSPs, Gain and Excitation Bits, forming 80 bits for the standard rate and 64 bits for annex D rate. These bits are calculated over frames of 10 ms duration each. In this Papers; the HCDC compression algorithm was tested against both rates, the original signal's frames were grouped into four frames of 320 bits for 80 bits frames and 256 bits for annex D frames, then the compression performance were evaluated. Testing data set used were voices of four adult English speaking males and females. HCDC was able to reduce transmission rate by 50% in average for both CODEC rates. The results were compared to the entropy compression methods (Golomb-Rice) implemented in FLAC package, these methods could reduce the data rate by 22% in average. The overall compression performance were evaluated by averaging the compression rates for all frames for each sample in data set. HCDC were able to compress on parity=3 only. For other parity values; few blocks were valid, and the overall compression rate for frames were below 1.

**10:55 A Flexible Signalling Structure for Content Delivery in Dynamic Broadcast**

Junge Qi (Braunschweig Technical University, Germany); Ulrich Reimers (Braunschweig Technical University, Germany)

In this paper, we analyze the requirements imposed by Dynamic Broadcast on the content delivery signalling and propose extensions to the current signalling structure developed by the DVB project to meet these requirements.

**11:15 - 11:40**

## Coffee Break

Room: Break Area

**11:40 - 13:00**

## 2.1: Ambient Assisted Living

Room: A

Chair: Petra Friedrich (Hochschule Kempten, University of Applied Sciences, Germany)

**11:40 An activity monitoring system for detecting movement by a person lying on a bed**

Eisuke Hanada (Shimane University Hospital, Japan); Tatsuto Seo (Sanin Seigyō Corporation, Japan); Hiroshi Hata (Sanin Seigyō Corporation, Japan)

To protect against falls by patients leaving bed, we developed a system for beds that detects a variety of movements. Our system consists of sensor bars that use switches common to PC keyboards, a processor, and a communication device. This paper reports an examination of the effectiveness of

the system in which we found that the functions worked well. The system is ready for commercialization. We plan to improve the system to fit the beds of other companies and to fit Japanese "Futon."

**12:00 Towards a Scalable infrastructure for Ambient Assisted Living \*\*\*\*\* %**

Jie Wan (CLARITY Centre for Sensor Web Technologies, University College Dublin, Ireland)

Extensive effort has been dedicated to the research and development of Ambient Assisted Living technologies. Specifically, sensor technologies are widely perceived as offering a foundation that enables behavior monitoring, and the categorization of Activities of Daily Living. Meanwhile, in the outdoors, GPS tracking has been harnessed in multiple domains. However, research in both domains - indoor and outdoor tends to be insular. Thus, a critical need exists for a unified approach, both from a technological infrastructure perspective, and in terms of behavior classifier models that encompass indoor and outdoor activities. This paper considers the design of a test bed to enable such an integrated approach.

**12:20 Data-driven generation of rule-based behavior models for an Ambient Assisted Living system \*\*\*\*\* )**

Thorsten Rodner (University of Kaiserslautern, Germany); Lothar Litz (U Kaiserslautern, Germany)

In this paper we introduce an approach for modeling the typical behavior of inhabitants in smart homes. The presented modeling process is data-driven and based on unsupervised learning methods. The models consist of association rules that are automatically generated from collected sensor telegrams by data mining. The intended application for such models is the detection of alterations in the mid- or long-term behavior indicating possible changes in health conditions of users of Ambient Assisted Living systems. We successfully applied the modeling approach to real world sensor data recorded in permanently inhabited flats.

**12:40 New mobility concepts for disabled and elderly people \*\*\*\*\* -**

Michael Häcker (Hochschule Kempten, Germany); Petra Friedrich (Hochschule Kempten, University of Applied Sciences, Germany); Bernhard Wolf (Technische Universität München, Germany)

This paper deals with the development of a new mobility concept for disabled and elderly people. The core of our project is a wheelchair which can climb stairs. For this purpose the wheelchair has to be extremely manoeuvrable and therefore suitable for indoor and outdoor usage. A further aim is the integration of the wheelchair into a car. With its help the user is able to travel longer distances by car. INTRODUCTION One of the first wheelchairs was invented in the 6th century. Since then, there were many improvements in technical and operational issues. Nevertheless, wheelchairs cannot meet all needs yet and inventors have since been coming up with new technical solutions in order to support disabled people. An important point within this old but actual field is the development of an increasingly old society. This change in population provides a further reason to come up with new supporting mobility solutions. According to [1] the share of disabled people in our population with increasing age grows. Almost every third of the over 80 years old is categorised as disabled. Disabled does not equal the need of a wheelchair but gives us a rough tendency. Due to that, the Kempten University of Applied Sciences in cooperation with the Technical Universität München develops a new wheelchair for assisted mobility. STATE-OF-THE-ART The following selection shows state-of-the-art wheelchairs with electric drive which are able to climb stairs autonomously. • iBot® 4000 by Independence Technology: The stair climbing mechanism works after the principle of dynamic stabilisation similar to the Segway® PT [3]. Both axes rotate around each other and move the wheelchair body, which is fixed between the two axes, over the steps [4]. Disadvantage: User needs a healthy and strong upper body part in order to hold the banister and shift weight. • Explorer by TGR and TopChair by TopChair: These two wheelchairs use extendable crawler chains for stair climbing.

## 2.2: Source Coding II

Room: B

Chair: Sharon Peng (Harman International, USA)

**11:40 HEVC Performance and Complexity for 4K Video \*\*\*\*\* ( (**

Benjamin Bross (Fraunhofer HHI, Germany); Valeri George (Fraunhofer HHI, Germany); Mauricio Alvarez-Mesa (Fraunhofer HHI, Germany); Tobias Mayer (Fraunhofer HHI, Germany); Chi Ching Chi (Fraunhofer HHI, Germany); Jens Brandenburg (Fraunhofer Institute for Telecommunications, Heinrich-Hertz-Institut, Germany); Thomas Schierl (Fraunhofer HHI, Germany); Detlev Marpe (Fraunhofer Institute for Telecommunications - Heinrich Hertz Institute, Germany); Ben Juurlink (Technische Universität Berlin, Germany)

The recently finalized High-Efficiency Video Coding (HEVC) standard was jointly developed by the ITU-T Video Coding Experts Group (VCEG) and the ISO/IEC Moving Picture Experts Group (MPEG) to improve the compression performance of current video coding standards by 50%. Especially when it comes to transmit high resolution video like 4K over the internet or in broadcast, the 50% bitrate reduction is essential. This paper shows that real-time decoding of 4K video with a frame-level parallel decoding approach using four CPU cores is feasible.

**12:00 Fast Partitioning Depth Decision Based on Skipping Block Sizes in HEVC \*\*\*\*\* B#5**

Rihab Haouachi (Al Manar University, Tunisia); Azza Ouled Zaid (El manar University, Tunisia); Purnachand N (University of Aveiro, Portugal); Luis Nero Alves (Universidade de Aveiro & Instituto de Telecomunicações, Portugal); Antonio Navarro (University of Aveiro, Portugal)

High Efficiency Video Coding (HEVC) is the latest video coding standard developed under joint collaboration of ITU-T VCEG and ISO/IEC MPEG, together under the name JCT-VC (Joint Collaborative Team on Video Coding) [1-2]. Recently, in February 2013, this video coding standard was issued by ITU as H.265 and by ISO/IEC as MPEG-H Part 2. The number of possible coding block sizes (block modes), and therefore its complexity, increased in comparison to its predecessor H.264/MPEG-4 AVC. For each 64x64 pixel coding unit (CU), there are 659 CU partitions. In the encoding process, very few CU partitions are selected. In this paper, we avoid the calculation of most likely unselected CU partitions in Inter coding. Using TZ motion estimation algorithm, our fast partitioning depth decision mode algorithm saves 17% of the complexity, with negligible loss in PSNR and bit rate, in comparison to algorithm implemented in HEVC test model (HM) 10.0 encoder.

**12:20 Fast Sample Adaptive Offset Encoding Algorithm for HEVC based on Intra Prediction Mode \*\*\*\*\* ) \$**

Jaehwan Joo (Samsung Electronics, Korea); Yongseok Choi (Samsung Electronics, Korea); Kyo-Hyuk Lee (Samsung Electronics, Korea)

Monday, September 9

This paper presents a fast sample adaptive offset (SAO) encoding algorithm in High Efficiency Video Coding (HEVC). The key idea of a proposed method is to simplify decision of the best SAO edge offset class by exploiting intra prediction mode information instead of exhaustive RD cost calculation for all classes. The proposed method reduces encoding time about 77.3% only with 0.8% BD-rate degradation under common test condition of HEVC reference software version 10.0.

#### **12:40 High throughput VLSI architecture supporting HEVC Loop Filter for Ultra HDTV**

([Mihir N Modu](#) (Texas Instruments, India); [Niraj Nandan](#) (Texas Instruments, India); [Hideo Tamama](#) (Texas Instruments, USA))

In-Loop filtering in HEVC/H.265 is one of most computation intensive block taking around 15-20% of overall complexity for decoding. The loop filtering in HEVC is more sophisticated with introduction of Sample adaptive offset (SAO) filter in addition to de-blocking filter in comparison to H.264. In this paper, very high performance as well as area efficient VLSI architecture is proposed for HEVC decoder, which supports 4K@60fps for next generation Ultra HDTV at 200 MHz clock. The design can process Largest Coding Unit (LCU) of size 64x64 in less than 1200 cycles in all scenarios. The architecture consists of LCU level pipelining across de-blocking and SAO filtering with four & three stage internal pipeline within each block. The architectures proposes fully on-the-fly filtering avoiding memory bandwidth, custom filtering order as well as scanning, 4x4 based block processing and FIFO based asynchronous architecture to achieve high performance. The final design in 28nm CMOS process is expected to take around 0.2 mm<sup>2</sup> after actual placement & routing. The proposed design is capable of handling 4K@60fps as well as fully compliant to HEVC video standard specification including all corner conditions handling like slice and tiles processing via generic region definition.

**13:00 - 14:00**

### **Lunch**

Room: Break Area

**14:00 - 14:45**

### **Keynote: Johannes Clauss: Electronics for Better Health**

Room: A

Chair: Hans L. Cycon (HTW Berlin & Daviko GmbH, Germany)

**14:45 - 15:45**

### **3.1: Vital Parameter Monitoring**

Room: A

Chair: Bernhard Wolf (Technische Universität München, Germany)

#### **14:45 Care Of Cardiovascular Disease With COMES**

([Thomas Spittler](#) (Technische Universität München, Germany); [Bernhard Wolf](#) (Technische Universität München, Germany); [Petra Friedrich](#) (Hochschule Kempten, University of Applied Sciences, Germany); [Sebastian Köhl](#) (Technische Universität München, Germany); [Robin Weiß](#) (Technische Universität München, Germany))

Due to rising numbers of applications for rehabilitation treatment, the significance of medical rehabilitation in Germany increases steadily. Nevertheless, the duration of rehabilitation is limited to three weeks, making an efficient and successful post-rehabilitative aftercare essential. For this reason, a telematic system called COMES was developed at the Heinz Nixdorf Lehrstuhl für Medizinische Elektronik der Technischen Universität München. COMES supports the continuation of life style changes after rehabilitation as it collects and utilizes, daily and individually, important data concerning a patient's cardiovascular disease. Thus with COMES, e.g. physicians, are able to react immediately to worsening circumstances. Furthermore patients have an extensive overview of their own rehabilitation process.

#### **15:05 Smart-Clothes --- Prototyping of a Health Monitoring Platform**

([Yung-Cheng Ma](#) (Chang-Gung University, Taiwan))

Many countries, such as Taiwan and Japan, have become an aging society. Domestic health-care systems to provide elders long-term health monitoring are required in the aging society. This paper proposes a novel wearable platform for longterm health monitoring --- the smart-clothes platform. Utilizing the emerging electronic textiles, the smart-clothe is embedded with five types of sensors for health monitoring. The platform includes Based on the smart-clothe, a computing platform utilizing embedded gateway, smart-phone, and back-end cloud servers are designed for long-term sensors data collection and diagnosis. The platform enables wide-range of applications for health service based on smart-phones and cloud services.

#### **15:25 A User-based Heuristic Evaluation of an Intelligent Healthcare System**

([Alice May-Kuen Wong](#) (Chang Gung Memorial Hospital, Taiwan); [Tsai-Hsuan Tsai](#) (Chang Gung University, USA); [Kevin Tseu](#) (Chang Gung University, Taiwan); [Hsien Jui Chang](#) (Chang Gung University, Taiwan))

The current study aimed to evaluate an intelligent health care and promotion system. The developed system, named as CareTogether Pro, was designed for elderly people who are at risk for or suffering from metabolic syndrome that would enable them to manage their health by themselves and

improve their satisfaction towards distributed health care. In this study, a heuristic evaluation was employed to identify usability problems in the newly developed system among those users living in an elderly community. The results showed anticipation of both the value of the system as well as potential issues.

## 3.2: Video Processing I

Room: B

Chair: Hans L. Cycon (HTW Berlin & Daviko GmbH, Germany)

### **14:45 A true motion estimation method based on binarized cross correlation** \*\*\*\*\*,

Francesco Michielin (University of Padova, Italy); Giancarlo Calvagno (University of Padova, Italy); Piergiorgio Sartor (Sony Deutschland GmbH, Germany); Oliver Erdler (Sony Deutschland GmbH, Germany)

In this paper a new method that combines the traditional approaches of the phase correlation and block based recursive search for motion estimation is presented. Phase correlation is generally more complex but provides an immediate convergence and it is less affected by noise. Recursive search is already suitable for real time applications thanks to its wide implementation, but the increase of resolution in modern display and the request for real time software implementation demand for faster approaches. The proposed method solves this problem by means of a binarized cross correlation as a matching cost for a recursive search strategy. The results show a similar vector field estimation in comparison to the standard SAD based recursive search method with a considerable reduction of the computational effort.

### **15:05 An Efficient Video Stabilization System for Low Computational Power Devices** \*\*\*\*+',

Tae-Shick Wang (Samsung Electronic Co. Ltd., Korea); Tae-Chan Kim (Samsung Electronic Co. Ltd., Korea)

In this paper, we describe an efficient video stabilization (VS) system for low power devices, which produces an unwanted motion compensated video based on feature point (FP) extraction and matching methods. In our system, by extracting the constant number of FPs for every frame, video can be robustly stabilized with the consistent time complexity regardless of scene complexity. Experimental results show that our VS system can efficiently stabilize the video.

### **15:25 Adaptive Thresholding for Scene Change Detection** \*\*\*\*+)

Soongi Hong (Yonsei University, Korea); Beobkeun Cho (Yonsei University & Image&Information LAB., Korea); Yoonsik Choe (Yonsei University, Korea)

In previous scene change detection (SCD) method, the scene change is detected by comparing current detection measure with the fixed threshold which induced preceding experiments. Above method can not provide best performance on variety video sequence equally because the video sequence has a specific character of their own. For solving above problem we propose the adaptive threshold decision method based on mathematical modeling and analyzing. Our proposed method is better performance than the previous fixed threshold method on variety sequences.

**15:45 - 16:05**

## Coffee Break

Room: Break Area

**16:05 - 17:25**

## 4.1: RF & Wireless

Room: A

Chair: Alexander Huhn (Alpha-board GmbH Berlin, Germany)

### **16:05 Enhanced Blind Maximum Ratio Combining Using Channel Tap Masking for Broadcasting Applications** \*\*\*\*+)

Ben Eitel (Sony, Germany); Rana Ahmed (University of Stuttgart, Germany); Joachim Speidel (University of Stuttgart, Germany)

In this work, we propose a new mechanism to exploit the communication channel sparseness via channel tap masking for blind identification using multi-channel frequency least mean squares (MCFLMS). The proposed approach has the advantage of significantly enhancing the tracking capability of MCFLMS and making it robust to channel order overestimation. We provide BER simulation results for a 1 x 2 SIMO DVB-T2 system which shows the effectiveness of the proposed approach on blind maximal ratio combining (BMRC) using MCFLMS, especially when synchronization information is not available in the BMRC block.

### **16:25 Joint Mitigation of Carrier Frequency Offset and Phase Noise in DVB-T2 Receivers** \*\*\*\*; (

Nikolay N Tchamov (Tampere University of Technology, Finland); Ali Hazmi (Tampere University of Technology, Finland); Jukka Rinne (Tampere University of Technology, Finland); Mikko Valkama (Tampere University of Technology, Finland); Markku K. Renfors (Tampere University of Technology, Finland)

An enhanced algorithm for the suppression of ICI due to the joint presence of carrier frequency offset and phase noise is proposed. Originally developed for mitigation of ICI due phase noise only, the algorithm is modified to also efficiently mitigate ICI due to carrier offset with a minimal

increase in complexity. The technique is verified by simulations of a DVB-T2 receiver performance in the presence of either a basic free-running oscillator or a practical charge-pump PLL synthesizer.

**16:45 An IEEE 802.15.4g SUN FSK RF CMOS Transceiver for Smart Grid and CEs** \*\*\*\*, -

Seung Sik Lee (ETRI, Korea)

The proposed IEEE 802.15.4g SUN FSK (Frequency Shift Keying) RF CMOS transceiver, for the advanced ZigBee, can be adapted to Smart Grid application, but also CEs (Consumer Electronics) Application. With proposed SUN RF transceiver, wireless connectivity among CEs devices and electric meters can make lives more comfortable and save electronic energy. The proposed RF transceiver consists of a digital PLL (Phase Locked Loop), a Driver amplifier, a Modulator, a LNA (Low Noise Amplifier), Complex Band Pass Filter, 3-stage VGA (Variable Gain Amplifier), and Demodulator. The proposed RF transceiver is in CMOS technology as a part of SoC and consumes 18~34-mA implemented in a 0.18-μm TX and 28-mA in RX mode from a 1.8-V supply voltage. In addition, with a fabricated RF transceiver chip, we have succeeded a public demonstration.

**17:05 A Multi-Conductivity Dipole Antenna Design for Printed UHF RFID** \*\*\*\* - '

Pornanong Pongpaibool (National Electronics and Computer Technology Center, Thailand); Werayuth Wallada (NECTEC, Thailand); Siwaruk Siwamogsatham (National Electronics and Computer Technology Center, Thailand)

In this study, we propose a novel multi-conductivity dipole antenna design for improving the radiation efficiency performance of the UHF RFID tag and reducing the fabrication cost. By using the high-conductivity conductive material at the feed areas instead of thickening the conductive layer, the superior performance can be achieved without requiring additional reprinting process.

## 4.2: Video Processing II

Room: B

Chair: Dietmar Hepper (Technicolor, Germany)

**16:05 Quantitative Review of Local Descriptors for Visual Search** \*\*\*\* - ,

Daniilo Pietro Pau (STMicroelectronics, Italy); Raimondo Schettini (University of Milano Bicocca, Italy); Simone Bianco (UNiversity of Milano Bicocca, Italy); Davide Mazzini (STMicroelectronics, Italy)

Local Visual detectors and descriptors have been studied since many years, but their applications for large volume low cost embedded system have been limited or negligible to date. One reason is the lack of a standard. Fortunately MPEG is working on standardizing Compact Descriptors for Visual Search and selecting the top performing methods. As contribution to such process, this work reviews existing methods for interest point detection and visual descriptor synthesis. They are compared under a common pairwise matching test environment on selected databases, based on the tools devised by the standardization group MPEG CDVS. Performances are reported in term of precision at two different levels of False Alarm Rate

**16:25 Mixing Retrieval and Tracking using Compact Visual Descriptors** \*\*\*\* %'

Daniilo Pietro Pau (STMicroelectronics, Italy); Alex Buzzella (STMicroelectronics, Italy); Emanuele Plebani (Politecnico di Milano, Italy); Marco Marcon (Politecnico di Milano, Italy)

Visual search has seen many improvements over the years, but its application on video content is still an open research problem and often it is limited to still images. We developed a processing flow, based on the tools devised by the standardization group MPEG CDVS, which processes at nearly real-time a video acquired with a low cost imager and performs content search and retrieval of the top match from a local database. To allow an efficient interest point detection, we used a GPU accelerated SIFT library. To process the video frames efficiently, we developed a new dataflow processing which allows switching between object searching, retrieving and tracking to keep at minimum the number of queries sent to the database. A search into a local database is performed only when no object has been recognized, and once a good match has been found, the algorithm switches to tracking mode.

**16:45 A DCT Based In-Focus Visual Saliency Detection Algorithm** \*\*\*\* %\$,

Jayachandra Chilukamari (Robert Gordon University, United Kingdom); Sampath Kannagara (The Robert Gordon University, United Kingdom); Maxwell Grant (Robert Gordon University, United Kingdom)

A novel in-focus visual saliency detection algorithm is presented. This fast in-focus region detection algorithm detects salient-frequencies present in in-focus areas using Discrete Cosine Transform coefficients. The performance of this algorithm is compared against five state-of-the-art saliency detection algorithms. The results show that this algorithm consistently outperforms other saliency detection algorithms.

**17:05 Implementation of Super-Resolution Scaler for Full HD and 4K Video** \*\*\*\* %%

Hiroyuki Okuhata (Synthesis Corporation, Japan); Masanao Ise (SYNTHESIS Corporation, Japan); Roberto Omaki (Synthesis Corporation, Japan); Isao Shirakawa (University of Hyogo, Japan)

A sophisticated algorithm for 'super-resolution' image scaling is described, which can scale up from a given lower-resolution image to a high-resolution image with more accurate depiction of edges and details than the conventional interpolation algorithms. Specifically, the devised algorithm can enlarge a given image to arbitrary sizes without "jaggy" artifacts or blurring characteristics incurred in the conventional methods. The scaling process is executed through the following four steps; 1) calculating edge orientation, 2) calculating average edge orientation, 3) edge pattern detection, and 4) interpolation; which are pipelined to achieve efficient hardware implementation. Experimental results are shown in terms of the SSIM (Structural SIMilarity) index, to reveal the attainability of much improved image quality by this algorithm in comparison with the conventional ones. In addition, FPGA implementation results are also shown to demonstrate that the devised scaler can produce Full HD and 4K video frames in realtime.

17:45 - 18:45

## Welcome Reception

Room: A

## P.1: Poster Session 1

Room: A

### ***Investigation of the Effectiveness of Video Quality Metrics in Video Pre-Processing***

Jayachandra Chilukamari (Robert Gordon University, United Kingdom); Sampath Kannangara (The Robert Gordon University, United Kingdom); Maxwell Grant (Robert Gordon University, United Kingdom)

This paper presents an investigation of the effectiveness of current video quality measurement metrics in measuring variations in perceptual video quality of pre-processed video. The results show that full-reference video quality metrics are not effective in detecting variations. However, no reference metrics show better performance when compared to full reference metrics, particularly, Naturalness Image Quality Evaluator (NIQE) is notably better at detecting perceptual quality variations.

### ***A Low Energy HEVC Inverse DCT Hardware***

Ercan Kalali (Sabanci University, Turkey); Erdem Ozcan (Sabanci University, Turkey); Ozgun Yalcinkaya (Sabanci University, Turkey); Ilker Hamzaoglu (Sabanci University, Turkey)

In this paper, we propose a novel energy reduction technique for High Efficiency Video Coding (HEVC) Inverse Discrete Cosine Transform (IDCT) for all Transform Unit (TU) sizes. We also designed and implemented an efficient HEVC 2D IDCT hardware for all TU sizes using Verilog HDL. The proposed hardware can decode 48 Ultra HD (3840x2160) video frames per second. The proposed technique reduced its energy consumption up to 20%.

### ***A Reconfigurable HEVC Sub-Pixel Interpolation Hardware***

Ercan Kalali (Sabanci University, Turkey); Yusuf Adibelli (Sabanci University, Turkey); Ilker Hamzaoglu (Sabanci University, Turkey)

Sub-pixel interpolation is one of the most computationally intensive parts of High Efficiency Video Coding (HEVC) video encoder and decoder. In this paper, we propose a reconfigurable HEVC sub-pixel (half-pixel and quarter-pixel) interpolation hardware for all prediction unit sizes. The proposed reconfigurability reduces the area and power consumption of HEVC sub-pixel interpolation hardware more than 30%. The proposed hardware, in the worst case, can process 64 quad full HD (2560x1600) video frames per second.

### ***On Enhancement Signal Using Non-uniform Sampling in Clipped Signals for LTE Smart Phones***

SeongGeon Bae (dalim university, Korea); Hyung-woo Park (Korea Railroad Research Institute & Echo-system Lab., Korea); Myung-Sook Kim (Soongsil univ., Korea); Myung-Jin Bae (Soongsil univ., Korea)

Various methods have been employed to enhance the quality of signals in the noisy environments during the speech signal processing. In the case of signal restoration in particular, the deterioration of signals in low frequency has been an issue as they are also converged into the deterioration of voiced signals based on the characteristic feature of speech quality deterioration. Therefore, great efforts have been concentrated on improving signal quality and signal restoration in the voiced signal section. Provided that signals have an effect on perception to process a waveform coding, this study suggests that the non-uniform sampling technique can be utilized to get the enhanced quality of reconstruction in clipped signals.

### ***Implementation of Embedded Linux Platform based Vehicle Feature Extractor for ITS***

HongYeon Yu (Electronics and Telecommunications Research Institute, Korea); SeungChul Son (ETRI, Korea); Nacwoo Kim (ETRI, Korea); Byung Tak Lee (ETRI, Korea)

This paper propose the vision base vehicle feature extractor which can be operated on the low performance embedded linux platform. In addition, we implement an intelligent transportation system applying the OGC SWE framework for traditional analog CCTV based traffic controlling system. The proposed method is comprised of the moving vehicle detection, license plate recognition and vehicle color detection stage. The fast operation is possible by limiting the feature extraction area in the each step. The experimental result feature extractor can be effectually integrated with the conventional system. It provides the exact vehicle identification information.

### ***Using Fuzzy Logic to Estimate User Interests in Multiscreen Viewing Situation***

Yuichi Maki (NTT Corporation & NTT Service Evolution Laboratories, Japan); Manabu Motegi (NTT, Japan); Youichi Takashima (NTT Corporation, Japan); Tomohiro Yamada (Nippon Telegraph and Telephone Corporation, Japan); Toru Kobayashi (Nagasaki University, Japan)

This paper describes a method to extract user interest keywords for user profiling applicable to various recommendation systems from browsed web pages during multiscreen viewing, i.e. watching TV while browsing web pages related to the TV program on smartphones or Tablet PCs. Our method extracts keywords from browsed web pages and computes interest weights, which is based on the user's natural behaviors of "browsed", "bookmarked; like social bookmarking" or "no reaction; user did not browse it although it was shown". Ranking the keywords in order of interest weights allows us to estimate the interest keywords. Experiments show that our method has better potential in filtering out non-useful keywords and thus is superior to the basic TFIDF approach.

### ***Orthogonal Wavelet Division Multiplex as a Modulation Scheme for Digital Television***

Abdullah S Almuttiri (De Montfort University, United Kingdom); Scott L Linfoot (None, United Kingdom)

Issues surrounding wireless communications have arisen as a result of an increase in popularity and usability. The complexity of modulating signals over carriers is considered to be a significant challenge and Orthogonal Frequency Division Multiplex has proven to be a popular technology. The discovery of the wavelet transform, while mainly used in image processing applications, has led to a recently proposed, innovative new modulation technique called Orthogonal Wavelet Division Multiplex. This paper looks at the application of different families of wavelet as applied to digital terrestrial television.



**Robust Autodetection of Camera Lens Distortion Parameters**

Thomas Schneider (Hochschule Furtwangen University, Germany); Sebastian Piontek (Hochschule Furtwangen University, Germany); Philipp Hafen (Hochschule Furtwangen University, Germany); Nikolaus Hottong (Hochschule Furtwangen University, Germany)

Stereoscopic video systems require particular attention to the avoidance of geometric distortion errors that may be caused by optical image acquisition and projection devices. Our paper presents an algorithm for detecting camera lens distortion parameters in a precise and robust manner. The distortion parameters may be used for image correction either in real-time through camera hardware or by means of post-processing software.

**A proposal for VMS extension of Android based DTV STB**

Darko Dejanovic (University of Novi Sad, Faculty of Technical Sciences, Serbia); Davor Ropic (Faculty of Technical Sciences Novi Sad & RT-RK, Serbia); Nemanja Fimic (Faculty of Technical Sciences, University of Novi Sad, Serbia); Nikola Kuzmanovic (University of Novi Sad, Serbia); Milan Savic (University of Novi Sad, Serbia)

This paper presents one solution of the VMS extension for an Android based DTV set-top box. Proposed VMS extension will provide simultaneous live playback and PVR functions on various DTV services, as well as adaptive streaming of DTV content on second screen devices over MPEG-DASH protocol. Furthermore, VMS can be controlled by second screen devices.

**Proposition for Mosaic Video Playback on Android based DTV Devices**

Stevan Medic (Faculty of Technical Sciences, University of Novi Sad, Serbia); Nikola Špirić (Faculty of Technical Sciences, University of Novi Sad, Serbia); Sreten Tanacković (Faculty of Technical Sciences, University of Novi Sad, Serbia); Milan Vidakovic (University of Novi Sad - Faculty of Technical Sciences, Serbia); Nikola Kuzmanovic (University of Novi Sad, Serbia)

This paper presents a proposition for mosaic video playback on Android based DTV devices. Mosaic is a software solution that relies on rendering multiple video streams on one display, where each sub-picture presents one video stream (e. g. DTV service). This approach also provides an enhanced method that can display and navigate through a large number of digital television programs, supplying the viewer with a real-time overview of the currently visible channels from the channel selection dialog. Feasibility of the proposed solution is demonstrated through an implementation on Android based platforms such as DTV decoder systems and set-top boxes with multiple decoders and multiple tuners.

**One solution of implementation and display of electronic program guide on the Android-based digital TV signal receiver**

Branimir Pavlovic (Faculty of Technical Sciences, Serbia); Marko Kovacevic (RT-RK Institute for Computer Based Systems, Serbia); Branimir Kovacevic (RT-RK Institute for Computer Based Systems, Serbia); Marko Zivanovic (RT-RK Institute for Computer Based Systems, Serbia); Nemanja Zigic (RT-RK Institute for Computer Based Systems, Serbia)

This paper describes the implementation of information management for the Electronic Program Guide (hereinafter EPG) from EIT (Event Information Table) tables that are located in the DTV (Digital Television) bit stream, propagation of such data to the Android application and display the data in graphical user interface. For the collection and processing of DTV data, DTV software for television sets (Middleware) was used.

**Implementation of Disaster Recovery Agent within Android based set-top box**

Mladen Kovacev (RT-RK Institute for Computer Based Systems, Serbia); Krsto Lazic (Faculty of Technical Sciences, Serbia); Nenad Jovanovic (RT-RK Institute for Computer Based Systems, Serbia); Aleksandar Stefanovic (RT-RK Institute for Computer Based Systems, Serbia); Ivan Petrovic (RT-RK Institute for Computer Based Systems, Serbia)

This paper gives an overview of extending Android system with Disaster Recovery Agent (DRA). The focus of this paper is on switching from bad, critical system state to working, default system state. Adding this feature involves changing existing bootloader and recovery of Android.

**18:45 - 20:45**

**GOLD Event**

Room: B

09:00 - 09:45

**Keynote: Math Bollen: Consumer Electronics and the Power Grid - What are they doing to each other?**

Room: A

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

09:45 - 11:10

**5.1: Invited Session: Telemedicine**

Room: A

Chair: Yao Shieh (Chang Gung University & University of California Irvine, Taiwan)

**09:45 *The Increasing Role of Portable Electronics in the Emergency Department***

Mason Shieh (Beth Israel Medical Center, USA); Yao Shieh (Chang Gung University & University of California Irvine, Taiwan)

Human nature sometimes makes us reluctant to embrace change that disrupts the familiarity of our daily lives. We healthcare providers in particular drag our feet when it comes to changes in the manner of practice we've maintained over the decades due to the indoctrinating nature of traditional medical education and teaching. As a matter of tradition we continue to wear white coats and ties even though they have been shown to be fomites for infection. Portable electronics have had a limited but expanding role in the Emergency Department (ED). In this paper, we will review the current status and future prospective of portable electronics applications in the ED.

**10:05 *A computer-in-the-loop model for the transaction between care-providers and patients***

Mengkai Shieh (Russian Medical Academy of Postgraduate Education, Russia); Chien-Hung Chang (Chang Gung Memorial Hospital and College of Medicine, Chang Gung University, Taiwan); Yao Shieh (Chang Gung University & University of California Irvine, Taiwan); Tsong-Hai Lee (Chang Gung Hospital, Linkou Medical Center and Chang Gung University, Taiwan); Scott Goodwin (University of California Irvine, USA)

Healthcare expenditure in many developed countries has reached such an unprecedented level that it cannot be sustainable unless some change in medical practice is implemented. In this paper, we examine a computer-in-the-loop model for the transaction between care-providers and care-receivers by identifying tasks that can be offloaded from physicians to computers in light of the state of the art of computer technology, as well as its evolution with time. Currently a number of consumer electronics innovations have found their way into healthcare applications. We anticipate that healthcare will be continuously benefited by such a trend.

**10:25 *Adaptive Wireless Optical Transmission Scheme for Health Monitoring System***

Wasinee Noonpakdee (Thammasat University, Thailand)

This paper presents an indoor optical wireless communications using adaptive wireless optical transmission scheme for health monitoring system. Since radio frequency (RF) networks can present electromagnetic disturbances with medical devices, an alternative system based on infrared (IR) technology is studied. In this scheme, optical wireless communication is proposed to transmit the obtained measurements from sensors to a central node and a medical center using intensity modulation-direct detection (IM/DD) with on-off-keying (OOK) modulation. An image sensor is utilized as a receiver, and the signal to noise ratio (SNR) at the image sensor is analyzed with consideration of the half power angle of the optical source, the transmitted power, data rate, and the patient's location. The analytical results indicate that by employing the adaptive transmission scheme, the required SNR of 13.6 dB is achieved.

**10:45 *Cloud-super-computing virtual colonoscopy with motion-based navigation for colon cancer screening***

Hiroyuki Yoshida (Massachusetts General Hospital and Harvard Medical School, USA)

A novel cloud-super-computing-based diagnostic system for colon cancer based on laxative-free virtual colonoscopy examination has been developed. The virtual colonoscopy images are post-processed by computationally intensive algorithms such as real-time computer-assisted bowel preparation for increased patient adherence to the screening program, and real-time computer-assisted detection for improved sensitivity in the detection of colonic polyps. A high-resolution mobile display system is connected to the cloud-supercomputing virtual colonoscopy system to allow for visualization of the entire colonic lumens and diagnosis of colonic lesions at anytime, anywhere. The navigation through the colonic lumen is driven by a motion-based natural user interface based on a Kinect sensor for easy navigation and localization of colonic lesions. Preliminary results show that the cloud-supercomputing-based virtual colonoscopy system with motion-based navigation improves the workflow and efficiency of the interpretation of virtual colonoscopy images for screening of colorectal cancers.

Tuesday, September 10

## 5.2: Energy

Room: B

Chair: Frank Bauernöppel (HTW Berlin, University of Applied Sciences, Germany)

### 09:45 *Energy consumption of IEEE 802.11 connected consumer electronic devices*

Florian Pregizer (Ulm University, Germany); Daniel Fehrenbacher (Ulm University, Germany)

To use a smartphone as a remote controller for consumer electronic devices, the integrated wireless communication interfaces provide access to common network protocols. Especially the IEEE 802.11 protocol family is widely used. This family provides three different modes of operation for different network topologies. Since energy usage is critical in mobile devices, this paper compares the annual energy usage of the infrastructure, adhoc and WiFi-direct mode based on a simple usecase.

### 10:05 *Computer Systems Power Model Estimation*

Breno Neves (Universidade Federal de Campina Grande, Brazil); Bruna Cruz (Universidade Federal de Campina Grande - UFCG, Brazil); Raphael Mendes (Federal University of Campina Grande, Brazil); Frederico Bublitz (State University of Paraiba, Brazil); Jaidilson Jo Silva (Federal University of Campina Grande, Brazil); Saulo O. D. Luiz (Universidade Federal de Campina Grande - UFCG, Brazil); Angelo Perkusich (Federal University of Campina Grande, Brazil); Hyggo Almeida (Federal University of Campina Grande, Brazil)

The estimation of power models for computer systems is important for the development process of dynamic power managers. In this work, a power model is estimated based on a constrained linear least-squares technique.

### 10:25 *Partial Page Buffering for Consumer Devices with Flash Storage*

Dongwook Kim (Hanyang University, Korea); Sooyong Kang (Hanyang University, Korea)

As the capacity of the NAND flash memory increases rapidly, flash storage device needs to maintain larger amount of storage metadata (e.g., mapping information), which necessitates larger amount of hardware resources such as DRAM. Therefore, for storage manufacturers, it is needed to develop a novel scheme that minimizes the amount of storage metadata while preserving the storage performance. One of the effective approaches to cope with the increased storage capacity is enlarging the mapping unit to decrease the amount of mapping information. However, larger mapping unit can greatly increase the number of internal Read-Modify-Write operations which is very costly. In this paper, we propose the 'Partial Page Buffering' scheme, in which only partial page write requests are buffered, to reduce the Read-Modify-Write operations in storage devices. The proposed scheme enables us to increase the mapping unit size while preserving the storage performance.

### 10:45 *Feasibility of a timeout power management policy*

Saulo O. D. Luiz (Universidade Federal de Campina Grande - UFCG, Brazil); Antonio Marcus Nogueira Lima (Universidade Federal de Campina Grande & Center for Electrical Engineering and Informatics, Brazil); Angelo Perkusich (Federal University of Campina Grande, Brazil); Jaidilson Jo Silva (Federal University of Campina Grande, Brazil); Frederico Bublitz (State University of Paraiba, Brazil); Hyggo Almeida (Federal University of Campina Grande, Brazil)

Timeout power management policies are widely used in mobile devices for saving power by switching on and off peripherals like display, hard disks, or network interfaces. However the selection of the timeout policy is usually based on heuristic approaches. In this case, a wrong timeout policy may increase the power consumption and degrade the performance. In this work, a probabilistic approach for optimize both the power savings and performance is adopted to evaluate the feasibility of a timeout power management policy.

11:10 - 11:45

## Coffee Break

Room: Break Area

11:45 - 13:00

## Panel Discussion: Health Care @ Consumer Electronics; Y.Shieh, M.Shieh, Yoshida, Brederlow, Gupta, Wolf

Room: A

Chair: Yao Shieh (Chang Gung University & University of California Irvine, Taiwan)

13:00 - 14:00

Lunch Room: Break Area

Tuesday, September 10

14:00 - 14:45

## Keynote: Ralf Brederlow: New Opportunities for Microelectronics in Medical Diagnosis

Room: A

Chair: Johannes F. Clauss (Technische Universität München & Innovationszentrum Medizinische Elektronik e. V. Munich, Germany)

14:45 - 15:45

## 7.1: Video Processing III

Room: A

Chair: Thomas Schneider (Hochschule Furtwangen University, Germany)

### 14:45 *Investigating Properties of Film Grain Noise for Film Grain Management*

Dietmar Hepper (Technicolor, Germany)

Part of our cultural heritage includes AV content stored on chemical film that is scanned, archived, processed electronically, and distributed for various purposes. Grain particles in the film lead to visible film grain noise in the viewed and/or scanned film. Film grain management is often required which includes the removal or reduction of film grain noise and/or the superimposition of a certain type of film grain noise. Achieving a natural film look and feel first requires sufficient understanding of major characteristics of film grain noise. This contribution presents results of extensive investigations of essential properties of film grain noise in various SD, 2k and 4k scanned films. These results form the basis for subsequently developing adapted methods for film grain noise superimposition.

### 15:05 *Fine Grain Creation for UHDTV*

Hyun-seung Lee (Samsung Electronics, Korea)

A novel fine grain creation method for Ultra-High-Definition TeleVision (UHDTV) has been proposed. To make fine grain components in low-resolution video, the mixed modulation method is developed. It is composed of two parts, one is diffusion of low frequency components, and the other is generation of aliased high frequency components. Those are added on the up-scaled video with matching weights to enhance the feeling of textures. The proposed method shows a better performance compared to the conventional restoration methods in terms of texture by the experimental results.

### 15:25 *Extended MPEG-4 3DGC for Real-time Rendering on Embedded Platforms*

Mathieu Robart (STMicroelectronics, United Kingdom); Mauro Plumari (STMicroelectronics, United Kingdom); Danilo Pietro Pau (STMicroelectronics, Italy)

Embedded application processors have evolved dramatically over the past years, offering ever increasing computation power and hardware support for critical features such as 3D Graphics with programmable OpenGL ES-capable GPUs. Games, User Interfaces or Augmented Reality applications can now render complex and interactive 3D assets in real-time on portable or embedded devices. Such applications often use their own proprietary format for encoding and distributing 3D assets, in response to very particular use-cases or IP protection issues for example. However, in many cases, an open, compact, streaming-friendly format would be preferred. In this paper, we concentrate our attention to the 3D Graphics Compression (3DGC) standard developed by MPEG as part of MPEG-4, which intends to provide an open solution for encoding, compressing and streaming animated 3D assets. We used 3DGC as a basis for our developments and extended it to support modern shader-based GPU techniques on embedded platforms for the real-time rendering of complex 3D models, with pre-computed or user-controlled animation.

## 7.2: Car Electronics

Room: B

Chair: Carsten Dolar (Robert Bosch GmbH, Germany)

### 14:45 *Cognitive Approaches to Increase the Data Rate in Automotive Power Line Communication*

Stefan Heiland (Chemnitz University of Technology, Germany); Gangolf Hirtz (TU Chemnitz, Germany)

The communication demand in modern vehicles is rapidly increasing by the number of multimedia devices. In addition to car entertainment products like audio systems, DVD players and headrest monitors there are various advanced driver assistance systems to consider. Especially the increasing amount of cameras and likewise sensors in modern vehicles has lead to an extreme rise of the in-vehicle data traffic between a large number of widely spread communication units. Mainly this data are transferred over special cables or maybe over Ethernet. In addition, all these units have to be powered. The wire harness of a modern car is one of its most expensive and heaviest components. To overcome the use of extra wires, power line communication (PLC) is proposed. In this paper cognitive approaches to increase the data rate and to reduce the error rate in high bandwidth automotive power line communications are presented.

### 15:05 *A Low-Power AdaBoost-Based Object Detection Processor Using Haar-Like Features*

Motoki Kimura (University of California, San Diego, USA); Janarbek Matai (University of California, San Diego, USA); Matthew Jacobsen (University of California, San Diego, USA); Ryan Kastner (University of California, San Diego, USA)

This paper presents an architecture of a low-power real-time object detection processor using Adaboost with Haar- Like features. We employ a register array based architecture, and introduce two architectural-level power optimization techniques; signal gating domain for integral image extraction, and low-power integral image update. The power efficiency of our proposed architecture including nine classifiers is estimated to be 0.64mW/fps when handling VGA(640x480) 70fps video.

### **15:25 Trade-off between Accuracy and Speed for Pedestrian Detection using HOG Feature**

Soojin Kim (Hankuk University of Foreign Studies, Korea); Kyeongsoon Cho (Hankuk University of Foreign Studies, Korea)  
In order to achieve both high detection rate and fast detection time, we propose a new method for pedestrian detection using HOG feature. Multi-scale cells and blocks of HOG feature are used to improve detection accuracy, and they are computed by using integral HOG to improve detection speed. In order to further improve detection quality in terms of accuracy and speed, two-stage approach is adopted in the proposed method. Experimental results show that our method improves both detection rate and speed.

## **15:45 - 16:05**

### **Coffee Break**

Room: Break Area

## **16:05 - 17:25**

### **8.1: 3D Video**

Room: A

Chair: Benjamin Bross (Fraunhofer HHI, Germany)

### **16:05 Model-Based Video Compression For Real World Data**

Christian Feller (University of Ulm, Germany); Juergen Wuenschmann (Universitaet Ulm, Germany); Raimar Wagner (University of Ulm, Germany); Albrecht Rothermel (University of Ulm, Germany)

This work examines the benefits for displaying video content on a 2D screen that can be gained by incorporating depth information into the encoding process. The creation of a 3D model helps to compensate for redundant encoding of reappearing contents beyond group of picture borders, like needed in hybrid video codecs. Starting with filtering the image data, creating a 3D model and applying a model-based compression via MPEGIV / Part 25 to the model, finally a 2D video representation is rendered. Subjective quality assessments of first preliminary results show, that the perceived video quality is comparable with H.264/AVC encoded videos for low quality scenarios when working with a static 3D model.

### **16:25 Gaze Adaptive Convergence in Stereo 3D Applications**

Stefan Eickelberg (TU Dortmund University, Germany); Ruediger Kays (TU Dortmund University, Germany)

The accommodation vergence conflict is one of the the main sources for visual fatigue caused by stereo 3d. Special care has to be taken during content production in order to maintain a high quality of experience. However, the common approaches of doing so are not always viable and might come with certain disadvantages as well. In this paper, we therefore propose and analyze a method, which solves the accommodation vergence conflict. The basic idea is to constantly shift the point currently gazed upon into the display plane. This is done via convergence shifts of the stereoscopic imagery, which are known to be unperceivable if done slowly. The proposed method is based on gaze tracking, signal processing and disparity maps.

### **16:45 Point-based Model Construction for Free-viewpoint TV**

Ku-Chu Wei (National Taiwan University, Taiwan); Yung-Lin Huang (National Taiwan University, Taiwan); Shao-Yi Chien (National Taiwan University, Taiwan)

Free-viewpoint TV provides an interactive selection of viewpoints when people watch 3D videos. In this paper, to give more fascinating viewing experience, constructing point-based models for 3D video processing in free-viewpoint TV is proposed. The results show the constructed models from two types of 3D videos. Furthermore, the subsequent processing can be benefited because the point-based model is compact and quite suitable for computer graphics techniques and the existing GPU hardware.

### **17:05 Phase Mosaic with Minimize Noise in Time-of-Flight Sensor**

Deok-ha Shin (SAMSUNG & System LSI, Korea)

In time-of-flight 3D application, sensors detect modulated light responses for depth calculation. To measure the distance, time-of-flight camera needs 4 phases. Typical method needs to 4 frames to obtain 4 phases which has motion blur, low frame rate. To solve those problems 2-tap operation was considered. But it has a problem in removing fixed pattern noise. In this paper, we propose the phase to reduce disadvantages in typical Time-of-flight camera. We will analyze the mosaic pattern with considering noise. And we compare the performance among mosaic patterns and typical method.

## **8.2: Hardware & Storage**

Room: B

Chair: Ralf Brederlow (Texas Instruments Germany, Germany)

**16:05 Variability of NVM Response Time and its Effect on the Performance of Consumer SSDs**

**Maria Varsamou** (University of Patras, Greece); **Theodore A. Antonakopoulos** (University of Patras, Greece)  
Solid-State Drives (SSDs) use non-volatile memories (NVM) for storing and retrieving information in the form of sectors and/or pages. For achieving high capacity, consumer SSDs use high density multi-level cells (MLC) memories that experience high read and write times. The maximum achieved IO performance and the minimum response time depends on the used NVM technology, which determines the read and write times, and other system parameters, like the number of simultaneously accessed NVM channels and the applied workload. Most of these parameters remain unchanged during the lifetime of a SSD, except of the read and write times which increase as the lifetime of the device progresses and higher variability is observed. Based on experimental results and a detailed SSD model, we analyze how the increase and variability of the NVM response time determines the performance of a consumer SSDs and how it is affected by other system parameters.

**16:25 Design of Instruction Decode Logic for Dual-issue Superscalar Processor Based on LEON2**

**Xue Yang** (Beijing Microelectronics Technology Institution (BMTI), P.R. China); **Lixin Yu** (Beijing Microelectronics Technology Institution (BMTI), P.R. China); **Wei Zhuang** (Beijing Microelectronics Technology Institution (BMTI), P.R. China); **Yingpan Wu** (Beijing Microelectronics Technology Institution (BMTI), P.R. China); **Li Hao** (Beijing Microelectronics Technology Institution (BMTI), P.R. China)

An instruction decode logic available for dual-issue pipeline processor is presented in this paper. The structure is based on the LEON2 scalar processor and the performance is improved by 64.5% compared to the single-issue pipeline. Problems of instruction dispatching, dependences between two instructions in parallel and operands hand over to each other between the two pipelines are solved. Structure block diagrams of the dual-issue pipeline are given. Besides, the area of the new integer unit can be exaggerated to less than 1.8 times of the former one. Power of the new processor has been increased by less than 8.9%.

**16:45 An Efficient 6-Bit TIQ ADC for Low Power Portable Appliances**

**Wasim Arif** (National Institute Of Technology Silchar, India); **Satya Mishra** (NIT Silchar, India); **Jishan Mehedi** (Jadavpur University, India); **Srimanta Baishya** (NIT, India)

Analog to digital converter (ADC) is an integral part of the system on chip (SoC) product because it fills the gap between the analog physical world and digital logical world. Low power and low voltage requirements are becoming increasingly important issues as the MOSFET channel length shrinks below 0.25 submicron in the digital domain. In addition, SoC trends compel ADCs to be integrated on a chip with other digital circuits. A power efficient Flash ADC is most important module for long life span of battery for the portable appliances. The high speed and low power ADC design achieved by using TIQ (Threshold quantization comparator) comparator instead of traditional high gain differential comparator and also decoder is design using multiplexer instead of traditional ROM decoder. Multiplexer based decoder is modified to get lesser fan-out in critical path which reduces delay of encoder and more symmetrical and more regular structure to reduce area of circuit. The 6-bit ADC is designed and simulated with UMC 180 nm CMOS technology in CADENCE VIRTUSO platform and achieves maximum speed of 1Gsp/s with 1.23mw of power consumption and exhibits static error DNL/INL of +/- 0.33/0.65 LSB and dynamic parameter SFDR and SNDR as 39.24dB, 32.2dB respectively. Simulated result shows that the proposed model achieves high speed, low power consumption, low voltage operation and small size compared to other conventional ADCs.

**17:05 Automatic TFT-LCD Mura Detection Based on Image Reconstruction and Processing**

**Yu-Bin Yang** (Nanjing University, P.R. China); **Ning Li** (Nanjing University, P.R. China); **Yao Zhang** (Jin-Ling College, Nanjing University, P.R. China)

Automatic inspection of Mura defects is a challenging task in thin-film transistor liquid crystal display (TFT-LCD) defect detection, which is critical for LCD manufacturers to guarantee high standard quality control. In this paper, we propose a set of automatic procedures to detect mura defects by using image processing and computer vision techniques. Singular Value Decomposition (SVD) and Discrete Cosine Transformation (DCT) techniques are employed to conduct image reconstruction, based on which we are able to obtain the differential image of LCD Cells. In order to detect different types of mura defects accurately, we then design a method that employs different detection modules adaptively, which can overcome the disadvantage of simply using a single threshold value. Finally, we provide the experimental results to validate the effectiveness of the proposed method in mura detection.

**17:25 - 17:45**

**Tom Coughlin: Creating the Future**

Room: A

**19:30 - 21:30**

**Conference Dinner  
Seehof Hotel**

09:00 - 09:45

## Keynote: Tae-Chan Kim: Imaging Technology Challenges for the Future

Room: A

Chair: Dietmar Hepper (Technicolor, Germany)

09:45 - 10:45

## 9.1: Image Processing

Room: A

Chair: Christian Feller (University of Ulm, Germany)

### 09:45 *Image Color Correction in DCT Domain*

Igor Kharitonenko (University of Wollongong, Australia); Wanqing Li (University of Wollongong, Australia)

A commonly used method of color correction for digital cameras utilizes a 3x3 correction matrix with the coefficients optimized to achieve maximum color fidelity. Although this operation leads to significant improvement in color rendering, it amplifies noise at the same time. This paper presents a new method of performing color correction in DCT domain that reduces noise amplification. The paper shows that the color correction operation performed in DCT domain is more computationally efficient than the same operation that is traditionally performed in the image domain. It is also shown that gamma correction can be applied before color correction because the introduced color distortions measured in the perceptually uniform CIE Luv color space are below the human sensitivity threshold and do not affect perceptual quality of processed images. As a result, the proposed solution leads to revision of the commonly used color processing/compression chain of digital cameras reducing its computational complexity and improving image quality.

### 10:05 *Image Compression with Discriminative Dictionaries*

Raimar Wagner (University of Ulm, Germany); Markus Thom (University of Ulm, Germany); Michael Gabb (University of Ulm, Germany); Christian Feller (University of Ulm, Germany); Roland Schweiger (Daimler, Germany); Albrecht Rothermel (University of Ulm, Germany)

Common image compression algorithms like JPEG or JPEG2000 transform the individual pixel values into a domain that favors a compact representation. In contrast to the fixed DCT or Wavelet domains, recent efforts were made on image coding with learned over-complete dictionaries. In this work, we investigate the question whether dictionaries based on classification features are usable for image compression. We show that, despite their original purpose is to extract discriminative features within a Convolutional Neural Network, these features are capable of reaching competitive compression results when combined with a sparsity promoting coding scheme.

### 10:25 *Lossless Compound Image Compression for Digital Imaging System*

Sungbum Park (DMC R&D Center, Samsung Electronics, Korea); Choi Daiwoong (Corporation & Samsung, Korea); Jaewon Yoon (DMC R&D Center, Samsung Electronics, Korea); Woosung Shim (Samsung Electronics, Korea)

In this paper, we propose a simple but efficient lossless compression scheme for compound images. For natural image region in compound image, we introduce an efficient context modeling scheme, with reduced complexity in context modeling. Then, a block skip method is adopted to effectively express homogeneous regions. We also incorporate a pattern run-based representation for graphic regions. In the experiment, the proposed scheme outperforms JPEG-LS [1] and JPEG-XR [2] by 1.4 times and 2.9 times, respectively.

## 9.2: Home Networking and Home Gateways

Room: B

Chair: Matthias Wählisch (Freie Universität Berlin, Germany)

### 09:45 *Adaptive TR-069 system service for Android-based consumer electronic devices*

Norbert Nemet (University of Novi Sad, Faculty of Technical Sciences & RT-RK Institute for Computer Based Systems, Serbia); Saša Radovanović (University of Novi Sad, Faculty of Technical Sciences & RT-RK Institute for Computer Based Systems, Serbia); Rade Simikić (University of Novi Sad, Faculty of Technical Sciences, Serbia); Istvan Papp (University of Novi Sad, Serbia); Teodora Novković (University of Novi Sad, Faculty of Technical Sciences, Serbia)

In this paper we propose an integration of a device configuration and monitoring module based on the TR-069 protocol (also known as CPE WAN Management Protocol) as a system service for Android-based set-top-boxes (STBs) and other consumer electronic devices. Currently there is no support for configuration and monitoring of consumer devices under Android OS. Introducing such a feature would increase the possibility for seamless integration of devices to the existing auto-configuration servers and facilitate QoS monitoring.

**10:05 One implementation of multimedia content presentation for the Android-based set-top box**

Veljko Ilkic (Faculty of Technical Sciences, Serbia); Marko Kovacevic (RT-RK Institute for Computer Based Systems, Serbia); Milos Milanovic (Faculty of Technical Sciences, Serbia); Branimir Kovacevic (RT-RK Institute for Computer Based Systems, Serbia); Petar Jovanovic (RT-RK LLC, Serbia)

This paper shows one solution for collection, browsing and reproduction of multimedia content for the Android-based STB (set-top box). This solution offers unique way of displaying different multimedia content. This is achieved by making an abstraction layer which unifies following multimedia content: television channels, Android applications and widgets, DLNA (Digital Living Network Alliance) servers, PVR (Personal video recorder) files, images, video and audio files. All the multimedia content is treated the same way, and presented with the unique graphical interface.

**10:25 Design and Implementation of the Lightweight Home Cloud Computing Framework**

Jaehun Lee (Hanyang University, Korea); Kihan Choi (Hanyang University, Korea); Youngjin Kim (Hanyang University, Korea); Sooyong Kang (Hanyang University, Korea)

Consumer electronics devices are rapidly evolving in terms of both hardware and software. However, computing resources in those devices are not fully used in most of the time. In this paper, we implement a home cloud computing framework that exploits unused computing resources in various devices at home to deliver more powerful and novel functionalities to users.

**10:45 - 11:10**

**Coffee Break**

Room: Break Area

**11:10 - 12:30**

**10.1: Human-Device-Interaction**

Room: A

Chair: Björn Schuller (Technische Universität München, Germany)

**11:10 Smart Home User's Behavior Prediction**

Dmitry Vavilov (T-Systems, Russia); Alexey Melezhik (Gazprom Promgaz, Russia); Ivan Platonov (St.-Petersburg State Polytechnical University, Russia)

Modern Smart Home solutions can be generally classified as sensor-based or user-directive based. Prediction of the User Behavior is a very promising approach because it improves usability of Smart Home devices critical for their future expansion. It requires an effective enough, cheap, flexible, and easy implemented algorithms. Such "light" algorithms previously developed for predicting of TV viewer activities could be easily adapted for Smart Home devices programming.

**11:30 Green Technology and Wearable Haptic Feedback Display with 5x12 Arrays of Vibrotactile Actuators**

Anak Agung Gede Dharma (Kyushu University, Japan); Ezendu Ifeanyi Ariwa (University of Bedfordshire, United Kingdom); Kiyoshi Tomimatsu (Kyushu University, Japan)

In this study, we have developed a wearable haptic vest that can display sophisticated haptic feedback patterns. Our proposed haptic vest consists of 60 vibrotactile actuators that have direct contact to torso area. In addition, we have developed 34 haptic stimuli and conducted user testing to measure the effectiveness of our proposed haptic display method. In recent years, there is a growing interest on haptic feedback and visualization methods [1]. Recent advances in haptic technology enable artificial haptic feedback to be embedded in mobile or wearable devices. Haptic feedback plays a significant role for users, due to its' capabilities to present tactile and kinesthetic cues [2]. Furthermore, somatosensory sense is considered as an important primary sensory channel, especially for the visually impaired [3]. Therefore, it is important to explore spatial and temporal properties in haptic feedback. One of the possible ways is by developing a wearable haptic feedback display and conduct relevant user testing and experiments. In this paper, we mention notable preceding works, describe our proposed prototype design and the usability tests with its target users. Furthermore, the conclusion and possible future works is discussed in the last section. RELATED WORKS The psychophysical sensation of feeling tactile illusions according to two-dimensional tactile actuation has been reported by Israr et al. and Chang et al. [2, 3, 4, 5]. Furthermore, preceding researches [6, 7, 8] suggest that an  $n \times n$  array of actuators can be used to convey haptic information to the users. However, these researches only utilized a small number of arrays, i.e.  $3 \times 3$  [8] or  $4 \times 4$  [7]. We consider that further exploratory studies with more number of arrays of actuators are needed to gain better comprehensions regarding haptic visualization. PROTOTYPE DESIGN Our proposed prototype consists of a haptic vest with  $5 \times 12$  arrays of actuators. By connecting these actuators to a microcontroller, it is possible to independently control each actuator and create sophisticated design patterns with different spatial and temporal properties. Another aspect that we thoroughly consider during the design process is the vest material. We chose a wet suit for the vest material as it provides sufficient strength, durability, and elasticity. The design concept of our proposed haptic vest is described To create sophisticated haptic stimuli with various spatial and temporal characteristics, it is necessary to install the appropriate type of vibrotactile actuator inside the vest. We used disk-shaped vibration motor (FM34F ) that is commonly used in mobile phones and other portable devices. Vibrotactile actuators are arranged in a  $12 \times 5$  array surrounding the torso and each vibrator is well distributed within the torso area. By applying this arrangement, we assumed that the interpolation effect such as apparent motion and phantom vibration can be obtained. This interpolation effect has been demonstrated experimentally in the research report "Surround Haptics" by Disney Research [5]. HAPTIC PATTERNS Our stimuli for the user testing experiment consist of 34 unique haptic patterns, each indicate one of four main directions (back, front, left, or right). These patterns consist of eight front patterns, eight back patterns, nine left patterns, and nine right patterns.



**11:50 Workflow based test script generation \*\*\*\*\*&+)**

Mladen Stanojevic (RT-RK d.o.o., Serbia); Vladimir Marinkovic (Faculty of Technical Sciences at University of Novi Sad, Serbia); Ivan Kastelan (University of Novi Sad, Serbia); Jelena Kovacevic (University of Novi Sad, Serbia); Vukota Pekovic (RT-RK d.o.o., Serbia)

Activity theory is commonly used in designing Human-device interaction. It is used as a point of view, a philosophy, on which graphical user interfaces are designed. Donald Norman in his paper Human-Centered Design Considered Harmful [1] criticized traditional approach, which he called Human-Centered Design, and introduced a new approach, called Activity-Centered Design. In this paper his new approach is directly used and widened so it can be used in a tool for test generation. Workflow paradigm is used for sequential flow of elements, called activities. Activity theory is directly implemented on Workflow elements by applying division of work on: Activity, Actions and Operations, Combination of Activity theory and Workflow is used as start point for broad range of Human computer interaction, and in this paper it is used as upgrade of test generation framework for iDTV (TV and STB) testing called BBT[3][4][5][6][7]. Goal of this approach is to simplify test script creation process for user with little or none programming experience..

**12:10 New Possibilities of Human-Computer Interaction in Integrated Video Games for Mobile Phones, TV and Internet \*\*\*\*\*&+)**

Ana Jelacic (University of Belgrade, School of Electrical Engineering, Serbia); Marija Punt (University of Belgrade, School of Electrical Engineering, Serbia); Milan Z. Bjelica (University of Novi Sad & iWedia, Serbia); Velimir Vujanovic (RT-RK Institute for Computer Based Systems, Serbia)

Advances in the capabilities of both mobile devices and digital televisions have created new possibilities for human-computer interaction, which can be used for developing informal TV-centric games. Those possibilities were tested by creating a game that can be played on a TV, while a television program is showing, which can be controlled through mobile phones. Both the TV and the mobile phones are connected via a wireless network and the results of the game can be shared on social networks. The game performance was evaluated by measuring the responsiveness to user actions and a survey was conducted among a group of test users.

## 10.2: Smart Home & Internet

Room: B

Chair: Francisco J. Bellido Outeiriño (University of Córdoba, Spain)

**11:10 Consumer-Oriented Integration of Smart Homes and Smart Grids: A Case for Multicast-Enabled Home Gateways? \*\*\*\*\*& &**

Sebastian Meiling (Hamburg University of Applied Sciences, Germany); Till Steinbach (Hamburg University of Applied Sciences, Germany); Moritz Duge (Hamburg University of Applied Sciences, Germany); Thomas C. Schmidt (Hamburg University of Applied Sciences, Germany)

Smart Home automation is pushing into the consumer market for several years, while at the same time energy companies are working on the deployment of Smart Grids. Although, a key idea is to integrate small energy devices at the consumers site, the potential benefits of Smart Home technologies for Smart Grids remain unused until now. In this work we present a concept for consumer-oriented integration of Smart Home devices into Smart Grid applications using multicast-enabled Home Gateways. A first evaluation using standard consumer hardware confirms general feasibility and performance of our approach.

**11:30 Implementation of IEEE 802.15.4g Wireless Communication Platform for Smart Utility Service \*\*\*\*\*& +**

Sangjae Lee (Electronics and Telecommunications Research Institute, Korea); Byounghak Kim (ETRI, Korea); Mi-kyung Oh (ETRI, Korea); Young-Ae Jeon (ETRI, Korea); Sangsung Choi (Electronics and Telecommunications Research Institute(ETRI), Korea)

Smart home utility network is the last mile of smart grid network. Although some wireless technologies such as ZigBee or Wi-Fi have been used for home utility service, they have disadvantages such as cost, power consumption, and network topology. To overcome the problems, a new wireless technology has been introduced in IEEE 802.15.4g standard. In this paper, we implement IEEE 802.15.4g communication platform and show possibilities of smart home utility service using the implemented platform. We firstly introduce the architecture of the implemented platform. Then, we show the demonstration of smart home utility service and water metering service using the platform which includes IEEE 802.15.4g OFDM and FSK features.

**11:50 Pervasive Advertising: an Approach for Consumers and Advertisers \*\*\*\*\*& \$**

Frederico Bublitz (State University of Paraiba, Brazil); Hyggo Almeida (Federal University of Campina Grande, Brazil); Saulo O. D. Luiz (Universidade Federal de Campina Grande - UFCG, Brazil); Angelo Perkusich (Federal University of Campina Grande, Brazil)

Pervasive Advertising stands out from other forms of ad-serving by using contextual information of consumers. However, providing relevant ads is not enough for effective Pervasive Advertising. It is also necessary to address the objectives of the advertiser on his advertising campaign, leading to a impasse between advertisers objectives and needs of consumers. In this paper, we present a multiagent solution to solve this impasse. Experiments show that the solution is efficient in finding a balance between the needs of the consumers and the objectives of the advertisers.

**12:10 Ontology based Keyword Dictionary Server for Semantic Service Discovery \*\*\*\*\*& -)**

HyunKyung Yoo (Electronics and Telecommunications Research Institute, Korea); Yoo-mi Park (ETRI, Korea); TaeDong Lee (Samsung Electronics, Korea)

Web service discovery relies on matching between the description of service functionality and the user requirement. To minimize the gap between service description and user requirement, it is effective to expand query keywords with domain-specific ontologies and make use of the extended keywords in service discovery. In this paper, we propose the keyword dictionary server that supports ontology modeling, keyword expansion, and similarity calculation between ontology terms with reasoning. It expands the synonyms and hyponyms of query keywords and can help to discover the suitable services to meet the user's query intention. Also we present the performance measurement result of keyword dictionary server to verify

deployment performance of server that provides REST interfaces. Our keyword dictionary server can support semantic service discovery by matching between the user query and service description through the keywords expansion.

**12:30 - 13:45**

**Lunch**

Room: Break Area

**12:30 - 13:30**

**P.2: Poster Session 2**

Room: A

***A Tight Curve Warning System Using FSK Visible Light and Road-to-Vehicle Communication*** \*\*\*\*\*&-

Ryouichi Yoneda (Ryukoku University, Japan); Kuniyoshi Okuda (Ryukoku University, Japan); Wataru Uemura (Ryukoku University, Japan)

Rolling accidents often happen on the tight curves, so road-to-vehicle communication is required. In this paper we apply visible light communication to road-to-vehicle communication and propose a tight curve warning system. We use the hierarchical coding of FSK because a receiver can receive both low frequency data and high frequency data when it is close to the sender, and it can receive only low frequency data when it is far away from the sender. We made a 1/32 scale prototype model and the experimental results show its ability to distinguish the communication distance from the frequency. The car on our prototype system put on its brakes 2 m from an LED using 16.6 kHz.

***Towards Securer and Smarter Smartcard Applications*** \*\*\*\*\*&

M. Fahim Ferdous Khan (The University of Tokyo, Japan); Ken Sakamura (The University of Tokyo, Japan)

This paper presents eTRON, as a comprehensive architecture for securer and smarter smartcard application development. At the core of the eTRON architecture lies the tamper-resistant eTRON chip which is equipped with functions for mutual authentication, encrypted communication and strong access control mechanism. The IC chip supports dual-interface in a single card that is compliant with ISO/IEC 7816 and ISO/IEC 14443 for contact and contactless interfaces respectively.

***Cloud-based personalization framework for end-user set-top box applications*** \*\*\*\*\*&+

Veljko Mihailovic (Faculty of Technical Sciences & RT-RK Institute For Computer Based Systems, Serbia); Sasa Mirkovic (RT-RK Institute For Computer Based Systems, Serbia); Milan Z. Bjelica (University of Novi Sad & iMedia, Serbia); Dejan Stefanovic (RT-RK, Serbia); Danijel Spasojevic (RT-RK Institute For Computer Based Systems, Serbia)

The concept of cloud computing allowed for integration of vast variety of devices and services towards the provision of enhanced experience for consumers. In this paper techniques and a framework for the provisioning of personalization information to the users of set-top box applications are presented and evaluated. To provide personalized services, the framework utilizes cloud-computing concept and online profile of the user. Evaluation is performed within a personalized electronic program guide application.

***Safe Memory Read-Path using Silent CRC Calculation of Binary Bit-Inversion for Low-Power Fast ROM Integrity Verification*** \*\*\*\*\*&\$

Daejin Park (Korea Advanced Institute of Science and Technology (KAIST), Korea); Tag Gon Kim (Korea Advanced Institute of Science and Technology, Korea)

The integrity verification of on-chip flash memory data as code memory is becoming important in microcontroller-based applications. On-the-fly memory fail-detection without any interruption of CPU operation requires a fast detection method and low-power flash access hardware to provide safety-conscious execution of the user-programmed firmware during system operations. In this paper, newly-designed read-path architecture for an on-chip flash-embedded microcontroller is proposed in order to provide a memory scrambling method that enables fail-safe low-power memory access with zero hardware overhead by embedding the scramble flags on the CRC protection code. Time-multiplexed CRC calculation for bit-inversion binary code is automatically executed with the silent background mode during CPU idle time without any CPU wait cost.

***Social Contents Sharing Model and System based on User Location and Social Network*** \*\*\*\*\*&%

Jung Tae Kim (Electronics and Telecommunications Research Institute, Korea)

Increasing numbers of smart phone users and Social Network Services (SNS) created a new pattern and characteristic called Social Lifestyle, the way of smart phone users to supply and consume various social media contents. Many SNS services provide individual solutions to group users within a physical location or those who share a common interest in order to exchange and share personal knowledge and contents. Although some of the web-based open platforms are trying to integrate the individual social applications and APIs, there are limitations of sharing social contents and social network information across the separated service providers and platforms. In order to solve such limitations and complexities, there needs to be a generalized model which supports a unified way of social content sharing as well as the system architecture for support the cross social media sharing mechanism. To do so, the paper initially proposes the Place-Content-Social Network based content sharing model (PCS Model) which supports a sophisticated way of connecting user interests for sharing contents within the boundaries of the locations and social network information. The PCS model also provides a social trust for sharing contents based on the analysis of the attributes of the social contents including the user participation, communication patterns and contents sharing activities called the Social Activities.

**TV-Centric Multiplayer Gaming over the Cloud for Consumer Electronic Devices**

Nikola Veljkovic (Belgrade University, Serbia); Marija Punt (University of Belgrade, School of Electrical Engineering, Serbia); Milan Z. Bjelica (University of Novi Sad & iWedia, Serbia); Nikola Crvenkovic (RT-RK Institute of Computer-Based Systems, Serbia)

In this paper a cloud-based TV-centric gaming architecture is proposed, enabling the creation of games played amongst friends seated in geographically separated living rooms. In each living room a television is used as a public game display and mobile devices are used as game controllers. An example of a multi-player board game using the proposed architecture was developed and validated using tests measuring the communication performance between server and client.

**A 70 dBohm 2.3GHz low noise Transimpedance Amplifier**

Yang Jiao (Beijing Microelectronics Technology Institute, P.R. China); Weimin Li (Beijing Microelectronics Technology Institute, P.R. China); Dianwei Zhang (Beijing Microelectronics Technology Institute, P.R. China); Wu Wen (Beijing Microelectronics Technology Institute, P.R. China)

A low-noise transimpedance amplifier (TIA) for 2.5Gb/s family is presented using 0.35 um BiCMOS technology. It would be used in radiation detectors to transform the current pulse produced by a photo-sensitive device into an output voltage pulse with a specified amplitude and shape. In this paper, the mathematical analysis of the proposed TIA is presented together with a detailed analytical noise optimization. For the gain boosting, Cherry-Hooper amplifier is introduced for the second stage amplification. Also a method for eliminating the DC current of the input photodiodes is proposed. The chip measured results show the TIA achieves a constant gain of 70dBohm From 65kHz to 2.3GHz when connected to a 0.85pF load, average input referred current noise of 5 pA/sqrt(Hz) from 65 kHz up to 1.6GHz, 16 mA supply current at +3.3V including the output buffer. The die size is 30milx50mil.

**Designing mobile support care for patients with chronic kidney disease**

Shu Hui Hung (NCHC & NCKU, Taiwan); Hsin-Hung Lin (NCHC, Taiwan); Chin-Hsien Wang (NCHC, Taiwan); Peng-Hsiang Hung (NCHC, Taiwan)

The study aimed to develop and implement a service included web portal, Android and iOS phone environment for kidney patient's care at home in Taiwan. The service is not only centralized collecting patients' daily activities data, such as blood pressure, food and drug taken and exercise etc., but also by sending the automatic feedback and/or systematic alert message back to patients in circumstances to avoid the condition worsen such as kidney failure.

**CADdy - Colposcopy Learning Machine for Computer Aided Diagnosis**

Marcello Traversi (Polytechnic University of Bari & SSTLab, Italy); Maddalena Falagario (Dip. di Scienze Biomediche ed Oncologia Umana - Università "Aldo Moro" - Bari, Italy); Cataldo Guaragnella (Politecnico di Bari, Italy)

The study and development of a decision support system for doctors and students is presented, aiming to ease the diagnosis of the cervix cancer through an automated smart system: using a web application, a medical expert can upload colposcopic images feeding an expert system that carries out a deep analysis by a processing system on images uploaded by doctors; results coming out of the processing system are presented by a user friendly system suggesting the decision to the the medical expert who is able to confirm or change it, and annotate information. If changed, the diagnosis is sent to the expert system, developed on a reinforcement learning scheme, to tune decision parameters and enhance detection rates. The paper present the work in progress preliminary results of the system being developed.

**Development and usage of a NUI framework**

Christian Schmitt (Hochschule für Technik Stuttgart & Tellur GmbH, Germany); Matthias Zierold (Hochschule für Technik Stuttgart, Germany); Florian Pönisch (Hochschule für Technik Stuttgart, Germany)

This paper presents the design, implementation and usage of a framework in the natural user interfaces (NUI) area with use of the Kinect for Windows sensor targeting small and medium sized projects.

**Novel Methods for Feature Extraction Based on Motion History Images and Evaluation with Regard to Altering Viewing Angles**

Julia Richter (Chemnitz University of Technology, Germany); Gangolf Hirtz (TU Chemnitz, Germany)

In recent years western countries have been facing the impact of demographic change. Due to factors such as a rising life expectancy and a decreasing birth rate, our society is getting older. Alongside this development comes the constant lack of nursing staff, which leads to an imbalance of people who need care and educated personnel caring for them. There already is a variety of approaches investigating vision-based action recognition. In this paper novel methods for feature extraction from motion history images are proposed.

**MRI Parallel Processing for Embedded Visualization**

Danilo Pietro Pau (STMicroelectronics, Italy); Manuel Beniani (Politecnico di Milano, Italy); Mariagiovanna Sami (Politecnico di Milano, Italy)

The work here presented focuses on the development of the BrainTool, an embedded application that provides full automated volume segmentation and visualization of the 3D mesh of human brain acquired from 3D Magnetic Resonance sampler, executed on embedded (mobile) systems. The tool operates through three principal modules: an automatic segmentation to remove the non-brain components, a parallel implementation of a state of art Marching Cubes mesh synthesizer followed by OpenGL ES renderer for final visualization. The development of the application was done using two different low cost boards integrating low power state of art CPU and GPU into embedded systems on chip while testing used samples acquired from MRI available at a common hospital. The experience allows concluding that the Marching Cube algorithm parallelizes fairly enough and can be distributed on the available resources reaching scalable performances when running on laptop and embedded systems. Rendering of graphics assets up to 2.7M triangles per model has been achieved.

13:45 - 14:30

## Keynote: Björn Schuller: Latest Advances in Machine Listening -Time to get excited

Room: A

Chair: Gangolf Hirtz (TU Chemnitz, Germany)

14:30 - 16:10

## 11.1: Networked AV & Multimedia

Room: A

Chair: Benjamin Bross (Fraunhofer HHI, Germany)

### 14:30 *Evaluation of Adaptive Streaming Algorithms over HTTP* \*\*\*\*\* ( ,

Jelena Kovacevic (University of Novi Sad, Serbia); Goran Miljkovic (RT-RK d.o.o., Serbia); Krsto Lazic (Faculty of Technical Sciences, Serbia); Milan Stankic (RT-RK Computer Based Systems, Serbia)

In order to guarantee the best user experience throughout different network access technologies with dynamically varying network conditions, it is fundamental to adopt new technologies enabling a proper reception of the multimedia content. In this paper we implemented a prototype of streaming client, based on the MPEG DASH standard. We experimentally evaluated three adaptive streaming algorithms proposed by different authors in order to answer the following questions: (i) how fast is the reaction time on a bandwidths changes? (ii) algorithm behavior on a highly unstable network conditions and (iii) buffer underrun/overflow. We identify differences, inefficiencies and possible improvements.

### 14:50 *Network-Optimized Adaptive SVC-based Live Video Streaming* \*\*\*\*\* ) &

Dan Grois (Fraunhofer Institute for Telecommunications - Heinrich Hertz Institute, Germany); Ofer Hadar (Ben-Gurion University of the Negev, Israel); Detlev Marpe (Fraunhofer Institute for Telecommunications - Heinrich Hertz Institute, Germany)

In this work, a network-optimized live scalable video streaming scheme with adaptive pre-processing is presented, while showing significant improvements in visual presentation quality. According to the proposed scheme, an adaptive pre-filter is applied prior to encoding each Scalable Video Coding (SVC) layer, while each pre-filter parameters are dynamically adjusted according to varying network conditions, such as the network Round Trip Time (RTT) and packet loss ratio, thereby enabling to continuously obtain an optimal visual presentation quality at the decoder side. The performance of the presented scheme is evaluated and tested in detail, thereby demonstrating a significant gain of up to 5dB.

### 15:10 *Implementation of a BitTorrent protocol client for streaming purposes* \*\*\*\*\* ) )

Nenad Jovanovic (RT-RK Institute for Computer Based Systems, Serbia); Milena Milosevic (RT-RK Computer Based Systems LLC, Serbia); Mladen Kovacev (RT-RK Institute for Computer Based Systems, Serbia); Krsto Lazic (Faculty of Technical Sciences, Serbia); Nedeljko Babic (RT-RK Institute for Computer Based Systems, Serbia)

This paper describes one solution for using BitTorrent protocol for streaming of multimedia content and a realization on an Android set-top box. BitTorrent has established itself as a reliable and popular data sharing protocol, resilient and suitable for large scale traffic. With few improvements, solutions like this could potentially decrease costs for content providers, most of all for those providing audio and video content to the consumers.

### 15:30 *Subjective evaluation of the effects of packet loss on HEVC encoded video streams* \*\*\*\*\* ) ,

James Nightingale (University of the West of Scotland, United Kingdom); Qi Wang (University of the West of Scotland, United Kingdom); Christos Grecos (University of West of Scotland, United Kingdom); Sergio Goma (Qualcomm Inc, USA)

The emerging High Efficiency Video Coding standard (HEVC) will bring the benefit of delivering the same perceptual quality at about half of the bandwidths required in the current H.264/AVC standard. Such significantly higher compression efficiency of HEVC will, however, potentially lead to higher sensitivity to packet loss and thus have a great impact on the users of portable consumer devices such as smartphones and tablets when delivering HEVC encoded video over loss-prone networks, thereby adversely affecting the user's quality of experience (QoE). Existing subjective evaluations of the perceptual quality of HEVC have focused on its performance in loss-free environments. In this work, we empirically transmit HEVC streams over a hybrid wired/wireless network at typical (UK) mobile broadband speeds under a range of packet loss conditions, using typical smartphone and tablet resolutions. Our subjective evaluation experiments quantify the effect, on perceptual quality, of packet loss in HEVC streams and establish packet loss rate thresholds beyond which users find poor perceptual quality has a detrimental effect on their QoE. Furthermore, we employ two error concealment schemes to mitigate the impact of packet loss/corruption and investigate their effectiveness on users' QoE

### 15:50 *f.Gaze - Focus on Gaze Animation for Autonomous Virtual Human Characters* \*\*\*\*\* \*\$

Christian Bode (HTW Berlin, Germany); Bernhard Dubbick (Research Assistant, Germany); Thomas Bremer (HTW Berlin, Germany); David Strippgen (HTW Berlin, Germany); Simone Strippgen (Beuth University Berlin, Germany)

The advances in interactive realtime animation do not match the realistic visuals synthesized by modern hardware. We investigate if the liveliness of interactive virtual characters may be enhanced by a more detailed gaze animation compared to current games. We propose a modified inverse kinematics scheme, that we use to adapt motion capture animation to a specific situation.

## 11.2: Emerging Network Architectures & Standards

Room: B

Chair: Thomas C. Schmidt (Hamburg University of Applied Sciences, Germany)

### 14:30 *Cloud-based framework for QoS monitoring and provisioning in consumer devices* \*\*\*\*\*

Saša Radovanović (University of Novi Sad, Faculty of Technical Sciences & RT-RK Institute for Computer Based Systems, Serbia); Norbert Nemet (University of Novi Sad, Faculty of Technical Sciences & RT-RK Institute for Computer Based Systems, Serbia); Mića Četković (University of Novi Sad, Faculty of Technical Sciences, Serbia); Milan Z. Bjelica (University of Novi Sad & iWMedia, Serbia); Nikola Teslic (University of Novi Sad, Serbia)

The purpose of this paper is to provide a framework for a scalable, adaptable and efficient Quality of Service (QoS) monitoring system for consumer devices. The system is set in the Cloud environment and based on TR-069 remote management protocol. The proposed solution allows the development of secure, cloud-based network provisioning and management applications. Cloud access interfaces provide all needed information for the development of web-based or mobile applications which allow visualization of acquired QoS parameters.

### 14:50 *Secure Access and Management of Smart Objects with SNMPv3* \*\*\*\*\*

Sven Zehl (Beuth Hochschule für Technik Berlin, Germany); Thomas Scheffler (Beuth Hochschule für Technik Berlin, Germany)

Smart Objects are ordinary objects that become part of a network architecture. This allows remote control and management of such devices, as well as the development of tightly integrated usage scenarios. Application security for such devices is a very important prerequisite. This paper presents a prototypical smart object for the control of an electrical outlet. Our solution uses a wireless network based on the IEEE 802.15.4 standard. The network layer is built on IPv6 which is transmitted over a 6LoWPAN adaptation layer. The smart object uses a 8-bit microcontroller from Atmel and runs the network-enabled operating system Contiki in version 2.6. We implement a SNMPv3 agent with the integrated User Based Security Model to offer secure control and management functionality through application layer encryption and authentication. We use our prototypical implementation to discuss performance criteria, such as energy consumption, computation and transmission times for typical management tasks.

### 15:10 *Interactive RTP services with Predictable Reliability* \*\*\*\*\*

Jochen Gruen (Saarland University, Germany); Manuel Gorius (Saarland University, Germany); Thorsten Herfet (Saarland University & Intel Visual Computing Institute, Germany)

Despite the fact that non-interactive Internet multimedia applications are prevalently deployed via HTTP/TCP, dedicated real-time protocols remain the essential basis for interactive voice and video services. This is particularly pronounced by the standardization of WebRTC, which enables peer-to-peer real-time communication between web browsers via the RTP protocol suite. However, a compound solution that contributes error and congestion control for RTP-based communications services is missing by now. In our previous work we presented a novel transport protocol – Predictably Reliable Real-time Transport (PRRT) – a protocol layer that efficiently supports the reliability required by interactive multimedia services under their specific time constraint. In the following paper we integrate PRRT's header format into a bi-directional RTP session by enhancement of the profile for generic forward error correction. We particularly focus on a low messaging overhead and the preservation of backward compatibility in the protocol's error control.

### 15:30 *Analysis of Routing Overhead in Route Discovery Based on PHY, MAC in Noisy MANETs* \*\*\*\*\*

Haitham Y Adarbah (De Montfort University, United Kingdom); Scott L Linfoot (None, United Kingdom)

A Mobile Ad hoc NETWORK is built by mobile consumer devices but its efficiency is limited by the battery life. The challenge facing mobile consumer device designers is that the discovery phase of the routing process when attempting to establish a mobile ad hoc network tends to put the highest strain on the battery of the device. They tend to be affected by routing packets which need to be sent during the re-built the route. This paper is concerned with studying the performance analysis of Routing Overhead and its messages in Route discovery based on physical module such as noise power and MAC module such types of access as well as the effect of routing overhead on the lifetime of networks. The relationships between routing packets and the power consumption have been identified.

### 15:50 *A 10 GbE TCP/IP Hardware Stack as part of a Protocol Acceleration Platform* \*\*\*\*\*

Ulrich Langenbach (Fraunhofer HHI, Germany); Andreas Berthe (Fraunhofer-Gesellschaft zur Förderung der Angewandten Forschung e. V., Germany); Boris Traskov (Technische Universität Darmstadt, Germany); Stefan Weide (Fraunhofer HHI & University of Potsdam, Germany); Klaus Hofmann (TU Darmstadt, Germany); Peter Gregorius (Fraunhofer Institute for Telecommunications, Germany)

With the increasing number of Internet services, the flexible and reliable TCP/IP protocol suite has become a standard for network communication. TCP/IP is the underlying protocol used for ordered, connection-oriented data transfers over the Internet. Also in the application field of embedded systems TCP/IP has become the protocol suite of choice. Embedded systems with integrated native TCP/IP can connect to an internal network or even the global Internet. The next generation of embedded communication solutions will address 10 Gbps and more due to the growing demand for low round-trip times and high throughput. Traditional TCP/IP hardware accelerator implementations impose excessive resource requirements both in terms of code size and memory usage to be useful for embedded real-time requirements. This paper presents a hardware-based fully hardwired 10 GbE TCP/IP Stack which can be tightly coupled with higher-level protocols and application-specific logic in order to build a fully integrated and accelerated communication stack as part of an FPGA or ASIC design. The advantages of using a hardware-based 10 GbE TCP/IP stack in terms of latency and throughput are illustrated in this paper by comparing its performance with that of state-of-the-art NICs in conjunction with software-based TCP/IP stacks.

16:10 - 16:30

## Coffee Break

Room: Break Area

16:30 - 17:30

## 12.1: HbbTV & Second Screen

Room: A

Chair: Scott L Linfoot (None, United Kingdom)

### **16:30 Second Screen for HbbTV -- Automatic application launch and app-to-app communication enabling novel TV programme related second-screen scenarios** ( , )

**Christoph Ziegler** (Insitut fuer Rundfunktechnik, Germany)

The article presents an open standards-based framework that enables bi-directional communication between web applications for TV and second-screen devices. It also provides mechanisms for the automatic launch of applications from the TV on the second screen. Due to its compliance to the HbbTV standard, the framework allows broadcasters to create novel interactive applications with direct programme relation potentially targeting millions of already deployed devices on the market.

### **16:50 Porting and integration of functionality required by HbbTV standard on Android based DTV platform** - \$

**Milena Milosevic** (RT-RK Computer Based Systems LLC, Serbia); **Stanislava Markovic** (RT-RK Computer Based Systems LLC, Serbia); **Nenad Jovanovic** (RT-RK Institute for Computer Based Systems, Serbia); **Boris Mlikota** (RT-RK Computer Based Systems LLC, Serbia); **Milos Balac** (RT-RK Computer Based Systems LLC, Serbia)

This paper presents our experience in porting and integration of functionality required by HbbTV standard on Android based DTV platform. HbbTV functionality was originally implemented on Linux operating system, and in this paper are presented modifications made to HbbTV software stack, modification made to the Android operating system and extension of existing DTV functionality on Android OS.

### **17:10 A Proposal for Second Screen DTV and Remote Control Application** - (

**Nenad Soskic** (Faculty of Technical Sciences, University of Novi Sad, Serbia); **Dejan Popov Tapavicki** (Faculty of Technical Sciences, University of Novi Sad, Serbia); **Milos Subotic** (Faculty of Technical Sciences, University of Novi Sad, Serbia); **Nikola Kuzmanovic** (University of Novi Sad, Serbia); **Milan Savic** (University of Novi Sad, Serbia)

Usage of handheld devices such as tablets and smartphones as the second screen devices in television is becoming more popular. The main reason for that is great improvement and development of those handheld devices as well as television popularity. In this paper, the system architecture and framework of the second screen features are presented. The paper focuses on implementation of mosaic content list as well as other digital television services such as Electronic Program Guide, Teletext, Personal Video Recording control or live TV on the second screen.

## 12.2: Mobile Devices

Room: B

Chair: Dan Grois (Fraunhofer Institute for Telecommunications - Heinrich Hertz Institute, Germany)

### **16:30 A Comparison of Sensorfusion Methods for Localization on Mobile Phones** - +

**Martin Schüssel** (University of Ulm, Germany); **Florian Pregizer** (Ulm University, Germany)

In this paper we propose several methods to combine heterogeneous location technologies. At first we evaluated dead reckoning and its accuracy on commercial off-the-shelf (COTS) mobile phones. We combined this data with other absolute positioning techniques to improve the accuracy and availability of the location system. Several sensor fusion frameworks were validated in a simulated environment. All frameworks show improved accuracy and availability. But the results indicate that choosing the right framework is largely dependent on the information that the location systems supply to the fusion framework.

### **16:50 Indoor Localization with WLAN-Fingerprinting and Directional Antennas** ( \$&

**Christoph Messerschmidt** (FH München, Germany); **Michael Dippold** (Munich University of Applied Sciences, Germany)

University of Applied Sciences, Munich Department of Electrical Engineering and Information Technology STUDENT PAPER 1. Introduction Positioning and navigation in large buildings may be challenging if signals of satellite navigation systems are not available. This problem arises in many contexts like logistics, production and administration. Also in hospitals and residential care homes there may be a need to determine the actual position of a person or a certain device within a building or the availability of devices in a depot. In our paper emphasis lies on low cost implementation of locating in buildings without using specialized hardware. 2. Overview Several techniques like ultrasonic sound, infrared, the exploitation of WLAN, UWB, RFID and sensors signals from accelerometer, gyros or compasses, etc. are possible approaches to locate objects or persons in the inside area of a building. A short overview of the latest literature is given. The problems of many systems are high initial recognition costs and interference. Due to its prevalence and the good benefit-cost relation regarding its reachable accuracy WLAN-Fingerprinting was chosen for our system called "IndoorXY". This method consists of an offline- and an online-phase. During the offline-phase the signal received powers and MAC addresses of all available WLAN access points in defined cells of the building are measured and saved in a database. These are called the fingerprints of the building. Then in the application phase the received WLAN-signals are compared to all entries in the database by a suitable algorithm. With the fingerprint, which is in best accordance with the measurements, the current location is associated.

### **17:10 Network-Based Face Recognition on Mobile Devices** ( \$\*

**Keita Imaizumi** (Fukuoka University, Japan); **Vasily Moshnyaga** (Fukuoka University & Faculty of Engineering, Japan)

This paper presents new face recognition system for mobile wireless devices. Unlike existing systems, which perform complex face-recognition tasks on a mobile terminal shortening its battery lifetime, the proposed system uses mobile device only for input and output interface; all functions of face detection and face recognition are done by the network server. The system runs in Android OS on SONY tablet PC providing robust face recognition at 10 times faster rate than related mobile systems.

Wednesday, September 11

**17:30 - 18:30**

**Closing Remarks and Best Paper Awards**

Room: A