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Sunday, September 7

10:00 - 18:00

## Young Professionals Seminar

Room: A

12:00 - 18:00

## Doctoral Workshop

Room: B

Monday, September 8

09:00 - 09:30

## Opening

Room: A

09:30 - 10:15

## Keynote 1: Thomas Wiegand: "Recent Advances in Video Coding and Processing"

Room: A

10:15 - 11:15

## 1-1: Smart Home

Room: A

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

### 10:15 Color sensing and illumination with LED lamps 1

Shuai Li (Philips Research, The Netherlands); Ashish Pandharipande (Philips Research, The Netherlands)

With the advent of light emitting diodes (LEDs) in lamps, new ways of user interaction with LED lamps are becoming possible. We present an LED lamp that can sense and pick up the color from an illuminating object. The principle of employing an LED as a wavelength-sensitive light sensor is employed in designing an RGB (red green blue) LED lamp. A design prototype of such an LED lamp is presented, along with an associated driver protocol, such that it can sense color and illuminate at the picked up color without perceivable flicker. Experimental results are shown to demonstrate the dual function of the RGB lamp in color sensing and illumination at primary RGB colors.

### 10:35 Reference Model for Smart Home User Behavior Analysis Software Module 3

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

Smart Home spread is relatively low due to need of investments, usability issues and fears of the personal data security. To resolve these problems we suggest the reference model for the software responsible for analysis of Smart Home user behavior and simulation of the user's activities in automatic mode.

**10:55 Integration of rehabilitation in smart homes 7**

Kai-Uwe Hinderer (Hochschule Kempten, Germany); Philipp Eberle (Hochschule Kempten, University of Applied Sciences, Germany); Petra Friedrich (Hochschule Kempten, University of Applied Sciences, Germany); Bernhard Wolf (Technische Universität München, Germany)

This article describes a design for the integration of a telemedical rehabilitation system into a smart home concept. The focus lies on the interface communication, the user benefit and the challenges in combining these complex systems. Difficulties as well as best-practice solutions, based upon experiences with the creation of a show room at the University of Applied Sciences Kempten, are further discussed in this article.

## 1-2: Car Electronics

Room: B

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

**10:15 A Hardware/Software Co-Design Approach for Ethernet Controllers to Support Time-triggered Traffic in the Upcoming IEEE TSN Standards 9**

Friedrich Groß (Hamburg University of Applied Sciences, Germany); Till Steinbach (Hamburg University of Applied Sciences, Germany); Franz Korf (Hamburg University of Applied Sciences, Germany); Thomas C. Schmidt (Hamburg University of Applied Sciences, Germany); Bernd Schwarz (Hamburg University of Applied Sciences, Germany)

Real-time Ethernet variants are expected to build the future communication infrastructure in cars. First camera based driver assistance functions will communicate using IEEE 802.1 AVBs credit-based shaping. But for the strict timing requirements of automotive control-traffic, AVBs current timing guarantees are insufficient. The upcoming IEEE 802.1Qbv standard proposes synchronous time-triggered traffic to overcome these limitations. This paper presents a low footprint microcontroller based communication architecture, that supports both traffic-classes in parallel while using standard hardware components. It allows first realistic performance analyses of coexistent traffic shaping strategies in a software based implementation.

**10:35 Software Stacks for Mixed-critical Applications: Consolidating IEEE 802.1 AVB and Time-triggered Ethernet in Next-generation Automotive Electronics 14**

Soeren Rumpf (Hamburg University of Applied Sciences, Germany); Till Steinbach (Hamburg University of Applied Sciences, Germany); Franz Korf (Hamburg University of Applied Sciences, Germany); Thomas C. Schmidt (Hamburg University of Applied Sciences, Germany)

Real-time Ethernet variants are expected to build the future communication infrastructure in cars. First camera based driver assistance functions will communicate using IEEE 802.1 AVBs credit-based shaping. But for the strict timing requirements of automotive control-traffic, AVBs current timing guarantees are insufficient. The upcoming IEEE 802.1Qbv standard proposes synchronous time-triggered traffic to overcome these limitations. This paper presents a low footprint microcontroller based communication architecture, that supports both traffic classes in parallel while using standard hardware components. It allows first realistic performance analyses of coexistent traffic shaping strategies in a software based implementation.

**10:55 Monocular Hyperrealistic Virtual and Augmented Reality display 19**

Haruhiko Okumura (Toshiba Corp. R & D Center, Japan)

We proposed and developed a novel monocular windshield augmented reality projector: WARP for AR and head-up display (HUD) applications. They use monocular vision that eliminates the depth cues caused by binocular parallax information. Our developed MHDP and WARP system achieved a high hyper-reality performance with free depth perception and high visibility.

**11:15 - 11:35**

## Coffee Break

Room: Break Area

**11:35 - 12:55**

## 1-3: Consumer Health Care & AAL

Room: A

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

**11:35 Ultrasonic circular array sensing for human arm motion classification 24**

Ruud van Sloun (Eindhoven University of Technology, The Netherlands); Ashish Pandharipande (Philips Research, The Netherlands); David Caicedo (Philips Research, The Netherlands); Sriram Srinivasan (Philips Research, The Netherlands); Piet Sommen (Eindhoven University of Technology, The Netherlands)

Classification of human arm movements is an important problem in healthcare and well-being applications. In this paper, an ultrasonic Uniform Circular Array (UCA) Doppler sensing method is proposed for classifying arm movements from a given set. The method uses velocity and angular information, derived from Doppler frequencies and direction-of-arrival (DoA) by processing the signals received at the UCA, and employs a Bayesian classifier to distinguish between movements. The performance of the sensing method is evaluated using experimental datasets. The proposed ultrasonic UCA Doppler sensor and processing methods provide a compact solution for human arm movement classification.

**11:55 A trial of an improved sleep activity monitoring system with a bio-sensor for urine 26**

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

We built a sleep activity monitoring system that can monitor the status and actions of the user of a hospital bed, such as leaving, sitting up, changing sides, or not moving on the bed. The system calculates the load on nine sensors under the mattress to monitor changes. This system was previously made exclusively for a bed produced by Voelker GmbH (Germany). For this trial, we adapted the system to another company's beds and added a system to prevent bedwetting or falls when leaving the bed to urinate by attaching a wearable bio-sensor.

**12:15 Depth Stream Compression for Enhanced Real Time Fall Detection by Multiple Sensors 29**

Enea Cippitelli (Università Politecnica delle Marche, Italy); Samuele Gasparini (Università Politecnica delle Marche, Italy); Ennio Gambi (Università Politecnica delle Marche, Italy); Susanna Spinsante (Università Politecnica delle Marche & ArieLAB Srl, Italy)

A fall detection system using depth data acquired from a single Kinect sensor could be expanded by addition of more devices. The idea consists in equipping each sensor with an embedded board, in order to stream the collected depth data over a network, towards a central system, able to retrieve the data and process them. A preliminary evaluation of a low-complexity compression algorithm for depth streams is performed, and some encouraging results are presented.

**12:35 e-Health Video System for Performance Analysis in Heart Revalidation Cycling 31**

Mark van Gastel (Eindhoven University of Technology, The Netherlands); Sveta Zinger (Eindhoven University of Technology, The Netherlands); Harel Kempers (Maxima Medical Centre, The Netherlands); Peter H.N. de With (Eindhoven University of Technology, The Netherlands)

INTRODUCTION. Cardiovascular diseases are the number one cause of death in the world with 17 million victims every year. By strictly executing a rehabilitation program, the mortality rate of people after e.g. cardio surgery/intervention caused by a cardiovascular disease, can be reduced by more than 30%. Evidently, the remote home monitoring of patients and their training efforts, while encouraging them to perform rehabilitation exercises, is highly attractive. We present a novel video system which is able to monitor the patient's cycling efforts and extract important pose and movement parameters, based on the input of only a single monocular camera. The proposed system is robust against different human appearances such as body size/posture and clothing. Furthermore, we have developed a motion-robust, unobtrusive, heart-rate detection algorithm which is the key parameter for exertion analysis. POSE ESTIMATION. The objective of the video analysis system is to match a 2D graphical representation of the human with the input frames of the camera placed in front or from the side of the cyclist. a camera placed in front of the subject, the heart rate is detected for scenarios with significant head motion. For clinical applications, further validation is necessary.

## 1-4: Networked AV/Multimedia I

Room: B

Chair: Scott L Linfoot (MASS, United Kingdom)

**11:35 A Fully Automatic Framework for Building 3D Animated Avatars 36**

Hugo Boujut (Institut Mines-Télécom, Télécom SudParis, France); Mejdj Ourir (Institut Mines-Télécom, Télécom SudParis, France); Titus Zaharia (Institut TELECOM, France)

The face animation process still requires an important amount of manual human interaction involving highly qualified artists with strong knowledge in facial anatomy. In this paper, we introduce a framework for automatic construction of 3D animated avatars. The proposed approach allows for animating an inanimate facial 3D mesh. The adopted representation is based on the MPEG-4 standard. First, the Supervised Descent Method (SDM) is employed for detecting automatically the MPEG-4 feature points starting from 2D images consisting of projections of 3D avatars. The originality of the approach consists of the training procedure proposed. Thus, we specifically train a SDM detector for each part of the face, i.e. mouth, eyes, nose, chin, cheeks, etc. Skinning operations are performed by jointly using the MPEG-4 FAPs and the feature point based deformation method. The combination of these three methods allows for building animated avatar with a large variety of shapes, i.e. from realistic human faces to cartoons.

**11:55 Using Statistical Data for Context Sensitive Pervasive Advertising 41**

Frederico Bublitz (State University of Paraiba, Brazil); MArco Rosner (Federal University of Campina Grande, Brazil); Hyggo Almeida (Federal University of Campina Grande, Brazil); Aislan Lima (UFCEG, Brazil); Thiago Batista (State University of Paraiba, Brazil)

smartphones are available anytime and anywhere, enabling applications to determine the user location. In a previous work, we demonstrate how we can use this information for inferring the age, gender, and social class based on the places visited by the user. In this work, we investigate the hypothesis that it is possible to deliver relevant advertisements based on statistical data, associated with basic customer information inferred from location. To validate our hypothesis, we conducted an experiment comparing the relevance of the advertisements of our approach with collaborative filtering.

**12:15 Server-Driven Rate Control for Adaptive Video Streaming using Virtual Client Buffers 45**

Yongtao Shuai (Saarland University, Germany); Goran Petrovic (Saarland University, Germany); Thorsten Herfet (Saarland University & Intel Visual Computing Institute, Germany)

Adaptive video delivery approaches perform video rate selection based on the streaming client's throughput estimate. In practice, the accuracy of the estimated throughput is limited due to feedback delay and the unawareness of the dynamics of the underlying HTTP/TCP transport layer. As a result, streaming applications employ large playback delays in the order of tens of seconds so as to maintain continuous video rendering with good quality and bandwidth utilization. In this paper, we introduce DASP, an advanced video rate adaptation, to achieve a low-latency adaptive video streaming. The key components of our solution are a server-side mirroring of the streaming client's buffer, which provides a low-delay feedback for the video rate selection, and a hybrid rate adaptation logic based on goodput and buffer information, which stabilizes the adaptive response to the dynamics of transport layer. We demonstrate the performance of our rate selection algorithm by evaluating the stability of the receiver buffer under low-latency and high-definition adaptive video streaming with variable bit rate encoding over an emulated wide-area network link. The results also show that our approach is promising and applicable for dynamic live streaming with a playback delay as low as the chunk duration.

**12:35 A Multi-Depth Camera Capture System for Point Cloud Library 50**

Stephan Rogge (Brandenburg University of Technology, Germany); Christian Hentschel (Brandenburg University of Technology Cottbus, Germany)

The area of Human Computer Interaction (HCI) benefits largely from the release of low cost depth cameras such as Microsoft's KINECT or ASUS' XTION Pro. Depth, RGB or infrared image data are provided via a USB-2.0-connection. However, due to limited USB data rate, HCI applications usually cannot use more than two cameras per PC. To overcome this problem we propose a system which uses a client-server-based capture system. Servers send their data to a client, where it can be further processed. The proposed system based on the Point Cloud Library (PCL), where point clouds are computed and merged into a global registered point cloud. This application can be used in conjunction with an infrared tracking system to evaluate human pose or hand pose estimation.

**12:55 - 13:55**

**Lunch**

Room: Break Area

**13:55 - 14:40**

**Keynote 2: Joe Decuir: "The Cloud meets Bluetooth Smart"**

Room: A

**14:40 - 16:00**

**1-5: Consumer Health Care & AAL II**

Room: A

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

**14:40 Virtual 3D Shield for Asset Protection 55**

Daniel Moldovan (Austrian Institute of Technology, Austria)

In this paper, we propose a practical system for detecting 3D volumetric intrusion in a predefined restricted area using depth images provided by a range camera. This system can be employed for the protection of valuable objects displayed in public areas, as well as for monitoring the space around private property assets. The system defines a virtual 3D shield around the asset that has to be protected, thus delimiting the protected boundaries in all 3 dimensions. Experimental results performed with both stereo camera and ToF sensors confirmed that the proposed method effectively localized the intrusion detection to the volume of the monitored object.

**15:00 Assessment and Care System Based on People Detection for Elderly Suffering From Dementia N/A**

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

This paper presents a novel AAL (Ambient Assisted Living) concept related to the care of people suffering from dementia. In our project, we are developing a stereo vision-based system designed to identify the deficits of demented people who are still capable of living at home. In this way, the assessment of their need of care can be improved. Furthermore, the system supports demented people during their daily life at home. By this means, they can stay longer in their familiar environments, which contributes to the preservation of their health.

**15:20 Object Recognition for Human Behavior Analysis 64**

Enes Dayangac (Technische Universität Chemnitz, Germany); Gangolf Hirtz (Chemnitz University, Germany)

This paper discusses the deformable part-based models for object detection in low contrast images. The objects wheeled walker, walking frame and chair are chosen for the activities walking, sitting and standing. Relationships between detected objects and persons are indicators for those activities. Hence, we enhance a stereo vision system for the purpose of high-level behavior analysis. In order to train models of the objects using the algorithm and get an optimum performance, a sufficient set of images was recorded and annotated. For evaluation, precision and recall curves are reported.

**15:40 Design and Implementation of a Fall Detection Monitor System with a Voice Interaction Function for Smartphones 69**

Y. W. Bai (Fu Jen Catholic University, Taiwan); Chia-Hao Yu (Fu Jen Catholic University, Taiwan); Chun-Cheng Chan (Fu Jen Catholic University, Taiwan)

In this paper a smartphone fall detection system featuring a three-axis accelerometer sensor with a voice interaction function is presented. The value, measured by the three-axis accelerometer sensor, is sent to the program. It is then calculated and compared to the fall characteristics. When a fall is detected, the voice function asks whether the user needs help. If the fall is not serious, the user can cancel this emergency notification by means of either the voice interaction function or the touch panel. Otherwise the smartphone would automatically send out an emergency signal to help the user.

## 1-6: Networked AV/Multimedia II

Room: B

Chair: Scott L Linfoot (MASS, United Kingdom)

**14:40 HbbTV 1.5 additions: one design, implementation and integration 71**

Milena Milosevic (RT-RK Computer Based Systems LLC, Serbia); Boris Mlikota (RT-RK Computer Based Systems LLC, Serbia); Mario Radonjic (RT-RK Computer Based Systems LLC, Serbia); Tomislav Maruna (RT-RK Computer Based Systems LLC, Serbia)

This paper presents our work and experience in designing, implementing and integrating HbbTV 1.5 additions. We extended existing HbbTV software stack which provides functionalities required by HbbTV 1.1 standard. Key additions that HbbTV 1.5 standard brings are EIT schedule (full 7-day EPGs), HTTP adaptive streaming based on the MPEG DASH specification and DASH delivered content protection with DRM technologies. This paper focuses on the following two additions: EIT schedule and MPEG DASH. Third addition is not mandatory by the HbbTV 1.5 and is left for further work.

**15:00 SDN for Segment based Flow Routing of DASH 74**

Cihat Cetinkaya (Ege University, Turkey); Erdem Karayer (Ege University, Turkey); Muge Sayit (Ege University, Turkey); Cornelius Hellge (Fraunhofer Institute for Telecommunications - Heinrich-Hertz-Institute, Germany)

In this paper we propose an SDN based dynamic path selection for HTTP-based video streaming. MPEG-DASH is a recently proposed standard allowing rate adaptation over HTTP. On the other hand, Software Defined Networking (SDN) is a new network architecture, which allows determining routes of packet flows. In this study we develop an optimization model aiming to obtain maximum throughput for DASH services by selecting the optimal paths for video packet flows over SDN.

**15:20 Advanced Rate Adaptation Algorithm in Video Streaming Over HTTP 78**

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

In order to guarantee the best user experience throughout different network access technologies with dynamically varying network conditions, it is fundamental to enable proper reception of the multimedia content. To overcome the

limitations/deficiencies of evaluated adaptive streaming algorithms, we propose Advanced Rate Adaptation algorithm (ARA, in the following text) and test it under various network conditions. The algorithm is implemented as a part of MPEG DASH compliant client.

**15:40 Analysis of Coexistence of Ginga and HbbTV in DVB and ISDB-Tb 83**

Gustavo Moreira Calixto (University of Sao Paulo & LSI-TEC, Brazil); Christian Keimel (IRT - Institut für Rundfunktechnik GmbH, Germany); Laisa C. P. Costa (University of Sao Paulo & LSI-TEC, Brazil); Klaus Merkel (IRT - Institut für Rundfunktechnik GmbH, Germany); Marcelo K Zuffo (University of São Paulo, Brazil)

In this paper, we examine the possible coexistence of Ginga and HbbTV, the middleware frameworks of the Brazilian and European broadcasting systems, ISDB-Tb and DVB, respectively. We compare the architecture of both frameworks in particular with respect to the frameworks' functional modules and our analysis provides the necessary information to assess the possibilities of a joint framework that includes both Ginga and HbbTV, consequently leading to a potential foundation of a system that supports both Ginga and HbbTV applications. In future work, we intend to execute tests on selected software modules from Ginga or HbbTV and even explore the possibility of using Ginga application via a browser plugin.

**16:00 - 16:20**

**Coffee Break**

Room: Break Area

**16:20 - 17:05**

**Keynote 3: C. Derrick Huang: "Internet of Things and the Human Touch"**

Room: A

**17:05 - 18:05**

**1-7: Wireless Communication**

Room: A

Chair: Alexander Huhn (Berliner Verkehrsbetriebe (BVG), Germany)

**17:05 Spectral Efficiency Analysis for LTE Networks 93**

Chen Wen-Tzu (National Cheng Kung University, Taiwan)

This paper analyzes the uplink spectrum efficiency of an LTE network, taking intercell co-channel interference into account. This study is based on signal-to-interference-plus-noise ratio analysis and appropriate channel models including path loss and shadow fading. This paper also uses the proportional fair scheduling scheme to allocate resource blocks to improve the cell edge performance. The research results reveal that the intercell co-channel interference can cause up to 50% throughput reduction for cell edge users, but has almost no impact on cell centric user performance.

**17:25 Improving the DVB-T2 BICM Performance by Newly Optimized Two-Dimensional Non-Uniform Constellations 96**

Javier Morgade (Samsung Electronics R&D UK, United Kingdom); Daniel Anzorregui (Samsung Electronics R&D UK, United Kingdom); Belkacem Mouhouche (Samsung Electronics Research and Development UK, United Kingdom); Hongsil Jeong (Samsung Electronics, Korea); Hakju Lee (Samsung Electronics, Korea)

This paper focuses on the potential enhancements of the DVB-T2 standard by the use of newly designed Two-Dimensional Non-Uniform Constellations (2D-NUC). In this work, a complete analysis of the DVB-T2 system performance when using the proposed 2D-NUC constellations against regular uniform (M-QAM) is presented. Based on the optimization of the Bit-interleaved Coded Modulation (BICM) capacity, the designed constellations provide a potential performance improvement of 1.1 dB for the overall DVB-T2 system performance in high order constellations. All carried out analyses are based on a complete DVB-T2 system specification simulation where equivalent 64-QAM and 256-QAM constellation and all baseline code rates have been evaluated.

**17:45 OFDM Communication Chain Performance Assessment Under Realistic Measured Narrowband PLC Channels and Noise 101**

Hela Gassara (Higher School of Telecommunications, Tunisia); Fatma Rouissi (Ecole supérieure des communications de Tunis, Tunisia); Adel Ghazel (SUPCOM, Tunisia)

This paper evaluates the performance of narrowband Power Line Communication (PLC) orthogonal frequency division multiplexing (OFDM) transceivers which comply with the ITU-T G.9955 recommendation. The performance assessment is based on realistic conditions namely when considering measured PLC channels at low frequencies and in presence of measured stationary and impulsive noise. Channel estimation using pilot OFDM symbols is also compared to channel estimation based on pilot subcarriers and it is shown that the first one provides lower bit error rate (BER).

## 1-8: Usability: TV Content Management

Room: B

Chair: Antonio Moreno-Munoz (University of Córdoba, Spain)

### 17:05 *High-accuracy time-variant recommender system with Number-Score curve* 106

Kazushige Hiroi (Hitachi, Ltd., Japan); Hiroyoshi Morita (University of Electro-Communications, Japan)

Recommender systems are becoming more effective as information becomes extensive. Conventional recommender systems show a list of recommended items, but the number of recommended items shown must be limited in some systems. For example, the recommender system for TV programs in a hard disk recorder has only a limited user interface and hardware resources, such as a remote controller, low display resolution, and limited hard disk capacity. Moreover, recommended TV programs must be changed in accordance with the time and day in this system. Thus, for these "time-variant" recommender systems, items must be recommended as accurately as possible within the limited number of recommended items. In this paper, we propose a high-accuracy time-variant recommender system with a "Number-Score curve", which indicates the relationship between the recommendation score and the number of recommended items. We examine a recommender system for TV programs in the hard disk recorder that can achieve 82% precision and 78% recall for the recommended results with the Number-Score curve.

### 17:25 *A Proposal for Remote DTV Content Presentation and Control* 111

Nenad Soskic (Faculty of Technical Sciences, University of Novi Sad, Serbia); Davor Ropic (Faculty of Technical Sciences Novi Sad & RT-RK, Serbia); Stevan Medic (Faculty of Technical Sciences, University of Novi Sad & RT-RK Institute for Computer Based Systems, Novi Sad, Serbia); Nikola Kuzmanovic (University of Novi Sad, Serbia)

Improvement and development of handheld devices such as tablets or smartphones opens new possibilities for them to be used in DTV environment. Handheld devices' proliferation has modified the way users watch and perceive TV. Giving users more control over their TV and easier access to additional information from their handheld devices is the focus of this paper. In this paper remote DTV content presentation like live TV, EPG and playback of multimedia content is presented. The paper also presents remote DTV content control such as remote controller with mouse pad and keyboard, EPG control and browsing of media server.

### 17:45 *One solution of visualizing Internet based EPG data combined with additional Internet content on an Android based set-top box* 114

Nevena Jovanov (University of Novi Sad & RT-RK Institute for Computer Based Systems, Serbia); Djordje Kovacevic (University of Novi Sad & RT-RK Institute for Computer Based Systems, Serbia); Stefan Pejić (University of Novi Sad, Serbia); Gordana Velikic (University of Rochester, USA)

This paper presents a solution of visualizing Internet based EPG data combined with additional Internet content for an Android based set-top box device. The main goal was to present different information in a unified way that will enhance user experience by allowing user to easily navigate through EPG and related Internet content on the screen. The important fact is that EPG data that we are using is not fetched from DTV transport stream but from server that stores this data in its database.

18:05 - 18:20

## Presentation of the IEEE Consumer Electronics Society. Membership & Benefits. By Stefan Mozar (IEEE CE Soc. President)

Room: A



18:20 - 20:00

## Poster Session 1

Room: A

### ***Clock Skew and Offset Estimations for Channel Rendezvous in Cognitive Radio Networks*** 117

Fang-Jian Han (National University of Defense Technology, P.R. China); Li Yu (National University of Defense Technology, P.R. China); Wei-Hong Fan (National University of Defense Technology, P.R. China)

In a Dynamic Spectrum Access (DSA) environment, how can cognitive radios (CRs) initially rendezvous their opportunistic channels to setup a network without causing interference to primary users (SUs) or other secondary users (SUs) is still an open problem in literature. In this paper, not much resource consumption is assumed, and this problem is solved by a proposed network-wide clock synchronization scheme, which is implemented along with the initial channel rendezvous procedures. The clock parameters of skew and offset are estimated on all nodes of a CR network except for the reference one. The timing message transmission delays in CR network are modeled by the exponential models. Two Maximum-Likelihood Estimation (MLE) algorithms and a quasi-MLE algorithm are proposed in three statuses of channel rendezvous respectively. The results of numeric simulations show that the proposed methods improve the mean square errors (MSE) of clock parameters estimations progressively, and the four-way based timing message exchanging based estimator outperforms classical one-way and two-way timing messages exchanging based estimators.

### ***A Hardware-Assisted Protection and Restoration Scheme of Lost Smart Phones*** 122

Ki Youn Kim (Samsung Electronics, Korea); Euseong Seo (Sungkyunkwan University, Korea)

Since smart phones are expensive and carrying sensitive personal information including e-mail messages, memos, photos and so on, mobile phone manufacturers are providing services that can protect personal information and help restoration of lost or stolen smart phones. Currently, most of the protection and restoration schemes, which are being used in the commodity smart phones, are software-based. However, such software-based schemes are not effective as they can be easily incapacitated through device initialization, network disconnection, system software modification and so on. This paper categorizes the incapacitation threat methods of the protection and restoration schemes into four, and analyzes how the current software-based schemes cannot function correctly in each threat model. In order to counter these four exploitation models, this paper also proposes a hardware-assisted solution. The proposed scheme is built upon on an additional internal SIM (Subscriber Identifier Module) card and small capacity sub-battery. Finally, this paper assesses the effectiveness of the proposed scheme against the four cases.

### ***Energy-Efficient Adaptive Localization Middleware Based on GPS and Embedded Sensors for Smart Mobiles*** 126

Yunwoo Lee (Sungkyunkwan University, Korea); Joonhwan Lee (Samsung Electronics, Korea); Dongsoo Stephen Kim (Indiana U. Purdue U. Indianapolis, USA); Hyunseung Choo (Sungkyunkwan University, Korea)

In this paper, we propose an energy efficient adaptive location middleware based on GPS and embedded sensors including accelerometer and compass for smart mobiles. Although location based services prefer a GPS location for its high accuracy, GPS signals are only available in outdoor environments and its energy use is significantly high than other positioning systems. The proposed method partially replaces the GPS use with a lower energy sensor based positioning. Since there is a trade-off between accuracy and energy saving, this system reduces energy consumption while maintaining the accuracy within a target range depending on application needs. This scheme was evaluated based on traces collected by Android smart mobiles. Experimental results show that the proposed method replaces 60% of GPS positioning to sensor ones while maintaining the location error when the targeted accuracy was set to be suitable for most of GPS navigations.

### ***Inaudible Dual Tone Data Transmission for Home Appliances*** 131

Sungsil Park (Sungkyunkwan University & Samsung Electronics Co., Ltd., Korea); Youngsoo Do (Samsung Electronics Co. Ltd, Korea); JaeSung Park (Samsung Electronics Co. Ltd, Korea); Dongsoo Stephen Kim (Indiana U. Purdue U. Indianapolis, USA); Hyunseung Choo (Sungkyunkwan University, Korea)

Smart home and Internet of Things (IoT) are recently drawing attention as the next-generation concept for home appliances. Inexpensive wireless communications technologies for connecting appliances to have enhanced capability and service will be important. This paper proposes the Inaudible Dual Tone Data transmission (IDTD) method, which can be applicable to them based on built-in speakers and microphones. IDTD utilizes an inaudible frequency band of 18kHz or higher in order to minimize discomfort for users. In order to prevent noise, each signal is allotted with dual tone. The proposed method is implemented using a speaker (BNM0026) which is actually applied to appliances. IDTD provides a higher speed and success rate than the existing sound communication systems while keeping the transmission distance is same. This results show feasibility of the data transmission at home appliances without extra hardware.

***A Proposal for a Multi-Format Streaming Server Framework 135***

Nikola Špirić (Faculty of Technical Sciences, University of Novi Sad, Serbia); Sreten Tanacković (Faculty of Technical Sciences, University of Novi Sad & RT-RK Institute for Computer-Based Systems, Serbia); Dejan Popov Tapavicki (Faculty of Technical Sciences, University of Novi Sad, Serbia); Goran Miljkovic (RT-RK d.o.o., Serbia)

This paper presents a proposition for design and realization of a multi-format streaming server framework. Building blocks required to implement this framework are identified, and their implementation described using existing technologies and protocols. Presented framework addresses the problems surrounding the distribution of Digital Television (DTV), as well as local media content, to a wide array of second screen devices (e.g. mobile devices, such as tablets or smartphones). The paper also includes a brief description and interaction analysis of protocols used for aforementioned media content discovery, control and out-of-band transfer

***Implementation of Remote Control Protocol Suitable for DTV Second Screen Applications 138***

Sreten Tanacković (Faculty of Technical Sciences, University of Novi Sad & RT-RK Institute for Computer-Based Systems, Serbia); Nikola Špirić (Faculty of Technical Sciences, University of Novi Sad, Serbia); Dejan Popov Tapavicki (Faculty of Technical Sciences, University of Novi Sad, Serbia); Nikola Kuzmanovic (University of Novi Sad, Serbia)

Constant hardware improvements of handheld devices (e.g. tablets and smartphones) and the fact that they are already present in almost every home, makes them a target platform for becoming the second screen of a digital TV (DTV) device. This paper presents one solution of remote control protocol suitable for resolving problems regarding content sharing from DTV set-top box to second screen devices and remote control of the host DTV device. The goal of this protocol is to enable handheld device owners to enjoy seamless integration with their TV-based entertainment experience.

***Towards a model to predict limitations of binocular eye tracking for 3DTV applications 142***

Frank Hofmeyer (Ilmenau University of Technology, Germany); Manuel Leonhardt (Hochschule Furtwangen University, Germany); Sara Kepplinger (Ilmenau University of Technology, Germany); Nikolaus Hottong (Hochschule Furtwangen University, Germany)

Monocular eye tracking is already an established tool for different evaluation purposes. Via two dimensional eye gaze recording it supports for example the optimization of applications' usability or a more intuitive human computer interaction. For certain research questions in the area of (auto) stereoscopic video quality perception a binocular eye tracking system would be beneficial. A binocular eye tracking system could support not only the investigation of the viewers' gaze on a 2D screen plane, but also his perceived depth in the simulated 3D space. Besides the investigation of S3D quality perception as a basic research, it is interesting to find solutions about the improvement of S3D quality based on certain S3D use cases. This focuses especially on the further development of TV and cinema technique, but also on the S3D film production and post-production. For example, based on estimations of S3D film producer, only insufficient possibilities are available in order to judge the overall quality of their films. Herein, it is especially important how single disruptions based on single production processes influence the subjective binocular perception. This asks for the weighting of severity. In order to reach intended results, the development of a sufficient accurate and precise binocular eye tracking system beforehand is necessary and useful to have an objective measuring tool. However, due to the hyperacuity and complexity of human stereoscopic vision, the definition of the line of gaze and the viewing direction of both eyes needs to be very accurate, in order to get valid values for calculating the viewing position in depth..

***A Method of Centralized Resource Management on a Set-Top Box 144***

Darko Dejanovic (University of Novi Sad, Faculty of Technical Sciences & RT-RK Institute for Computer Based Systems, Serbia); Milos Subotic (Faculty of Technical Sciences, University of Novi Sad, Serbia); Nemanja Fimic (Faculty of Technical Sciences, University of Novi Sad, Serbia); Laslo Benarik (RT-RK Computer Based Systems, Serbia)

The set-top box has evolved from single-user platform for digital television application to multi-user multi application platform for home digital entertainment. Historically, software and hardware stack for digital television content reproduction (DTV stack) allows only single-user, single process application to be executed. In the paper, we proposed service around software DTV stack to enable multiple applications to consume TV media content simultaneously. The service represents a proxy between client applications and DTV stack, which acts as a content provider and resource manager, allowing the DTV stack to be accessed from multiple processes. In order to support multiple clients, resource manager resolves acquisition conflicts of DTV resources.

***Adaptive Modified Hexagon Based Search Motion Estimation Algorithm 147***

Imdad Ali (NCP, Pakistan); Gulistan Raja (University of Engineering & Technology, Taxila, Pakistan); Muhammad Muzammil (International Islamic University, Islamabad, Pakistan); Ahmad Khan (UET Taxila, Pakistan)

This paper proposes a fast Adaptive Modified Hexagon Based Search (AMHexBS) Motion Estimation (ME) algorithm. The proposed algorithm predicts the direction of motion by using rood shaped pattern and then Hexagonal based Search (HexBS) is applied for refinement of search process. The size of rood shaped pattern is dynamically determined for each Macro Block (MB). An early termination scheme is incorporated to speed-up the ME process, which is mainly advantageous for the video sequences having low motion activities. The simulation results show that the proposed algorithm performs better according to Speed Improvement Rate (SIR) and number of search points for low and moderate motion video sequences.

***Simultaneous Color Matching in Stereoscopic Images Based on Image Decomposition* 149**

Ho-Gun Ha (Kyungpook National University, Korea); Wang-Jun Kyung (Kyungpook National University, Korea); Ji-Hoon Yoo (Kyungpook National University, Korea); Yeong-Ho Ha (Kyungpook National University, Korea)

Color discrepancies between left image and right image from a stereoscopic camera cause problems such as three-dimensional effect reduction, fatigue increase. Thus, color matching in stereoscopic images is important for three dimensional display systems. In this paper, simultaneous color matching is proposed based on image decomposition. The stereoscopic images are first decomposed into different scales. Then, colors in the stereoscopic images are matched by using cumulative histogram matching and Retinex algorithm. Experimental results show the proposed method has better color matching performance than the previous methods.

***Current Vector Analysis in Linear Voltage Regulators* 155**

Julio Cesar Garcia Alvarez (Universidad Nacional de Colombia Sede Manizales, Colombia); David Alfonso Berrio Perdomo (Universidad Nacional de Colombia, Colombia); Mario Alejandro Berrio (Universidad Nacional de Colombia, Colombia)

The present work proposes the Vector Current (CV) analysis, as an adequate method to quantize the performance of linear voltage regulators. We apply this analysis on linear voltage regulators that use a Zener diode as a core element. So, CV measure is a function of the Zener and load currents. CV analysis is carried out on three different regulator circuits, including an improved Feedback--Transistor--Zener (FTZ) regulator, which uses a feedback network for overload protection. As a result, the CV analysis can measure the different performances of the tested regulators, illustrating that there is an increasing current efficiency when using an additional transistor as current driver. Moreover, the CV analysis is useful to determine the overload value required for the feedback network design, opening further uses for evaluating power efficiency in other current-control power devices.

***Lossless Data-Hiding for H.264/AVC Videos* 158**

Yih-Chuan Lin (National Formosa University, Taiwan)

A lossless data-hiding scheme for the H.264/AVC compressed bit-stream is presented in this paper. Traditional data-hiding schemes of compressed videos would incur a great deal of permanent degradation of signal quality distortion in the marked bit-stream. In the paper, the proposed video data-hiding scheme is able to restore exactly the originally encoded video signal at the decoder while extracting the hidden secret message bits from the marked bit-stream. The embedding algorithm that is developed uses prediction of transform coefficients between neighboring 4x4-blocks in a macroblock and reversible histogram-shifting of the values of prediction-error to embed secret message bits in the non-zero quantized transform coefficients (NZQCs). Only a few of NZQCs in a macroblock are selected and modified with concerns of suppressing variations of bit-rate and visual quality from the marked bit-stream. Experimental results show that the message bits can be hidden in the encode bit-stream at the expense of a slight bit-rate increase and the original quality of encoded video can be rendered by the decoder after extracting the hidden bits.

## Welcome Reception

Room: A

**20:00 - 22:00**

## Young Professionals Event

Room: A

09:00 - 10:40

## 2-1: Usability & Human-Device Interaction I

Room: A

Chair: Thomas Coughlin (Coughlin Associates, USA)

### 09:00 *Effect of display resolution on physiological and psychological state while viewing video content* 162

Kiyomi Sakamoto (Panasonic Corporation, Japan); Akira Okada (Osaka City University, Japan); Kuniko Yamashita (Osaka City University, Japan); Seiji Sakashita (Panasonic Corporation, Japan); Hiroaki Shimazaki (Panasonic Corporation, Japan); Masahiro Kawashima (Panasonic Corporation, Japan)

We experimentally evaluated the effect of display resolution on physiological and psychological state while viewing video content at 4K and 2K on a 65-inch 4K TV. Four kinds of video content (two types of scenic material and two types of material with movement and action) were used. Each program comprised two minutes of 4K and two minutes of 2K content. The results showed that the scores for "presence," "impact," "realism," "quality" and "precision" when viewing 4K scenic content were significantly higher than those for 2K content. Significant differences were also observed between NIRS, an index of nervous system activity, during viewing tests of 4K content and that for 2K content; and between heart rate, an index of sympathetic nervous system activity, during viewing tests of 4K content and that for 2K content. Our results suggest that viewing material at 4K causes psychological elation, a surge in brain activity and calming of autonomic nerve activity, although the effects varied with type of content.

### 09:20 *Feasibility and Design Considerations for an Iris Acquisition System for Smartphones* 164

Peter Corcoran (National University of Ireland, Galway, Ireland); Petronel Bigioi (DigitalOptics Corporation Europe Ltd. & National University of Ireland, Galway, Ireland); Shejin Thavalengal (National University of Ireland, Galway & DigitalOptics Corporation Europe Ltd, Ireland)

Iris biometrics has the potential to provide the security required by next generation smartphones. This paper deals with the feasibility of an iris acquisition system for smartphones and similar hand held devices. When it comes to smartphones, a number of image acquisition challenges tend to surface. This paper discusses some of these challenges along with a brief description of acquisition system wavelength, iris image size and iris image spatial resolution and various other image quality parameters which affect iris recognition performance such as usable iris area, iris-pupil and iris-sclera contrast, image sharpness, gaze angle, SNR etc. Some preliminary results and design ideas for practical iris image acquisition are also presented.

### 09:40 *A gesture expressive model based on Laban qualities* 168

Arthur Truong (Institut Mines-Télécom, Télécom SudParis, France); Hugo Boujut (Institut Mines-Télécom, Télécom SudParis, France); Titus Zaharia (Institut TELECOM, France)

Today, gesture analysis lacks of global models able to characterize motion expressivity and its communicational character. In this paper, we propose a set of new gesture descriptors inspired from Laban Movement Analysis (LMA) and based on 3D body trajectories. We test our descriptors ability to characterize human actions in a machine learning framework (with SVM and different random forest techniques). The results obtained on Microsoft Research Cambridge-12 (MSRC-12) dataset and show very high recognition rates (more than 97%).

### 10:00 *Automatic key performance indicator measurements of television system using black box testing solution* 173

Branimir Kovacevic (Faculty of Technical Sciences, Serbia); Marko Kovacevic (Faculty of Technical Sciences, Serbia); Vukota Pekovic (RT-RK d.o.o., Serbia); Zivko Radonjic (RT-RK Institute for Computer Based Systems, Serbia)

This paper presents an approach to automated key performance indicator measurements of television system. The proposed system decreases the possibility of error which may occur when manually measuring the response to user request. The proposed system uses a novel block-based algorithm for image similarity assessment and measures the time needed for television system to process and execute commands sent from different devices.

### 10:20 *Content-adaptive Bitrate Reduction in Mobile Multimedia Applications* 176

Eugenie Grinenko (Saint Petersburg State University of Film and Television, Russia); Konstantin Glasman (St. Petersburg State University of Film and Television, Russia); Alexander Belozertsev (St. Petersburg State University of Film and Television, Russia)

This paper describes experimental study of QoE of compressed audiovisual materials for bandwidth-limited multimedia systems. A new method of bit rate reduction in such systems is proposed in this paper. It is based on a cross-modal audiovisual interaction-based model of QoE and takes into account that optimal audio and video codec parameters in bandwidth-limited multimedia systems can be content-adaptive.

## 2-2: Video and Image Processing

Room: B

Chair: Dietmar Hepper (Technicolor, Germany)

### 09:00 *Adaptive Differential Refinement of Block-Matching based Correspondence Vector Fields* 181

Matthias Brüggemann (TU Dortmund University, Germany); Ruediger Kays (TU Dortmund University, Germany); Paul Springer (Sony Deutschland GmbH, Germany); Oliver Erdler (Sony Deutschland GmbH, Germany)

In this paper we propose a post-processing method for block-matching based correspondence vector fields. We combine image adaptive filtering for object accurate vector field refinement with differential floating point precise optical flow estimation. More precisely, image warping and large cross-adaptive filter kernels are integrated into the Horn and Schunck optical flow estimation approach to break the block structure of the input correspondence vector fields and compute flow field updates fulfilling the smoothness constraint inside object borders. To reduce the influence of occlusion areas we integrate in-loop occlusion detection and adjust the adaptive filter weights after every iteration.

### 09:20 *Neighbor Embedding Based Single Image Super-Resolution using Hybrid Feature and Adaptive Weight Decay Regularization* 185

Yonggun Lee (Yonsei University, Korea); Yoonsik Choe (Yonsei University, Korea)

This paper proposes a novel single image super-resolution technique based on neighbor embedding. Conventional neighbor embedding technique uses gradient feature vectors in neighbor selection. However, since gradient feature is high-frequency feature, it is not appropriate for feature representation in weak-edge and texture regions. Therefore, instead of using only gradient feature as in neighbor embedding, we propose to use hybrid feature which combines gradient feature for edge region and luminance norm feature for non-edge region. Also, adaptive weight decay regularization is applied to shrink instable weights for neighbors. Consequently, experimental result shows that the proposed method can reconstruct more details in weak-edge, texture, and strong-edges as well as conventional method.

### 09:40 *Image Denoising Considering Characteristics of YCbCr Color Channels* 188

GyuJin Bae (Pohang University of Science and Technology, Korea); Sung In Cho (Pohang University of Science and Technology, Korea); Sanghun Kim (Pohang University of Science and Technology, Korea); Young Hwan Kim (Pohang University of Science and Technology, Korea)

Image denoising has played a very important role in the field of image processing, and many methods using diverse approaches have been proposed. Anisotropic diffusion and non-local means filtering methods are most famous approaches which are widely used for various applications. In this paper, we analyze the characteristics of these two methods, and we analyze the characteristics of YCbCr color channels. Then, we propose a channel-adaptive denoising framework, which uses the non-local means filtering for the Y channel and the anisotropic diffusion filtering for the CbCr channels. When compared to the non-local means filtering, which is known to give the best performance among weighted average methods, the proposed approach reduces the processing time and energy consumption by up to 4.3 times and 4.78 times, respectively, while maintaining the comparable performance in noise filtering.

### 10:00 *An Improved Logo Detection Method with Learning-based Verification for Video Classification* 192

Hyo-Young Kim (Korea University, Korea); Mun-Cheon Kang (Korea University, Korea); Sung-Ho Chae (Korea University, Korea); Dae-Hwan Kim (Korea University, Korea); Sung-Jea Ko (Korea University, Korea)

With the growth of cloud services, concerns have been raised regarding illegal sharing of the commercial video. To prevent the illegal sharing automatically, the method for classifying video as 'commercial' or 'noncommercial' is essentially required. Since most commercial video has a logo as a visible watermark, automatic logo detection can be an efficient method for the video classification. In this paper, we present an improved logo detection method which correctly detects the logo in any types of video using learning-based logo verification. Experimental results show that the proposed method achieves improved detection performance as compared with the existing method, and thus can be effectively used for classifying the video.

### 10:20 *Model Optimization for Model-Based Compression of Real World Video Data* 194

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

The availability of affordable cameras with additional depth sensors boosted the advances in the field of Simultaneous Localization and Mapping (SLAM). This area of research addresses creating a 3D representation of unknown environment by fusing sensor information. Whereas a coarse representation suffices for navigation purposes, the resulting 3D models are not accurate enough to allow rendering a visually pleasing video stream based on the gathered information, when applying a model based video compression standard such as MPEG-IV Part 25. This publication focuses on increasing the accuracy of the created 3D models in order to improve the perceived quality when using the model-based video codec and aims for performance comparable to hybrid video encoding.

Tuesday, September 9

10:40 - 11:00

## Coffee Break

Room: Break Area

11:00 - 11:45

## Keynote 4: Donna L. Hudson: "Technology in Healthcare"

Room: A

11:45 - 13:05

## 2-3: Usability & Human-Device Interaction II

Room: A

Chair: Thomas Coughlin (Coughlin Associates, USA)

### 11:45 *One implementation of search feature in an Internet based EPG provider* 196

Aleksandar Beserminji (University of Novi Sad & RT-RK Institute for Computer Based Systems, Serbia); Milan Knežević (University of Novi Sad & RT-RK Institute for Computer Based Systems, Serbia); Goran Stupar (University of Novi Sad & RT-RK Institute for Computer Based Systems, Serbia); Vukota Pekovic (RT-RK d.o.o., Serbia)

Electronic program guide (EPG) provides information that helps viewer to get to know which programs are available for watching. Our system provides recommendation feature based on EPG metadata. When this does not satisfy viewer needs, the system provides a search feature which viewer can use to find content he is interested in. Search is designed to find EPG events whose essence is similar to what viewer is searching for. That is achieved by using adequate indexing technique, with help of stemming and scoring mechanisms. Such search implementation showed better results in comparison to the search realised using SQL.

### 12:05 *User self-help module for a device management cloud based on the TR-069 protocol* 199

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); Mića Četković (University of Novi Sad, Faculty of Technical Sciences, Serbia); Nikola Ikonić (RT-RK Institute for Computer Based Systems, Serbia); Milan Z. Bjelica (University of Novi Sad & iWedia, Serbia)

In this paper, a solution for a self-help module as a part of a Device Cloud platform for connected consumer electronic devices is presented. The proposed solution allows users to track parameter values and solve issues on their devices. Contribution to technology is real-time issue solving mechanism based on cross-referencing of parameter values and predefined actions for specific device types.

### 12:25 *Device Cloud platform with customizable Remote User Interfaces* 202

Saša Radovanović (University of Novi Sad, Faculty of Technical Sciences & RT-RK Institute for Computer Based Systems, Serbia); Bojan Majstorovic (RT-RK Computer Based Systems LLC, Serbia); Milan Z. Bjelica (University of Novi Sad & iWedia, Serbia); Sandra Kukulj (RT-RK Computer Based Systems LLC, Serbia)

In this paper a concept and implementation of a Device Cloud with customizable generation of remote user interfaces is presented. The proposed solution allows adapting device dashboards in frontend applications connected to the Device Cloud, through a model-based approach in Internet of Things. Some of the main contributions to the state-of-the-art are customizable Remote User Interfaces through the TR-069 communication protocol with low communication overhead and advanced configuration and monitoring features such as problem solution mechanisms and cross-device analytics.

### 12:45 *An Ubiquitous System for Advertising using Mobile Sensors and Hand Gestures* 205

Gonzalo Cerruela García (University of Córdoba, Spain); Nicolás García-Pedrajas (University of Córdoba, Spain); Francisco J. Bellido Outeiriño (University of Córdoba, Spain); Irene Luque Ruiz (University of Córdoba, Spain); Miguel Ángel Gómez-Nieto (University of Córdoba, Spain)

This paper describe a solution to create augmented environments of virtual posts and to attach to these totems any contents or ads. Ads are automatically shows in the mobile phone of the users using a notification based process considering relative user location between the posts and the user preferences. Moreover, Ads can be stored and retrieved from the post using hand gestures and Near Field Communication technology.

## 2-4: AV/Multimedia

Room: B

Chair: Scott L Linfoot (MASS, United Kingdom)

### **11:45 Analysis of the implementation of hybrid functions in the current brazilian digital television system 210**

Jackelyn Tume Ruiz (University of Campinas, Brazil); Andrés Chicaíza Gómez (University of Campinas, Brazil); Luis Geraldo P. Meloni (University of Campinas & School of Electrical and Computer Engineering, Brazil)

Currently, interactivity has a fundamental role in DTV systems. With the arrival of smart-phones, tablets, and other gadgets connected to Internet, users have almost all the information that they needs at their hands. How to bring this interactivity to the electronic device found in almost every home, regardless of economic or social class of its residents?. Worldwide hybrid television standards are being developed, integrating the broadcast television signal and the broadband network, offering a myriad of possibilities for interactive applications that will be able to target people of every age, sex, physical, social or cultural condition, etc. This paper aims to make a study on the implementation of hybrid digital TV functions in Brazil, taking as reference the HbbTV standard, and what would be its impact on users and stakeholders.

### **12:05 Integration of RVU remote user interface and DLNA remote media player in Qt framework 215**

Davor Ropic (Faculty of Technical Sciences Novi Sad & RT-RK, Serbia); Stevan Medic (Faculty of Technical Sciences, University of Novi Sad & RT-RK Institute for Computer Based Systems, Novi Sad, Serbia); Nenad Soskic (Faculty of Technical Sciences, University of Novi Sad, Serbia); Milan Savic (University of Novi Sad, Serbia)

This paper describes integration of RVU remote user interface and DLNA media player plug-ins in Qt framework. Usage of RVU concept introduces possibility to achieve same user experience across various platforms such as Android, iOS, Linux, etc. Integration of RVU concept into Qt framework enables execution of Qt applications in home network environment. Qt application is stored and executed on the server, while user interface rendering and A/V content reproduction is done on the RVU client side.

### **12:25 Using HbbTV and a second screen to link TV programs to related content on the Web 218**

Lyndon Nixon (MODUL University Vienna GmbH, Austria); Jan Thomsen (Condat AG, Germany)

While parallel Internet usage to explore additional information while watching TV is on the rise, TV content owners face excessive costs and technological challenges to provide eased access to that information alongside their own content. Since viewers do not have access to the same background metadata as the content owner, they are often frustrated in their own searches. Linked Television is a concept for interlinked TV and Web content within a shared digital ecosystem under the control of the content owner. In this paper, we describe how we implement a prototype for Linked Television using a HbbTV device as main screen communicating with a second screen such as a tablet used by the viewer to easily access and browse information related to what is seen in the TV program.

### **12:45 Temporal annotation-based audio source separation using weighted nonnegative matrix factorization 220**

Ngoc Q. K. Duong (Technicolor, France); Alexey Ozerov (Technicolor Research & Innovation, France); Louis Chevallier (Technicolor, France)

We consider an emerging user-guided audio source separation approach based on the temporal annotation of the source activity along the mixture. In this baseline algorithm, nonnegative matrix factorization (NMF) is usually used as spectral model for audio sources. In this paper, we propose two weighting strategies incorporated in the NMF formulation so as to better exploiting the annotated information. We then derive the corresponding multiplicative update (MU) rules for the parameter estimation. The proposed approach was objectively evaluated in the fourth community-based Signal Separation Evaluation Campaign (SiSEC 2013) and shown to outperform the baseline algorithm, while obtaining comparable result to some other state-of-the-art methods.

13:05 - 14:05

## Poster Session 2

Room: A

### **Object Tracking Based on Hardware/Software Co-design of Particle Filter and Particle Swarm Optimization 225**

Chen-Chien Hsu (National Taiwan Normal University, Taiwan); Wen-Chung Kao (National Taiwan Normal University, Taiwan)

This paper presents a hardware/software co-design method for a hybrid object tracking algorithm incorporating particle filter (PF) and particle swarm optimization (PSO) based on System On Program Chip (SOPC) technique. Considering both the execution speed and design flexibility, we use a NIOS II processor to calculate weight for each particle and a hybrid accelerator implemented by hardware to update particles. As a result, execution efficiency of the proposed hardware/software co-design method is significantly improved while maintaining design flexibility for various embedded

applications. As soon as prototype testing for a specific problem is completed by using the software weight assignment, full hardware implementation of the weight calculating module can be used to speed up the execution speed.

**Depth Measurement Based on Pixel Number Variation and Speeded Up Robust Features 228**

Po-Ting Huang (National Taiwan Normal University, Taiwan); Chen-Chien Hsu (National Taiwan Normal University, Taiwan); Ming-Chih Lu (St. John's University, Taiwan); Yin-Yu Lu (The University of Melbourne, Australia)

This paper presents a method for depth measurement based on Speeded Up Robust Features (SURF) and pixel number variation of CCD Images. A single camera is used to capture two images in different photographing distances, where features in the images are extracted and matched by SURF. To remove false matching points, an Identifying point correspondences by Correspondence Function (ICF) method is adopted to automatically select suitable reference points required for the pixel number variation method. Based on the displacement of the camera at two photographing distances, difference in pixel count between feature points of the objects in the images can be used to determine the photographing distance of the target objects for constructing the depth map.

**One implementation of extendable application for collecting EPG data from internet sources 230**

Stefan Pejčić (University of Novi Sad, Serbia); Helena Peić Tukuljac (University of Novi Sad, Serbia); Milan Knežević (University of Novi Sad & RT-RK Institute for Computer Based Systems, Serbia); Istvan Papp (University of Novi Sad, Serbia)

This paper presents one solution for a extendable application which is used to collect EPG (Electronic Program Guide) data from various internet sources. The aim of the software is to complement or replace incomplete EPG information received from DTV (Digital television) stream with Internet data. The acquired data is processed and forwarded to remote server which further stores it to a database.

**An Analysis of Cooling Li-ion Battery Modules 233**

Yuuki Kitagawa (Ritsumeikan University, Japan); Lei Lin (Ritsumeikan University, Japan); Masahiro Fukui (Ritsumeikan University, Japan)

This paper discusses the theory and experiments of heating and air cooling of battery modules. Heating and cooling mechanism is shown first, then cooling of a single battery is measured. Power efficient air flow speed is discussed. Then, difference of cooling efficiency by location is discussed in a battery module of six serial cells.

**Development of an Estimation Model for Instantaneous Presence in Audio Content 238**

Kenji Ozawa (University of Yamanashi, Japan); Shota Tsukahara (University of Yamanashi, Japan); Yuichiro Kinoshita (University of Yamanashi, Japan); Masanori Morise (University of Yamanashi, Japan)

The sense of presence is often used to evaluate the performances of audio content and systems. To estimate the overall presence of a content item, we have developed estimation models for the sense of presence in audio-only and audio-visual content. In this study, the audio-only model is expanded to estimate the instantaneous presence in an audio content item. Initially, we conducted an evaluation experiment of the presence with 40 content items to investigate the relationship between the features of the audio content and the instantaneous presence. Based on the experimental data, a neural-network-based model was developed by expanding the previous model. To express the variation in instantaneous presence, six features, which were extracted from the content items in 500-ms intervals, were used as inputs for the model. A generalization test confirmed that the model is sufficiently accurate to estimate the instantaneous presence.

**Secure and Efficient Medium Access in Wireless Networks 243**

Youssef El Hajj Shehadeh (TU Chemnitz, Germany); Danai Chasaki (Villanova University, USA)

One of the fundamental tasks of the MAC layer in wireless networks is coordinating channel access securely and efficiently. However, the contention-based medium access scheme used in IEEE 802.11 networks has been found to be suboptimal, especially for a large number of users. Moreover, it is vulnerable to misbehavior resulting in an unfair share of the wireless channel. To tackle these two problems, we propose a distributed scheduling-based medium access scheme. In addition to its high efficiency, this scheme also provides security by design and ensures a fair distribution of wireless resources.

**Performance Indicators: A Mobile Solution to Identify Legacies in Mega Events 245**

Jorge Rodolfo Beingolea Garay (University of Sao Paulo, Brazil); Gustavo Moreira Calixto (University of Sao Paulo & LSI-TEC, Brazil); Alexandre De Oliveira (University of Sao Paulo, Brazil); Marcelo K Zuffo (University of São Paulo, Brazil)

This paper presents a user-centered mobile solution to evaluate the performance and success of the service's infrastructure at the level of Urban Mobility, Tourism, Airports (Air Transport), Stadium (Arenas) and security in mega events. This infrastructure is noted from the perspective of legacies and its impact is evaluated through a collaborative process between the KPI, as a tool installed on each mobile device, and the end user. This project is financed by the National Council for Scientific and Technological Development (CNPq) and aims to identify the relation between the values of investments applied to 2014 FIFA World CUP and the dimension of the resulting legacies.

**FPGA Implementation of Full HD Real-time Depth Estimation 249**

Hejian Li (Shanghai University, P.R. China); Ping An (School of Communication and Information Engineering, Shanghai University, P.R. China); Zhaoyang Zhang (School of Communication and Information Engineering, Shanghai University, P.R. China); Guowei Teng (Shanghai University, P.R. China)



Depth estimation is a common task in stereo vision system and usually requires a high computational effort. High resolution images offer more details compared to low resolution images and High resolution depth maps are necessary to provide a good image quality on autostereoscopic displays which deliver stereo content without the need for 3D glasses. In this paper, an FPGA architecture for a depth estimation algorithm is proposed, that is capable of processing full HD content in processing speed of 125fps and a disparity search range of 240 pixels. The resulting architecture is efficient in terms of power consumption and overall performance improvement. The proposed FPGA implementation can compete with other hardware architectures in terms of full HD depth maps in real-time and it boosts overall performance dramatically.

***A Modified A-law Companding Scheme for Indoor Visible Light Communication* 254**

Jinhyuk Song (ETRI, Korea)

Visible light communication (VLC) has been received much attention because it simultaneously provides data transmission and illumination without electromagnetic wave interference. However, the modulation using discrete multi-tone (DMT) is possible to suffer from harmful effect of human eye. To solve this problem, this paper introduces the manner of applying constant envelope orthogonal frequency division multiplexing (CE-OFDM) to VLC and then proposes optimal companding scheme. The basic idea is to deliberately convert statistical distribution of phase modulator input signal into quasi-uniform distribution using modified A-law companding (MA-law companding). The proposed scheme can bring enhancement of system performance regardless of the scaling constant. Simulation results show that bit error rate (BER) performance of the proposed MA-law companding is superior to original CE-OFDM and conventional companding schemes.

***Partial MMSE-ML detection for coded MIMO systems* 256**

Youngmin Kim (ETRI, Korea); Jae-Hyun Seo (Electronics and Telecommunications Research Institute, Korea); Heung Mook Kim (ETRI, Korea)

We propose computationally efficient MIMO detection scheme which can provide accurate soft decision information to the decoder. The detection process has two stages. The proposed scheme first detects symbol information using MMSE method, and calculates noise variances of each detected symbol. Next, each symbol is detected by single maximum likelihood demodulator partially. Compared to the maximum likelihood detection which exhaustively searches for the soft decision information, the proposed scheme greatly reduces the complexity due to its computational algorithm.

***Accelerating Method of Moments by Using Modern GPU Hardware* 259**

Artur Noga (Silesian University of Technology, Poland); Tomasz Topa (Silesian University of Technology, Poland); Michal Danisz (Silesian University of Technology, Poland); Przemyslaw Koziel (Silesian University of Technology, Poland); Krzysztof Zielinski (Silesian University of Technology, Poland)

In this paper, the GPU implementation of the method of moments (MoM) for solving electromagnetic scattering and radiation problems is presented. A single-CPU sequential MoM algorithm for analysis of arbitrary conducting 3D bodywire structures is ported using CUDA to heterogeneous CPU/GPU platform. Computational efficiency and measured speedups over a reference single-thread CPU implementation for hardware platforms with different CUDA architectures are demonstrated.

***Robotic Map Building by Fusing ICP and PSO Algorithms* 263**

Chen-Chien Hsu (National Taiwan Normal University, Taiwan); Wen-Chung Kao (National Taiwan Normal University, Taiwan)

This paper proposes the use of Particle Swarm Optimization (PSO) to work with an Enhanced-ICP to effectively filter out outliers and avoid false matching points during the map building of an unknown environment, where PSO is used to solve the local optima problem to obtain better transformation results for two data sets with excessive difference in initial position and direction. Then, we use part of global map as the reference data set with overlapping points for subsequent data matching. Experimental results show that the proposed algorithm not only solves outlier and noise problems but also reduces false matching points so that it has better alignment and smaller accumulated errors for map building.

## Lunch

Room: Break Area

14:05 - 14:50

## Keynote 5: Wayne Luplow: "THE LEGEND OF TV - Long and Winding Road: A Memoir"

Room: A

14:50 - 16:30

## 2-5: Smart Energy I

Room: A

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

### 14:50 *Intelligent Electronic Device for the control of Distributed Generation* 268

Rafael Real-Calvo (University of Cordoba, Spain); Antonio Moreno-Munoz (University of Córdoba, Spain); Víctor Pallarés-López (University of Cordoba & Electronics and Electronic Technology Area, Spain); Miguel Jesús González-Redondo (University of Cordoba, Spain); Jose-Maria Flores-Arias (University of Cordoba, Spain)

Today the Smart Grid concept along with the development of Distributed Generation (DG) causes the need to get devices that can manage different power flows in the power system. In this paper an Intelligent Electronic Device (IED) is presented. This device operates in real time (RT) and is ready to manage DG. It allows monitoring status of the interface between distributed generation and utility network, and manages communications between all involved entities.

### 15:10 *Home Energy Management System Based on IEEE 802.15.4g Smart Utility Networks* N/A

Jinsoo Han (ETRI, Korea); Chang-Sic Choi (ETRI, Korea); Wan-Ki Park (ETRI, Korea); Il-Woo Lee (ETRI, Korea); Sang-Ha Kim (Chungnam National University, Korea)

Network-based monitoring of the energy use of each home appliance is necessary for efficient home energy management. In this paper, as a communication network, an IEEE 802.15.4g smart utility network (SUN) is adopted instead of ZigBee to get a wide coverage and overcome radio shadow area. The system architecture is described based on a home energy gateway (HEG) and a smart plug (SP). Energy-efficient and collision-minimizing communication schemes are explained. The home energy information is browsed using smart devices; users figure out the home energy status and manage home energy. The proposed HEMS can contribute to enhancing home energy management and reducing home energy cost.

### 15:30 *Novel EMI Line Filter System for SMPS* 272

Daniel Miller (Augsburg University of Applied Sciences, Germany); Ralph Kennel (Technical University of Munich, Germany); Manfred Reddig (University of Applied Sciences Augsburg, Germany)

This article outlines new options to realize modern and highly efficient EMI line filter systems for switching mode power supplies (SMPS) which are applicable for standard consumer electronics. One system demonstrates an effective optimized standard line filter for power supplies. Another system is focused on a novel line filter system for a bridgeless boost power factor correction (PFC) stage which includes a completely new inductive filter component. The bridgeless boost PFC topology requires an additional filter stage to fulfill the limits of the valid standards like CISPR 22 [1]. Construction size, cost-efficiency and power losses are always on focus besides the general EMI functionality. All these properties will be analyzed in this paper. The standard cost curve on electronic development processes highlighted the fact that it is more effective to consider the EMI behavior at the beginning of development and not only at the end. This in combination with the ubiquitous presence of EMI affords the motivation of this project.

### 15:50 *Constrained Low-Power CMOS Analog Circuit Design via All-Inversion Region MOS Model* 277

Magnanil Goswami (West Bengal University of Technology, India); Sudakshina Kundu (West Bengal University of Technology, India)

In this paper we furnish a novel approach of design automation and power optimization of CMOS analog integrated circuits. This method offers an effective amalgamation between the principles of orthogonal-convex optimization and the all-inversion region MOS transistor model. The design equations, emerging from various device and circuit specifications can be modeled as the constraints of an orthogonal-convex optimization problem and can be evaluated automatically to ensure a globally optimal solution over a range of design scenarios.

### 16:10 *Dynamic timeout power policy for network interfaces* 279

Bruna Vilar (Universidade Federal de Campina Grande - UFCG, Brazil); Fabiano de M Silva (UFCG, Brazil); Saulo O. D. Luiz (Universidade Federal de Campina Grande - UFCG, Brazil); Jaidilson Jo Silva (Federal University of Campina Grande, Brazil); Hyggo Almeida (Federal University of Campina Grande, Brazil); Angelo Perkusich (Federal University of Campina Grande, Brazil)

Network interfaces are present in a variety of battery powered computer systems, such as notebooks, ultrabooks, tablets and mobile phones. Considering that the battery life is still a constraint, there are opportunities for power management by reducing the power consumption of idle network interfaces. In this work, a dynamic timeout power policy for network interfaces is presented, incorporating workload estimation and a problem optimization at runtime, thus providing power savings and suitable performance.

## 2-6: Consumer Networks I

Room: B

Chair: Alexander Huhn (Berliner Verkehrsbetriebe (BVG), Germany)

### 14:50 Usage Patterns Based Security Attacks for Smart Devices 284

Soumya Kanti Datta (EURECOM, France); Christian Bonnet (Institut Eurecom, France); Navid Nikaein (Eurecom, France) Smart devices are increasingly becoming part and parcel of daily life and as well as becoming the center of attraction for security attacks. This paper introduces a novel malware which exploits the usage patterns of smart devices and launches malicious attacks. A useful Android application is developed which aims to provide user-specific power saving profiles by analyzing individual usage patterns. The application collects various usage information including running applications, battery level and status, brightness level, status of wireless networks and amount of data transfer.

### 15:10 A 'Bluetooth Smart' Analyzer in iBeacon Networks 288

Maria Varsamou (University of Patras, Greece); Theodore A. Antonakopoulos (University of Patras, Greece) Bluetooth Low Energy (BLE), otherwise called Bluetooth Smart, is a newly emerged technology targeting low-power, low-cost wireless communications with medium or short range coverage. It has widened the applicability of classic Bluetooth and is an ideal choice for a variety of sensor-like products (e.g. biometrics monitors) as well as ubiquitous mobile devices (e.g. smartphones). Recently, it was proposed that indoor positioning can be feasibly realized if simple BLE sensor devices, called "iBeacons", are scattered in various locations in a particular venue. In this work, we present an Android-based application for analyzing iBeacon networks and determining the best signal map for the whole iBeacons installation.

### 15:30 On-site Installation Support Tool for Setup Error Prevention 293

Rade Simikić (University of Novi Sad, Faculty of Technical Sciences, Serbia); Mića Četković (University of Novi Sad, Faculty of Technical Sciences, Serbia); Dejan Stefanovic (RT-RK, Serbia); Nikola Živanović (RT-RK Institute for Computer Based Systems, Serbia)

In this paper, we present an on-site installation tool for setup of consumer devices. The tool is designed as an application for Android OS based handheld devices. The application is part of a system for monitoring and configuring of set-top box devices. The system provides access to the auto configuration server and exposes the server's functionalities. The main contribution to the state of the art is facilitated maintenance of devices that are deployed in the field.

### 15:50 Auto-Configuration Server architecture with device cloud cache 296

Mića Četković (University of Novi Sad, Faculty of Technical Sciences, Serbia); Norbert Nemet (University of Novi Sad, Faculty of Technical Sciences & RT-RK Institute for Computer Based Systems, Serbia); Tatjana Samardzic (University of Novi Sad, Serbia); Nikola Teslic (University of Novi Sad, Serbia)

In this paper, a server architecture based on the TR-069 communication protocol is proposed. Server provides an efficient and adaptive way to remotely control and monitor customer devices. The proposed solution is a modular because provides extendable layers to connect various statistics modules, modules for analysis and diagnosis of customer devices or for graphical presentation applications, such as web or android based applications.

### 16:10 Identify Regions/Free Spectral Range M-sequence Code to Improve Cardinality over AWG-based WDM/OCDMA Networks 299

Yao-Tang Chang (Kao Yuan University, Taiwan)

This paper presents a hybrid wavelength-division multiplexing (WDM) and optical code-division multiple-access (OCDMA) scheme over fiber to-the-home (FTTH) networks. In the proposed scheme, the total wavelength spectrum of the light source is divided into both of WDM group for identify section and OCDMA group for coded orthogonal section. In order to implement the shared arrayed-waveguide grating (AWG) encoder/decoder which exploiting in accordance with the inherent periodic free-spectral-range (FSR) interval range of the AWG router, the WDM group is used to distinguish each region configured with optical network units (ONUs) group based on the various diameter of optical line terminal (OLT) center. Moreover, the OCDMA groups are implemented with delay line matrix to obtain zero cross-correlation. Compared to conventional schemes without partition of identify section, the proposed scheme shows that the cardinality of proposed scheme approximately increased 6 times and 13 times than those of conventional scheme when the scheme is only partition number of 2 and 3 identify section, respectively. Furthermore, the proposed scheme provides more flexibility that the same identify region is assigned to the same ONU groups depending on the approximately distance from the OLT location.

**Tuesday, September 9**

**16:30 - 16:50**

**Coffee Break**

Room: Break Area

**16:50 - 17:35**

**Keynote 6: James L. Wayman: "Biometrics, Privacy, and Remote Authentication"**

Room: A

**17:35 - 19:20**

**Tour to TiME Lab (Heinrich-Hertz-Institut)**

**20:00 - 22:00**

**Conference Dinner ( Hyatt Hotel Potsdamer Platz)**

09:00 - 10:40

### 3-1: Smart Energy II

Room: A

Chair: Alexander Huhn (Berliner Verkehrsbetriebe (BVG), Germany)

#### **09:00 Analyzing the Effects of Time-shifted TV on the Energy Consumption of Personal Video Recorders 304**

Peter Neumann (TU Braunschweig & Institute for Communications Technology, Germany)

Due to economic and ecological reasons the energy consumption of consumer electronics products like TVs and set-top boxes (STBs) is of increasing importance. As nowadays also Personal Video Recorders (PVRs) are widely used, the question is raised, how time-shifted TV affects the energy use. In this paper a framework for analyzing the impact of recording and later playback of TV content on the energy consumption of a PVR is presented. The underlying method allows taking the viewing habits of users into account. The framework is used to analyze the energy consumption of a recommender-based PVR that, based on personalized recommendations, automatically records TV content for the user.

#### **09:20 Home Energy Management System for Electricity Cost Savings and Comfort Preservation 309**

Kornschnok Dittawit (Norwegian University of Science and Technology, Norway); Finn Arve Aagesen (NTNU, Norway)

The goal of the presented home energy management systems (HEMS) is to reduce electricity costs under a controlled reduction of comfort. Comfort covers here both the satisfaction of environmental states of rooms and the operating states of devices. Degree of Discomfort is a proposed measure for the dissatisfaction of comfort. A prototype HEMS was implemented. Simulations were conducted to study the potential cost savings from adjusting space heaters as well as the resulting discomfort. The cost reduction depends on the price condition and the consumer's willingness to sacrifice comfort. In the extreme cases considered, the cost reduction can go up to 19%.

#### **09:40 Adaptive build system for TR-069 consumer device agent 314**

Veljko Mihailovic (Faculty of Technical Sciences & RT-RK Institute For Computer Based Systems, Serbia); Nemanja Ignjatov (RTRK Computer Based Systems LLC, Serbia); Bojan Majstorovic (RT-RK Computer Based Systems LLC, Serbia); Nikola Teslic (University of Novi Sad, Serbia)

In the last few years, we have witnessed the expansion of Broadband Forum's CWMP (TR-069) protocol usage. Many devices today have integrated the TR-069 device agent. Integration of that agent can be difficult and time-consuming because of the many parameters and objects, where each of them requires an API function, to report its value. What we propose in this paper is the solution which includes API generation on the compile-time of the TR-069 device agent.

#### **10:00 Increasing power models accuracy by means of synchronized measurements 318**

Saulo O. D. Luiz (Universidade Federal de Campina Grande - UFCG, Brazil); Arthur Silva (Universidade Federal de Campina Grande - UFCG, Brazil); Diego Santos (Universidade Federal de Campina Grande - UFCG, Brazil); Thamiles de Melo (UFCG, Brazil)

For computer systems, it is essential the establishment of policies for reducing consumption and avoiding the waste of energy. However, traditional approaches for retrieving energy consumption information are not suitable for creating effective policies. In this paper, we present a power estimation model that provides detailed information about energy consumption of processors and devices, by applying constrained linear least squares, enabling more efficient energy policies for computer systems.

#### **10:20 Estimating computer systems power consumption for time scaled experiments 323**

Bruna Vilar (Universidade Federal de Campina Grande - UFCG, Brazil); Arthur Silva (Universidade Federal de Campina Grande - UFCG, Brazil); Igor Ulisses (University of Campina Grande, Brazil); Jaidilson Jo Silva (Federal University of Campina Grande, Brazil); Angelo Perkusich (Federal University of Campina Grande, Brazil); Frederico Bublitz (State University of Paraiba, Brazil)

Power policies are widely applied at computer systems such as desktops, notebooks, and smartphones. For example, the timeout policy to turn off the display. A power management policy must be tested by measuring the power consumption of an experimental platform running workloads. Such tests must be fast enough to feedback the development process with valuable information about the power policy performance. In this work, we have presented a methodology for estimating computer systems power consumption for time scaled experiments. Using the proposed methodology, we have reduced the overall time for developing a power management policy.

## 3-2: Video I: 3D & Displays

Room: B

Chair: Dietmar Hepper (Technicolor, Germany)

### **09:00 Image-Based Pose Estimation Using a Compact 3D Model 327**

Iris Heisterklaus (RWTH Aachen University, Germany); Ningqing Qian (RWTH-Aachen University, Germany); Artur Miller (RWTH Aachen University, Germany)

Image-based localization finds the position and pose an image was taken in. Our method uses the MPEG Compact Descriptors for Visual Search framework to build a compact 3D model from the 3D reconstruction of a city. Then using an image retrieval the closest match for a query image is found and the pose and position is estimated. Our method is able to determine an estimate of the pose within a few meters of the actual one.

### **09:20 Combining High Resolution Color and Depth Images for Dense 3D Reconstruction 331**

Pongsak Lasang (Panasonic R&D Center Singapore, Singapore); Sheng Mei Shen (Panasonic, Singapore); Wuttipong Kumwilaisak (King Mongkut's University of Technology, Thonburi, Thailand)

In this paper, we present an effective method to reconstruct a dense 3D model of an object or a scene by combining high resolution color and depth images. Conventionally, multiple views of color images can be used for reconstructing a 3D model of the captured scene. Although the conventional method can give the accuracy of the textured-regions of an object, it lacks density and leaves many holes in the texture-less regions. However, a depth camera is capable to capture 3D distance information even in homogenous regions. Still, it gives low resolution and is unable to provide an accurate result of a detailed object. We thus propose a combined method of utilizing both high resolution color and depth images to obtain a high-quality, accurate and dense 3D model. Compared to the conventional methods, our proposed method produces a much denser and more all-over 3D results.

### **09:40 Stereoscopic 3D Image Quality Assessment based on Cyclopean View and Depth Map 335**

Sid Ahmed Fezza (University of Oran, Algeria); Chaker Larabi (Université de Poitiers, France)

This paper presents a full reference quality assessment metric for stereoscopic images based on perceptual binocular characteristics. To ensure that the predicted 3D quality of experience is as reliable and close as possible to 3D human perception, the proposed stereoscopic image quality assessment (SIQA) method is relying on the cyclopean image. Our approach is motivated by the fact that in case of asymmetric quality, 3D perception mechanisms place more emphasis on the view providing the most important and contrasted information. We integrated this psychophysical findings in the proposed 3DIQA framework thanks to a weighting factor based on local information content. Add to that, to take into account the disparity/depth masking effect, we modulate the obtained quality score of each pixel of the cyclopean image according to its location in the scene. Experimental results show that the proposed metric correlates better with human judgement than the state-of-the-art metrics.

### **10:00 Hardware-friendly Color Temperature Management for Flat Panel Display 340**

Byungseok Min (Samsung Electronics, Korea)

There are demanding display quality factors to meet the industrial requirements for accurate color reproduction such as the chrominance accuracy of primary colors, uniform gray color temperature, display gamma for primary and gray channels and so forth. However, due to the optical limitation of display panels, the correlated color temperature fluctuates up to 3000 Kelvin in typical calibrated flat panel LCD or LED display. The most common method to maintain the constant color temperature is to adjust gamma curves of three primary channels, but it results in the failure of accurate gamma reproduction at the same time. The proposed approach keeps the uniform color temperature for all gray levels while keeping the RGB gamma curves as well as highly saturated colors unchanged, where color changes are made in inverse proportion to the distance from the gray axis. Using the proposed methodology, a new white balancing algorithm is introduced that the white balancing is restricted to near gray colors, not the whole colors in general manners.

### **10:20 Investigation on Electro-optical Performance of Transparent Displays 343**

Sunhee Park (LG Display, Korea)

Transparent displays have been expected to widen the scope of display application utilizing see-through function. There are, however, few studies on image quality of transparent display until now. This paper, therefore, describes the electro-optical performance of transparent displays. In order to evaluate see-through performance, novel evaluation method named purity was developed by measuring the amount of light which can form distinct image. The new proposed method could tell how clear the see-through image can be seen, and is consistent with viewer's perception. Our study would give suggestions on the development of transparent displays.

10:40 - 11:00

## Coffee Break

Room: Break Area

11:00 - 11:45

## Keynote 7: Pierluigi Siano: "Demand Side Management and Energy Management Systems from a CE perspective"

Room: A

11:45 - 13:05

## 3-3: Video II: Image capture and recognition

Room: A

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

### 11:45 *Novel Edge Preserve and Depth Image Recovery Method in RGB-D Camera Systems* 346

Pongsak Lasang (Panasonic R&D Center Singapore, Singapore); Sheng Mei Shen (Panasonic, Singapore); Wuttipong Kumwilaisak (King Mongkut's University of Technology, Thonburi, Thailand)

We proposed a new edge preserve and depth image recovery method that gives a sharp and accurate object shape from a noisy boundary depth map captured by a RGB-D camera. The edges of an input depth image are detected and the noisy pixels around them are removed from the depth image. An anisotropic diffusion edge tensor of an input RGB image is computed. Missing depth pixels are then recovered using the total generalized variation optimization with a guidance of the RGB-image edge tensor. Thus, accurate object depth boundary can be obtained and well aligned with the object edges in RGB images. The missing or invalid depth pixels in the large hole areas and the thin object can also be recovered. Experimental results show much improvement in edge preserve and depth image recovery with the expense on computation complexity when compared with previous works.

### 12:05 *Recognition of urban buildings with spatial consistency and a small-sized vocabulary tree* 350

Souheil Hadj Said (Institut Mines-Télécom, Télécom SudParis, France); Ismail Boujelbane (institut Mines Telecom, Telecom SudParis, France); Titus Zaharia (Institut TELECOM, France)

In this work, we address the problem of building recognition as a mobile application. Inspired by the work of Sivic et al , we use a small-sized vocabulary-tree of SIFT descriptors. Each SIFT descriptor in our dataset is saved along with its class label, its nearest neighbor from the vocabulary and the visual words corresponding to its spatial neighbors. To evaluate a new query image, we extract SIFT interest points and their descriptors and match it to a sub-list of descriptors that correspond to the same visual word. Then, as a verification step, we evaluate the spatial consistency. Finally, a voting scheme is used to decide which building category this image belongs to. The experimental results, obtained on two publicly available building datasets, show state of the art accuracy while ensuring reduced memory and computational requirements.

### 12:25 *Multi-object recognition and tracking with feature points matching and spatial layout consistency* 355

Ismail Boujelbane (institut Mines Telecom, Telecom Sudparis, France); Souheil Hadj Said (Institut Mines-Télécom, Télécom SudParis, France)

In this paper, we propose a simultaneous textured object recognition and localization approach designed to real-time mobile devices applications. Local interest points are extracted and classified with the help of a strong matching algorithm. The matching procedure is based on a strict verification of the spatial layout consistency of the considered interest points. The proposed approach is well suited for real-time multi objects tracking and yields precision/recall rates superior to 90%.

### 12:45 *The Method of Panorama Construction from Low Detail Source Videos* 360

Nataliia Obukhova (St. Petersburg State University of Aerospace Instrumentation, Russia); Alexandr Motyko (Saint Petersburg State University of Aerospace Instrumentation, Russia); Boris Timofeev (State University of Aerospace Instrumentation, Russia)

This paper concerns the task of panoramic image stitching in conditions when the initial pictures have low quantity of detail. In general the problem of image stitching is well studied, but the specific cases when the source videos have large flat

background areas and small initial quantities of characteristic features are interest for the researchers. The conditions of that kind appear very often in real tasks as in consumer application as in special video system. In case of medical images stitching with homogeneous tissues or in low detailed landscape observation in surveillance system the goal is to use the maximal number of the obtained "key points". In this paper the automatic method of video panorama construction from the images with low number of key points is proposed. The main features of proposed method are: • The reliability degree for key points matched pairs is introduced.

### 3-4: Consumer Networks II

Room: B

Chair: Dietmar Hepper (Technicolor, Germany)

#### 11:45 *One Solution of STB Users Cloud Based Profiling* 364

Goran Stupar (University of Novi Sad & RT-RK Institute for Computer Based Systems, Serbia); Dejan Nadj (University of Novi Sad, Serbia); Aleksandar Beserminji (University of Novi Sad & RT-RK Institute for Computer Based Systems, Serbia); Istvan Papp (University of Novi Sad, Serbia)

The purpose of this paper is to present a solution for adaptable and efficient user profiling system for set-top-box (STB) devices. The system is set in the cloud environment and based on TR-069 remote management protocol and TR-135 data model for STB devices. The proposed solution allows the development of better and more precise applications for recommending TV and Internet based multimedia content. The system that we propose enables further creation of services that provide better, smarter and more comfortable experience for STB users.

#### 12:05 *Sat>IP Client Integration in a DVB Software Stack* 367

Krsto Lazic (Faculty of Technical Sciences, Serbia); Jelena Kovacevic (University of Novi Sad, Serbia); Ilija Basicovic (University of Novi Sad, Serbia); Milan Acanski (RT-RK, Computer Based Systems, Serbia)

In order to leverage the full potential of video playback capabilities in modern connected devices new protocols for content delivery are emerging. Sat>IP protocol is gaining popularity as a new IP-based architecture for reception and distribution of satellite signal. In this paper we present one solution for integration of Sat>IP client in an existing DVB broadcast software stack. Seamless integration is enabled by using virtual IP tuner concept for content acquisition. The solution is implemented on an Android based embedded DTV platform.

#### 12:25 *Embedded Actors - Towards Distributed Programming in the IoT* 371

Raphael Hiesgen (Hamburg University of Applied Sciences, Germany); Dominik Charousset (HAW Hamburg, Germany); Thomas C. Schmidt (Hamburg University of Applied Sciences, Germany)

The long-term vision of an Internet of Things (IoT) is approaching reality and leading hardware vendors expect shipment of 50 billion devices in the near future. Emerging Internet standards will enable this huge number of embedded machines to interconnect and cooperate — and raise the challenge of building suitable software environments that provide scalability, reliability, and security at an efficient level. In this paper, we introduce such an approach — a modified actor model and a corresponding runtime environment. In contrast to common tools, it offers a higher abstraction to design and program applications for constraint devices, while remaining efficient, reliable, and open to include the security extensions from the agenda of the IETF.

#### 12:45 *Navigating Through Dynamic Indoor Environments Using WIFI for Smartphones* 376

Vinjohn V Chirakkal (Kyungpook National University, Korea); Myungchul Park (Kyungpook National University, Korea); Dong Seog Han (Kyungpook National University, Korea)

In recent days with a huge mass deployment of wireless networks, smartphones and various related services, different navigation techniques have been developed for indoor environments. Leveraging on these wireless networks, this paper proposes an indoor navigation model for a smartphone using WIFI. While a number of methods have been developed using received signal strength (RSS) based fingerprinting; only seldom approaches consider the dynamicity of the indoor environments. To tackle this limitation we propose a positioning algorithm based on RSSI - fingerprinting and Manhattan distance which addresses navigation in a rapidly changing indoor environment. The model described is one of the efficient methods in terms of memory and battery consumption.

13:05 - 14:05

### Poster Session 3

Room: A



**High-resolution Image Transmission over MIMO-OFDM E-SDM System with JSCC 379**

Koji Tashiro (Kyushu Institute of Technology, Japan); Leonardo Jr. Lanante (Kyushu Institute of Technology, Japan); Masayuki Kurosaki (Kyushu Institute of Technology, Japan); Hiroshi Ochi (Kyushu Institute of Technology, Japan)

In this paper, we propose a joint source-channel coding (JSCC) scheme for wireless image transmission over IEEE802.11ac system. JSCC is a coding technique where both source and channel characteristics are considered. The proposed algorithm maximizes the peak signal-to-noise ratio (PSNR) by adaptive allocation of both subcarriers and spatial streams on physical (PHY) layer. The PSNR performance reaches 40dB when signal-to-noise ratio (SNR) is higher than 17.5dB. The proposed method is capable of stable real-time transmission of high-resolution images even in a bad channel state.

**One solution of a RESTful API for a cloud based DTV content provider 384**

Stefan Pijetlović (University of Novi Sad & RT-RK Institute for Computer Based Systems, Serbia); Nevena Jovanov (University of Novi Sad & RT-RK Institute for Computer Based Systems, Serbia); Violeta Vukobrat (University of Novi Sad & RT-RK Institute for Computer Based Systems, Serbia); Ilija Basicovic (University of Novi Sad, Serbia)

In this paper we propose a solution of a RESTful application programming interface (API) for a cloud based digital television (DTV) content provider. The system described is responsible for the acquisition of data from the digital television transport stream, retrieving of the related content from the Internet and its exposure to the clients. The focus of the paper is on the REST architectural style and how it affects the overall design of the system.

**A 4k capable FPGA based high throughput binary arithmetic decoder for H.265/MPEG-HEVC 388**

Jan Hahlbeck (Fraunhofer Institute for Telecommunications, Heinrich-Hertz-Institute, Germany); Benno Stabernack (Fraunhofer Institute for Telecommunications, Heinrich-Hertz-Institute, Germany)

High Efficiency Video Coding (HEVC) is the newest video coding standard approved by the ISO/IEC and ITU-T in January 2013. By providing a video coding efficiency gain of up to 50% compared to its predecessor H.264/MPEG-4 AVC, the complexity of the used algorithms has raised significantly. Targeting video formats with higher spatial and temporal resolutions - e.g. 4Kp60 in broadcast applications - make implementing encoders and decoders a challenging task. A well known bottleneck in the decoder architecture addresses the Context-Based Adaptive Binary Arithmetic Coding (CABAC) specified as entropy coding method in the H.265/MPEG-HEVC standard. Reaching high throughput for real time applications is a demanding task in terms of context modeling and serial bin-to-bin dependencies in the binary arithmetic coding engine. Especially the context selection and the update of the context model in binary decision mode requires a complex underlying control flow for the decoding process of each syntax element. This paper presents a pure hardware implementation of a Main Profile H.265/MPEG-HEVC compliant binary arithmetic decoder. The design has been optimized to fulfill real time performance up to 4k video resolutions and data rates of up to 80 MBit/s using state of the art FPGA technology running at low clock frequencies.

**Object Detection In Quantized Feature Space 391**

Christopher Bulla (RWTH Aachen University, Germany); Bhomik Luthra (RWTH Aachen University, Germany); Ningqing Qian (RWTH-Aachen University, Germany)

In this paper, we present a method for the detection of objects in a quantized feature space. Quantizing the feature space is a preprocessing step to compact the amount of data in large scale image retrieval and classification applications. A drawback, compared to the use of non-quantized features, is the loss in the ability to precisely detect and localize common objects across the images. Our method can handle this limitation and is based on the frequently used Bag of Visual Keypoints representation in combination with a sliding window approach. Thereby, it does not need any knowledge about the objects. Experiments on real images show the good performance of our approach.

**A Low Power Adaptive H.264 Video Encoder Hardware 395**

Ilker Hamzaoglu (Sabanci University, Turkey); Aydin Aysu (Sabanci University, Turkey); Onur Ulusel (Sabanci University, Turkey)

In this paper, we propose a low power adaptive baseline H.264 video encoder hardware for portable consumer electronics devices. Multiple reference frame motion estimation (MRF ME) used in H.264 standard increases the video coding efficiency at the expense of increased computational complexity and power consumption. In the proposed hardware, the number of reference frames used for MRF ME can be dynamically changed for each macroblock in order to trade-off video coding efficiency and power consumption. The proposed hardware can code 55 CIF (352x288) frames per second with low hardware cost. Its power consumption ranges between 115mW and 235mW depending on the number of reference frames used for MRF ME.

**Stair sensing system based on optical 3D data for an autonomous stair-climbing wheelchair 400**

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

This paper deals with the development of an optical based scanning method for a new autonomous stair-climbing wheelchair. Therefore, two different 3D data acquisition methods are compared, a stereo camera system and a RGB-D camera (Kinect from Microsoft). After that, an image based algorithm calculates the step width and height in order to support the wheelchair with control information. As both detecting methods work on a different principle, advantages and disadvantages

are discussed. The focus for comparison of both methods lies in the stair recognition under different conditions such as external lightening and material of the stairs.

#### ***Provision of the Social web of Things 404***

HoonKi Lee (Electronics & Telecommunications Research Institute, Korea); Jonghyun Jang (Electronics and Telecommunications Research Institute, Korea); Hyeon Soo Kim (ChnugNam National University, Korea)  
Web of Things (WoT), an advancement of the Internet of Things, enables networking devices to connect and communicate among people and various objects called "things" including networking devices as well as services in distributed environments. Unlike in the many systems that exist for the Internet of Things, the Web of Things is about re-using the Web standards to connect the quickly expanding eco-system of embedded devices built into everyday smart objects. To do so, there need to be a networking infrastructure that supports communications between Web of Things regardless of the user interventions and cooperation. Especially for the services based on the location and Web requires to support social relationship information of users in order to search, control and share user intended services and related objects. The paper introduce a concept of "Social web of Things" (SoT) for supporting device to device collaborative services based on the social relationship information of users in order to control and share web based objects

#### ***Perceptual Audio Quality Assessment for Coder Evaluation 408***

Julio Cesar Garcia Alvarez (Universidad Nacional de Colombia Sede Manizales, Colombia); Paulo Diaz-Solarte (Universidad Nacional de Colombia, Colombia); Santiago Esteban Aguirre Ordoñez (Universidad Nacional de Colombia, Colombia)

The sound is part of the human stimuli, whose information is given by pressure fluctuations into the ear. The perceived sound quality has recently evaluated the performance of audio coders. Newer evaluation methodologies involve psychological and physiological responses of human listeners. However, there is no available methodology providing any relationship between the perceptual assessment and the audio coder performance evaluation. The present work illustrates the Perceptual Audio Quality Assessment (PQA), which analyzes the sound quality perceived by a listener, using a database composed of distorted audio recordings. The distorted records also pass through channels commonly used for audio signal transmission. This experiment allows us to determine a methodology that gives the first step to select an adequate audio compression format and the appropriate modulation/coding scheme for transmitting an audio signal format without a perceived loss.

#### ***A Low Complexity Visual Saliency Model Based on In-Focus Regions and Centre Sensitivity 411***

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

A novel low-complexity visual saliency detection algorithm for detecting salient regions in images is proposed. The algorithm derives salient regions based on in-focus regions and image centre sensitivity. The performance of the algorithm in predicting human eye fixations is validated against ten state-of-the-art algorithms using a public image dataset. The results demonstrate that the proposed algorithm achieves higher prediction accuracy in saliency detection at significantly lower computational complexity compared to other algorithms.

#### ***Texture Preserving Noise Reduction for Ultra High ISO Images 415***

HeeChul Han (Samsung Electronics, Korea)

We present a novel method to reduce sparkle and impulse noise in high ISO images. We employ a different approach for intensity(Y) image and two types of Color image (CB, CR) separately. For the intensity image, we propose a texture analysis based on frequency cut to distinguish between noise patches and texture patches. Noise analysis calibration for parameter extraction is proposed depending on exposure time, ISO and sensor size. The intensity noise is removed by a frequency magnitude cut assuming that the pattern patch has much higher magnitude than the noise patch. However, the color parts produce a big size noise mass after CFA interpolation. We proposed a coincidental smoothing filter for removing the color noise mass by applying the Gaussian function to the strength of the color. Finally, we blend noisy input image to a noise reduced image and add Gaussian noise to product a natural image and reduce some pattern loss.

#### ***Optimization of an electromagnetic micro generator for energy harvesting 420***

Karsten Pietsch (Beuth Hochschule für Technik Berlin, Germany); Bernhard Hiller (Baumer Hübner GmbH, Germany); Helmuth Godenau (Baumer Hübner GmbH, Germany)

The cooperation partner of the research project has developed a micro generator based on the principle of electromagnetic induction, which is used in the product of a rotation sensor. The rotation sensor using the micro-generator is capable of counting the revolutions of a drive without applied supply voltage. In this paper it is shown how the generator system can be simulated using a block diagram based, mechatronic simulation tool. Based on the simulated static flux density of the magnetic circuit, the induced electric voltage of the unloaded electrical circuits can be compared with obtained measurement data. With the simulation model of the electromagnetic micro-generator further steps of optimization can be realized

## **Lunch**

Room: Break Area

14:05 - 14:50

## Future Directions, by Tom Coughlin

Room: A

14:50 - 16:10

## 3-5: Smart Energy III

Room: A

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

### **14:50 Experimental Platform for Power Measurements of Computer Systems 424**

Thamiles de Melo (UFMG, Brazil); Saulo O. D. Luiz (Universidade Federal de Campina Grande - UFGG, Brazil); Jaidilson Jo Silva (Federal University of Campina Grande, Brazil); Breno Neves (Universidade Federal de Campina Grande, Brazil)  
This work presents the implementation of an experimental platform for monitoring the power consumption of mobile devices, such as smartphones, notebooks and netbooks. In this platform, a robust electrical circuit is connected to a data acquisition module for power measurements via a virtual instrumentation implemented in the LabVIEW software. The computer system state was measured by means of operating system performance counters. Finally, the power measurements were synchronized with the computer system state by means of MatLab. The implemented experimental platform has provided valuable information for the analysis of power management techniques for mobile devices.

### **15:10 Maximum Power Transfer Considering Limited Available Input Power in Ultrasonic Wireless Power Transfer for Implanted Medical Devices 431**

Ngan K. Hoang (KAIST, Korea); Jeong-Seon Lee (KAIST, Korea); Sang-Gug Lee (Korea Advanced Institute of Science and Technology (KAIST), Korea)  
Ultrasonic energy harvesting emerges as a leading candidate for clean energy used in implanted medical devices. In implanted medical applications, in order to prevent hot spots, only very low input voltage is allowed, while a high enough output voltage is needed for battery charging. Recent studies use an inductor in either series or parallel to the piezoelectric transducer to boost up output rectifier voltage, sometimes with the price of failing to achieve maximum power transfer. This study provides a method to obtain both maximum power transfer and highly boosted rectifier output voltage for ultrasonic wireless power transfer, considering the limited available input power case, to get enough high output voltage for battery charging in implanted medical applications.

### **15:30 A Software Framework for User-Level Power Management 435**

Bruna Vilar (Universidade Federal de Campina Grande - UFGG, Brazil); Diógenes Galdino Gondim (Federal University of Campina Grande, Brazil); Zeus Barros (Federal University of Campina Grande, Brazil); Frederico Bublitz (State University of Paraíba, Brazil); Hyggo Almeida (Federal University of Campina Grande, Brazil); Angelo Perkusich (Federal University of Campina Grande, Brazil)  
Most operating systems implement their own power management techniques, but it is hard to modify or hack its power policies without the source code. Many dynamic power management architectures were also proposed in the literature, but they lack a means to integrate with the underline OS power manager. In this work, we propose the design and implementation of such a power manager with a case study.

### **15:50 Embedded State of Charge and State of Health Estimator Based on Kalman Filter for Electric Scooter Battery Management Systems 440**

Rami Yamin (University of Picardie Jules Verne, France)  
In this paper, we have implemented this model in an 8-bit microchip PIC 18F45K22 microcontroller to realise an advanced BMS for consumers. The choice of this microcontroller has been made because of the high performances of its CPU, the variety of the inputs/outputs (analogues, digital, UART ...) and its extremely low power consumption which is ideal for the BMS application. We measure the batteries voltage, current and temperature. The mathematical model of the AGM Lead acid battery pack considered as a system. Then, the current is considered as the system's input. The voltage is considered as the system's output. The current and the voltage will enter to the Kalman algorithm to estimate the SOC by estimate the open circuit voltage (Uoc). The Kalman observer is used as software sensor which is implemented in the PIC microprocessor. The results will be shown on a LCD display, indicate to the user the energy left in the batteries.

### 3-6: Consumer Networks III

Room: B

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

#### **14:50 One solution of DTV stream data acquisition system 445**

Helena Peić Tukuljac (University of Novi Sad, Serbia); Djordje Kovacevic (University of Novi Sad & RT-RK Institute for Computer Based Systems, Serbia); Dejan Nadj (University of Novi Sad, Serbia); Nikola Teslic (University of Novi Sad, Serbia)

In order to connect various pieces of information, people have developed vast number of textual analyzers. All those analyzers can be applied to textual data from any source, including Digital Video Broadcasting (DVB) stream. In this paper we propose a realization of a system whose primary purpose is DVB stream data acquisition. This solution can be used on a big variety of set-top boxes (STBs), considering their performances and capabilities, and it presents an essential starting point for numerous types of systems, including television recommendation systems, personalized television systems etc.

#### **15:10 Implementation of RVU client for Android-based devices 449**

Stevan Medic (Faculty of Technical Sciences, University of Novi Sad & RT-RK Institute for Computer Based Systems, Novi Sad, Serbia); Davor Rapic (Faculty of Technical Sciences Novi Sad & RT-RK, Serbia); Nikola Kuzmanovic (University of Novi Sad, Serbia); Milan Savic (University of Novi Sad, Serbia)

This paper describes an implementation of RVU client on Android based devices. RVU represents a protocol based on client-server architecture and uses UPnP and DLNA to establish communication and share content. The key benefit of RVU is the user interface (UI) implementation, an approach that enables content service providers to deliver consistent user interface to all RVU client devices in a "Connected House" domain, significantly improving quality of service. RVU introduces concept of "thin client" which only renders content and handles user inputs, while all CPU intensive work is done on a server side.

#### **15:30 A method for system calls sandboxing based on atomic trusted code region 453**

Milos Subotic (Faculty of Technical Sciences, University of Novi Sad, Serbia); Nemanja Fimic (Faculty of Technical Sciences, University of Novi Sad, Serbia); Darko Dejanovic (RT-RK Institute for Computer Based Systems, Serbia); Goran Miljkovic (RT-RK d.o.o., Serbia)

This paper presents a new algorithm for the sandboxing system calls based on the atomic trusted code region. The algorithm successfully protects against any kind of code-injection attacks as well as any kind of mimicry attack including known-address attacks and scanning attacks. The algorithm is lightweight and simple. The implementation of algorithm does not need any change on an untrusted machine code and does not need extensive changes on system source code. Whole security policy could be enforced in user space as a plug-in, which gives great flexibility.

#### **15:50 Cloud-based framework for collecting DTV data related information from the Internet 457**

Nenad Jovanovic (RT-RK Institute for Computer Based Systems, Serbia); Violeta Vukobrat (University of Novi Sad & RT-RK Institute for Computer Based Systems, Serbia); Stefan Pijetlović (University of Novi Sad & RT-RK Institute for Computer Based Systems, Serbia); Velibor Mihic (RT-RK Computer Based Systems LLC, Serbia)

In this paper we propose a solution and describe one implementation of a cloud-based framework for collecting meta-data and multimedia content from the Internet related to the DTV data. The aim of the proposed solution is to acquire diverse additional information and content from various sources on the Internet and prepare them to best suit the end-users. The focus of the paper is on the design of a flexible system that provides the means for expansion and easy adaptation.

**16:10 - 16:30**

### Coffee Break

Room: Break Area

**16:30 - 18:10**

### 3-7: Wireless (MIMO & OFDM)

Room: A

Chair: Alexander Huhn (Berliner Verkehrsbetriebe (BVG), Germany)

**16:30 Comparison of MIMO Schemes in IEEE 802.11ac under Time-varying Channels: Analytical Approach 460**

Heejung Yu (Yeungnam University, Korea); Heeyong Lee (Yeungnam University, Korea)

In the recent wireless local area network (WLAN) IEEE 802.11ac standard, various multiple antenna technologies are adopted to improve the throughput without additional bandwidth. In cases of single-user beamforming (SU-BF) and multi-user beamforming (MU-BF), channel variation over time is a critical impairment. Under a severe condition, an open-loop scheme like space-time block code (STBC) can achieve higher throughput than the BF schemes even without channel feedback. As another example, the open-loop method is preferable to the close-loop one since the feedback can be an overhead when the amount of transmit data is not large. In this paper, we derive the rate loss due to channel variation and calculate the throughput by taking the frame structures and feedback overhead into consideration. Based on these analyses, we can give a guideline for system design of IEEE 802.11ac.

**16:50 Novel Compact UWB Monopole RDRA for Cognitive Radio Spectrum Sensing Applications 462**

Hany Atallah (Egypt-Japan University of Science and Technology, Egypt)

In this paper, a novel compact UWB, low-profile monopole rectangular dielectric resonator antenna (RDRA) is proposed using relatively low dielectric constant substrate material (Rogers RT/Duroid 3010  $\epsilon_r = 10.2$ ) and developed for cognitive radio spectrum sensing wireless communications applications. The rectangular DRA is fed with a modified stepped microstrip feed to ensure efficient coupling between the RDRA and the feeder. UWB operation is achieved by converting RDRA to monopole RDRA by finite ground plane which leads to a wider operating bandwidth covering the Federal Communications Commission (FCC) UWB (from 3.1 to 10.6 GHz). The proposed UWB monopole RDRA with finite ground plane produced an impedance bandwidth about 141 % covering a huge band for spectrum sensing. The proposed antenna is designed to operate over a frequency range from 3.1 to 18 GHz and the radiation patterns are stable over the operating frequency range. The frequency characteristics and radiation performance of the proposed antenna are successfully optimized with numerical experimentation techniques using 3D full-wave electromagnetic simulator Ansoft HFSS software.

**17:10 Throughput Analysis of IEEE 802.15.4 Enabled Wireless Sensor Networks under WLAN Interference 467**

Tallal Elshabrawy (The German University in Cairo, Egypt)

In this paper, theoretical analysis of network throughput of IEEE 802.15.4 enabled wireless sensor networks under WLAN interference shall be introduced. Analysis of achievable network throughputs is presented under multiple network configurations and WLAN interference scenarios.

**17:30 Secrecy Capacity for MIMO Fading Channel with Size-Limited Eavesdropper 470**

Wei Fan (Nanjing University of Posts and Telecommunications, P.R. China); Xiaoyun Hou (Nanjing University of Posts and Telecommunications, P.R. China); Yan Zhu (Nanjing University of Posts and Telecommunications, P.R. China); Hao Wei (Nanjing University of Posts and Telecommunications, P.R. China)

In the multiple input multiple output (MIMO) wiretap channel model which contains path loss, shadow fading and small-scale fading, we consider the effect of both spatial correlation and antenna mutual coupling, with limited size of eavesdropper which has Multi-antenna. Via Monte Carlo simulation, we analyze the effect on secrecy capacity when the location of the transmitter and the eavesdropper changes relatively, under the situation that the number of antennas of the eavesdropper is greater than the legitimate receiver's. The simulation results show that, based on different status of the wiretap channels, a corresponding safety distance between the transmitter and the eavesdropper should be calculated to ensure the system security.

**17:50 A Blind ML-SNR Estimation Method for OFDM Systems in Dispersive Fading Channels 474**

Sebastian Baumgartner (Chemnitz University of Technology, Germany); Gangolf Hirtz (Chemnitz University, Germany)

Orthogonal Frequency Division Multiplexing (OFDM) is a common used technology for communication systems nowadays. Besides the synchronization of OFDM based receivers, the estimation of the noise variance as well as the corresponding signal-to-noise ratio (SNR) is a challenging issue, especially under dispersive fading channel conditions. In this paper the principle of blind OFDM synchronization via Maximum Likelihood functions is picked up and extended in such a way, that the signal-to-noise ratio can be determined under realistic multipath fading channels. Furthermore the symbol timing offset and the channel length are estimated in advance, to overcome the problem of previous proposed SNR estimation techniques. Besides all existing blind SNR estimation procedures, no computationally inefficient sub procedures are required to find the Inter-Symbol-Interference (ISI) free region to determine the correct SNR value. All extracted parameters can be used to evaluate the signal quality within the receiver and to build up applications such as minimum mean-square error (MMSE) channel estimation. The algorithm is applied to the OFDM based Digital Audio Broadcasting (DAB/DAB+) system and shows excellent performance with less computational effort.

## 3-8: Consumer Networks IV

Room: B

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

**16:30 Sat>IP Server Implementation on an Embedded Platform 479**

Krsto Lazic (Faculty of Technical Sciences, Serbia); Jelena Kovacevic (University of Novi Sad, Serbia); Ilija Basiccevic (University of Novi Sad, Serbia); Milan Acanski (RT-RK, Computer Based Systems, Serbia)

In order to leverage the full potential of video playback capabilities in modern connected devices new protocols for content delivery are emerging. Sat>IP protocol is gaining popularity as a new IP-based architecture for reception and distribution of satellite signal. In this paper we present implementation of Sat>IP server on Linux embedded platform and propose programming techniques and overall system optimization.

**16:50 Indoor occupancy logger with compressive vision sensing 483**

Soumajit Majumder (RWTH Aachen University & Philips Research, Germany); Ashish Pandharipande (Philips Research, The Netherlands); Anteneh Abbo (Philips Research, The Netherlands)

An occupancy logger that determines user presence and estimated locations in an indoor space may be used for occupancy analytics, space management and other building services. We consider use of a vision sensor along with compressive sensing techniques for occupancy logging. In the presented solution, a sparse representation of captured images is obtained at the sensing device. The sparse representation is sent to a cloud computing unit (CCU). At the CCU, occupancy changes are determined using a change detector. If occupancy is determined, the image is reconstructed using compressive recovery techniques and occupancy is localized. We evaluate the performance of this technique with a simple image differencing method under different illuminance conditions.

**17:10 Integration mechanism for live stream QoS monitoring in Android-based IPTV set-top box 488**

Daniel Knezevic (RT-RK Institute for Computer Based Systems, Serbia); Istvan Papp (University of Novi Sad, Serbia); Milan Savic (Faculty of Technical Sciences, University of Novi Sad, Serbia); Ivana Ostojic (RT-RK Institute for Computer Based Systems, Serbia)

In this paper, a solution for integration mechanism for live stream QoS monitoring in Android-based IPTV set-top box is presented answering the growing need of service providers to provide high quality of service. The proposed solution allows QoS monitoring with no need to insert additional probe devices for data collection.

**17:30 Android development framework for TR-069-based services 491**

Bojan Trifunovic (Faculty of Technical Sciences, University of Novi Sad, Serbia); Veljko Mihailovic (Faculty of Technical Sciences & RT-RK Institute For Computer Based Systems, Serbia); Nemanja Ignjatov (RTRK Computer Based Systems LLC, Serbia); Rade Simikić (University of Novi Sad, Faculty of Technical Sciences, Serbia); Ivan Velikic (RT-RK, Serbia)

In this paper a solution is described which facilitates the integration of TR-069 functionality to Android applications. Solution for this problem is given as an Android service with a binding interface, which can be incorporated in any Android application.

**17:50 Forward Error Correction for Data Dissemination in MANET 494**

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

Interconnecting consumer electronic devices in an adhoc manner is considered one of the solutions to provide next generation services like "Ambient Intelligence" or the "Internet of Things". Since the transmission range of a single device is limited multi-hop techniques are often employed to provide a larger network coverage. In such a network (MANET) broadcast data is often disseminated via a simple flooding algorithm. Due to the high mobility and changing link conditions data packets get lost on their way to the receiver. Real-time applications like voice communication are sensitive to packet loss, end-to-end delay and jitter. Increasing values for either QoS parameter lead to a reduction of voice-quality. On the one hand beyond a certain loss rate understanding the communication partner becomes impossible. On the other hand reliable protocols like TCP are cumbersome to implement in a MANET and cannot guarantee a constant delay. To achieve acceptable user experience for these applications, forward error correction (FEC) schemes can be used. In this work we evaluate some of these schemes for multi level coded audio data, using a testbed developed in Simulink. An overview of the recovery results and the additional costs for the data overhead is presented for each FEC scheme. Furthermore based on the simulation results we implemented an application-layer based Parity FEC in an testbed which is used to broadcast real-time voice data in a mobile adhoc network. Measurements for the real world performance of single- and multi-hop testcases are presented. Additionally a simple adaptive scheme was developed to provide a good balance between loss rate and overhead.

**18:10 - 18:30**

## Closing Remarks, Best Paper Awards

Room: A

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

## Additional Papers

***Physical Layer Measurement of Cellular Standards* 88**

S. Tenney, Y. Jia

***Dynamic Efficiency Improvement of Field Effect Transistor by Suitable and Efficient Nanosizing* 153**

V. Kumar, S. Kumar, R. Saravanan

***Underwater Image Quality Enhancement Through Composition of Dual-Intensity Images and Rayleigh-Stretching* 219**

A. Ghani, N. Isa

***A Novel Self-Starting Ultra Low-Power and Low-Voltage DC-DC Converter for Microbial Energy Harvesting* 266**

E. Farjah, M. Ayaz, T. Ghanbari

***An Architectural Model for Communication Between the iDTV and Mobile Devices* 270**

E. Lima, R. Rabêlo

***FPGA Implementation of a Smart Home Lighting Control System* 419**

J. Garcia-Guzmán, E. Moctezuma-Monge, F. Villa-López

***An Efficient Multi-Touch Tracking Algorithm with a Large Number of Points* 429**

S.-L. Huang, S.-Y. Hung, C. Chen, C.-H. Tsao, N.-W. Chang

***Secure Communications Using the Mobile Communications (Cellular Telephony)* 433**

E. Franklin

***Power Quality Analysis of Energy Efficient Harmonic Loads* 499**

S. Khadem, M. Basu, R. Kerrigan, B. Basu