Conference Program can be seen at: https://edas.info/p21929

Program for *2016 IEEE 6th International Conference on Consumer Electronics - Berlin (ICCE-Berlin)*

Time	Berlin 1	Berlin 2	Break Area	Offsite
Monday, September 5				
10:40-11:20	*Opening Ceremony*			
11:20-13:00	*Automotive*	*Consumer Healthcare*		
13:00-14:00			*Lunch & IFA TecWatch Tour*	
14:00-15:00	*Keynote 1: "Visualization - from Leonardo da Vinci's drawings to Pokémon GO" - Prof. Hans-Christian Hege, Zuse Institute, Germany*			
15:00-16:40	*Image & Video Processing (I)*	*Smart Energy, Homes & IoT*		
16:40-17:00			*Coffee Break*	
17:00-18:00	*Women in Engineering Convention*	*Doctoral Workshop*		
18:00-19:00	*Keynote 2: "New approaches for the integration of Haptic Garments, Big Data Analytics, and Serious Games for Extreme Environments" Carolyn McGregor, University of Ontario, Canada*			
19:00-20:30	*Welcome Reception / Poster Session 1*			
Tuesday, September 6				
09:00-10:20	*Systems & Applications (I)*	*Communications*		
10:20-10:40			*Coffee Break*	
10:40-11:40	*Keynote 3: "Signal Enhancement in Cellphone Handsets, PCs, and Digital Still Cameras/Camcorders" Akihiko Sugiyama, NEC*			
11:40-13:00	*Interface & Experiences for Users (I)*	*Young Professionals Seminar*		
13:00-14:00			*Lunch & IFA TecWatch Tour*	
14:00-15:00	*Keynote 4: "The Memory of Cars" Thomas M. Coughlin, IEEE Future Directions*			
15:00-16:40	*AV Processing*	*Electromagnetic Compatibility*		
16:40-17:20			*Coffee Break & meeting point*	
17:20-19:40				*Tour to Fraunhofer, Heinrich Hertz Institute*
19:40-22:00				*Conference Dinner at Seehof Hotel*
Wednesday, September 7				
	Interfaces & Experiences for Users (II)	*Infotainment & UI*		

09:00-10:20				
10:20-11:00			*Coffee Break & Poster Session 2*	
11:00-12:20	*Image & Video Processing (II)*	*Systems & Applications (II)*		
12:20-13:20	*Keynote 5: "Visual Computing for the Entertainment Industry" Jean-Charles Bazin, Disney Research*			
13:20-13:40	*Closing Remarks & Awards*			
13:40-18:00				*For your individual IFA visit*

Monday, September 5

Monday, September 5, 10:40 - 11:20

Opening Ceremony ^{TOP}

Room: Berlin 1

Monday, September 5, 11:20 - 13:00

Automotive ^{TOP}

Room: Berlin 1

11:20 *Real-time lane detection and departure warning system on embedded platform*
Youngwan Lee (University of Inha, Korea); Hale Kim (INHA University & Visionin Company, Korea)

Within the last few years, studies on Advanced Driver Assistance Systems (ADAS) have been actively conducted and deployed in modern vehicles; moreover, lane detection and departure warning systems are important modules of ADAS. However, most of the recent papers have only focused on PC-based lane detection modules, and very few concerns have been addressed for the customized embedded board. This paper proposes a real-time lane detection and departure warning technique on a commercial embedded board. The technique is based on Inverse Perspective Mapping (IPM) generating a top view image of the road and Kalman filter tracking removing noise and enhancing accuracy. The experimental results show good performance with an average correct detection rate of 96% under various challenging urban and highway conditions while the processing time takes only 22.76 ms per frame (1280x720) on the embedded board which verifies that the proposed method could be feasible for real-time applications in commercial ADAS products.

11:40 *Integration of Vehicle and Lane detection for Forward Collision Warning System*
Huieun Kim (Inha University, Korea); Youngwan Lee (University of Inha, Korea); Taekang Woo (INHA University, Korea); Hale Kim (INHA University & Visionin Company, Korea)

The capability of automated vehicles with intelligent on-board systems aimed at improving traffic safety has been in constant advance. This paper proposes an integrated module of lane and vehicle detection for a forward collision warning system that can be embedded in an autonomous driving system operating in real time. Integration of lane and vehicle detection provides more precise information for driving environments by using geometric consideration of the roads, and achieves synergistic effects for rejecting false alarms by adjusting ground constraints. Also, once the vehicle is localized in ego-lane, it is able to estimate the distance between the front and ego-vehicle. The experimental results in this paper, conducted on a real road dataset, verify the applicability of the proposed work for advanced driver assistance systems.

12:00 *Reduced Memory Region Based Deep Convolutional Neural Network Detection*
Denis Tome (Politecnico di Milano, Italy); Danilo Pietro Pau (STMicroelectronics, Italy); Stefano Tubaro and Luca Baroffio (Politecnico di Milano, Italy); Emanuele Plebani (STMicroelectronics, Italy); Luca Bondi (Politecnico di Milano, Italy)

Accurate pedestrian detection has a primary role in automotive safety: for example, by issuing warnings to the driver or acting actively on cars brakes, it helps decreasing the probability of injuries and human fatalities. In order to achieve very high accuracy, recent pedestrian detectors have been based on Convolutional Neural Networks (CNN). Unfortunately, such approaches require vast amounts of computational power and memory, preventing efficient implementations on embedded systems. This work proposes a CNN-based detector, adapting a general-purpose convolutional network to the task at hand. By thoroughly analyzing and optimizing each step of the detection pipeline, we develop an architecture that outperforms methods based on traditional image features and achieves an accuracy close to the state-of-the-art while having low computational complexity. Furthermore, the model is compressed in order to fit the tight constrains of low power devices with a limited amount of embedded memory available. This paper makes two main contributions: (1) it proves that a region based deep neural network can be finely tuned to achieve adequate accuracy for pedestrian detection (2) it achieves a very low memory usage without reducing detection accuracy on the Caltech Pedestrian dataset.

12:20 *Pilot In-Vehicle Infotainment Learning Platform based on Open Source Technologies*

Aleksandar Dakic (Faculty of Technical Sciences - University of Novi Sad, Serbia); Tijana Srejic (Faculty of Technical Sciences, University of Novi Sad, Serbia); Mladen Krbanjevic (RT-RK Computer Based System, Serbia); Milan Z. Bjelica (University of Novi Sad, Serbia)

Current education institutions lack adequate tools for teaching software programming for automotive area, especially In-Vehicle Infotainment (IVI), with available tools constrained to a palette of proprietary, closed solutions. In this paper we give an overview of a pilot In-Vehicle Infotainment Learning platform (PIVILP), based on open source technologies and achievable in any educational environment with moderate cost. The developed pilot and the accompanying software libraries demonstrate the feasibility of the proposed approach during laboratory work for students at the university.

12:40 *Automotive Cluster Graphics:Current Approaches and Possibilities*

Jasmina Pesic (Faculty of Technical Sciences, Serbia); Kristina Omerovic (Faculty of Technical Sciences University of Novi Sad, Serbia); Ivana Nikolic (Faculty of Technical Sciences, University of Novi Sad, Serbia); Milan Z. Bjelica (University of Novi Sad, Serbia)

In this paper we give an overview of current approaches in the development of digital cluster units with rich graphical interface. Given that most of the presented approaches are closed source, proprietary and dedicated to a unique target environment, we discuss possibilities of utilization of open source technologies for cluster graphics development purposes. We give results of an experiment of cluster application developed using HTML5/WebGL technologies. Finally, we contrast different approaches with regard to the development time, scalability, portability, as well as the functional scope and show that utilization of HTML5 can be a viable route for future research.

Consumer Healthcare · TOP

Room: Berlin 2

Chair: Wolfgang Endemann (Dortmund University of Technology, Germany)

11:20 *A Real-Time Vital Sensing System for Persons during Exercises*

Shinsuke Hara and Takunori Shimazaki (Osaka City University, Japan); Hiroyuki Okuhata (Synthesis Corporation, Japan); Isao Shirakawa (University of Hyogo, Japan); Hiroyuki Yomo (Kansai University, Japan)

Real-time vital sensing for persons during exercises is important for effective physical training, healthcare and injury/disease prevention. We have developed a vital sensor node which can sense heart rate (HR), energy expenditure (EE) and body temperature (BT), and furthermore can transmit the sensed data by wireless in real-time, just by hanging itself with the clip at the rim of undershorts. The vital sensor node utilizes a motion artifact (MA) cancellation technique to accurately sense HR during vigorous exercises and an EE estimation technique by means of a motion sensor to accurately sense EE. In this paper, we outline the essence of the two techniques.

11:40 *TaoBall: An Interactive IoT Ball Design for Rehabilitation*

Chen-Yu Su (National Taiwan University, Taiwan); Chun-Yi Hsiao (National Taipei University of Technology); Ren-Guey Lee (National Taipei University of Technology, Taiwan); Jyh-Horng Chen (National Taiwan University, Taiwan)

Internet of things (IoT) and cloud service have been rapidly applied to various fields such as industry, smart home, or creative applications in daily life. In this paper, we propose to integrate a powerful smart IoT device, TaoBall with a Smartphone App to improve rehabilitation performance and convenience. The system designs and implements a few customized home-based games for muscle training and working memory (WM) training. The system is simple and thus easy for elderly people to increase their daily activity and also prevent their functional deterioration. The preliminary results show the reference index for suitable setting for two games in real test. In the future, our rehabilitation system can be applied to clinical study for more patients to do rehabilitation easily at their homes without assistance from physical therapist.

12:00 *Implementation of CoM Footboard Sensor for Lower Limb Rehabilitation*

Hyun-Woo Oh (Electronics & Telecommunications Research Institute, Korea)

Usually people are getting poor sense of balance by getting older or sometimes they lose it by accident. The poor sense of balance causes dizziness, which makes people unable to enjoy normal activities due to dizziness-related problems. In this paper, we propose a CoM (Center of Mass) footboard sensor for lower limb rehabilitation. It measures not only the position of feet, but also the weight degree of feet. Also, it senses the pressure degree of elbow and heel. So, it is possible to analyze straight standing or sense of balance that straight walk of the user.

12:20 *Real-time Gait Event Detection using a Single Head-worn Inertial Measurement Unit*

Tong-Hun Hwang (Leibniz Universität Hannover & Institut für Sportwissenschaft, Germany); Alfred Effenberg, Holger Blume and Julia Reh (Leibniz Universität Hannover, Germany)

A real-time gait event detection based on a single sensor unit fixed onto the head is suggested in this paper. Head acceleration is measured by an inertial measurement unit in order to detect two gait events. When heel strike and toe off occur, the impact is physically generated between the foot and the ground, which are transmitted to the head through the different physiological structures directed to the longitudinal body axis. Although it is damped by body structures such as intervertebral discs, the impact determines the detectable peak in head acceleration. With a threshold and a low pass filter, a peak detection referring to head acceleration is reliable in detection of the gait events. This proposed method can be applied to homebased rehabilitation and daily fitness.

12:40 *A Wireless Biosignal Measurement System using a SoC FPGA and Bluetooth Low Energy*

Ricardo Joaquinito (INESC-ID & Instituto Superior Técnico, Portugal); Helena Sarmento (Inesc-ID/IST/TU Lisbon, Portugal)

This paper presents the development of a prototype for a wireless biosignal measurement system, which makes use of a System-on-Chip FPGA, with an embedded ARM processor, and the Bluetooth Low Energy standard for wireless data

transmission to a smartphone. The body temperature and heart rate are monitored using a steel-head thermistor and an ECG acquisition module, respectively. The ARM processor runs a Real-Time Operating System. A part of the algorithm that extracts the heart rate runs on custom hardware implemented in the FPGA fabric. The prototype successfully extracts the vital signs and sends updated values to a smartphone every second.

Monday, September 5, 13:00 - 14:00

Lunch & IFA TecWatch Tour TOP

Room: Break Area

Monday, September 5, 14:00 - 15:00

Keynote 1: "Visualization - from Leonardo da Vinci's drawings to Pokémon GO" - Prof. Hans-Christian Hege, Zuse Institute, Germany TOP

Room: Berlin 1

Abstract

With the technical implementation of universal computing machines, the mass production of personal computers, smart phones and game consoles, and the connection of these devices to a global digital network, humankind has accomplished the transition from the Gutenberg galaxy in the Turing galaxy. Humans are integrated into the digital universe via various senses - the major one being the visual sense. With modern visualization techniques, information available in the digital universe can be presented to humans in a sensible way. The advancement of digital devices to powerful personal assistants requires also "to get the world into the computer". For this purpose, digital devices are equipped with sensors and related processing capabilities - the major ones again being image-based. Current consumer devices thus rely heavily on image-based techniques: image acquisition, computer vision, image synthesis, data visualization, visual analytics, visual display - and combinations of such techniques, enabling, e.g., virtual reality or augmented reality. In the talk I will present an overview, outline some recent developments mainly from a visualization perspective, and speculate about the future.

Biography

Hans-Christian Hege is head of the Department 'Visual Data Analysis' at Zuse Institute Berlin (ZIB). After studying physics and mathematics he continued with postgraduate studies in computational physics and quantum field theory at Freie Universität Berlin (1984-1989). Then he joined ZIB as a scientific consultant for high-performance computing. In 1991 he built up the Scientific Visualization department at ZIB, where research in visual data analysis is conducted and visualization software is developed, such as Amira. His research interests include visual computing as well as applications in life sciences, natural sciences and engineering. He taught as guest professor at Universitat Pompeu Fabra, Barcelona, and as honorary professor at the German Film School (University for Digital Media Production) / Film School Babelsberg. He is co-founder of the book series Mathematics + Visualization at Springer-Verlag and he has chaired several international IEEE and Eurographics symposia in the area of computer graphics and data visualization. He has co-founded the companies Mental Images (1986; now: NVIDIA Advanced Rendering Center), Indeed-Visual Concepts (1999; now: Visage Imaging) and Lenné3D (2005). For more information, visit www.zib.de/hege.

Monday, September 5, 15:00 - 16:40

Image & Video Processing (I) TOP

Room: Berlin 1
Chair: Kousik Ramasubramaniam Sankar (CISCO Video Technologies, India)

15:00 *Visual Search of Multiple Objects from a single query*
Marco Paracchini (Politecnico di Milano, Italy); Danilo Pietro Pau (STMicroelectronics, Italy); Marco Marcon (Politecnico di Milano, Italy); Emanuele Plebani (STMicroelectronics, Italy)
Hundreds of millions of images are uploaded to the cloud every day. Innovative applications able to analyze and extract efficiently information from such a big database are needed nowadays more than ever. Visual Search is an application able to retrieve information of a query image comparing it against a large image database. In this paper a Visual Search pipeline implementation is presented able to retrieve multiple objects depicted in a single query image. Quantitative and qualitative precision results are shown on both real and synthetic datasets.

15:20 *Local Self Similarity-Based Super-Resolution for Asymmetric Dual-Camera*
Byeongho Moon, Soohwan Yu, Seungyong Ko, Seonhee Park and Joonki Paik (Chung-Ang University, Korea)
This paper presents a super-resolution (SR) method for the asymmetric dual-camera system. The proposed method restores the high-resolution (HR) image using the local selfsimilarity between two input images as wide- and tele-view images. The proposed method consists of three steps: i) registration and warping processes to reduce the disparity between the input images, ii) high-frequency patch extraction from the tele-view image, and iii) super-resolution reconstruction using local selfsimilarity property. Experimental results show that the proposed method can significantly restore the HR image than existing interpolation and SR methods.

15:40 *Improved DCP-Based Image Defogging Using Stereo Images*

Hasil Park, Jinho Park, Heegwang Kim and Joonki Paik (Chung-Ang University, Korea)

Image defogging has recently received attentions in many applications such as advanced drive assistance systems (ADAS) and intelligent surveillance systems to acquire a high quality images. This paper presents a novel depth-based image defogging method using stereo images. The depth information obtained from a pair of stereo foggy images and then fuzzy Cmean (FCM) clustering is applied to reduce matching errors caused by atmospheric absorption and scattering during light propagation. The estimated depth information is used as weighting values in the dark channel prior (DCP)-in the defogging process. Experimental results show that the proposed method can successfully remove foggy components in the image without color distortion.

16:00 *Enhanced Hierarchical Motion Estimator Beyond Targeted Content*

Dietmar Hepper (Technicolor, Germany)

A hierarchical motion estimator developed for Targeted Content applications has been extended from estimating the motion of some defined points of interest to providing motion vectors for all pixels in a frame. It includes an arbitrarily large search range, DFD-based segmentation (displaced frame differences) of the measurement window for improved results near distracting moving objects, enhanced search procedures, bidirectional and sub-pel motion estimation.

16:20 *Advanced Feature Based Digital Video Stabilization*

Giuseppe Spampinato and Arcangelo Bruna (ST Microelectronics, Italy); Ivana Guarneri and Valeria Tomaselli (STMicroelectronics, Italy)

The present paper describes a low-cost algorithm for video stabilization. Like other feature based algorithms, it is robust to motion blur, noise and illumination changes. Moreover, maintaining real time processing, it is not negatively affected by moving objects in the scene, works fine even in conditions of low details in the background and it is robust to scene changes.

⬆ TOP

Smart Energy, Homes & IoT

Room: Berlin 2

15:00 *An Optimal Wireless Power Transfer System for Lithium-Ion Battery Charge*

Yuto Honda, Lei Lin and Masahiro Fukui (Ritsumeikan University, Japan)

We propose a magnetic field resonance type wireless power transfer system for the Li-ion battery (Lithium-ion battery). The transmitting efficiency is changed by the changing of the charging current to the storage battery. The system places the DC/DC converter at both of the primary and secondary sides. This system suppresses the degradation of transmitting efficiency due to the secondary side load variation by controlling the primary side DC/DC. By experiments, this system suppressed only 4.4% degradation of transmitting efficiency. It is significant improvement from 16% degradation by conventional approaches. Thus, this system derives both of optimum charging to storage battery and improvement of the transmission efficiency for wide range of output current.

15:20 *A Privacy-Preserving System Architecture for Applications Raising the Energy Efficiency*

Simon Walz and Yannic Schröder (Technische Universität Braunschweig, Germany)

To increase the energy efficiency of devices and appliances in the residential and the commercial sectors, a supporting communication system is needed. In this paper we propose a highly scalable, universal system architecture for communication between devices. By utilizing a hierarchical communication structure, a high level of data security and privacy is realized. Besides integrating devices with existing communication facilities, we also integrate legacy devices by retrofitting them with a communication interface. Application modules running on all involved devices coordinate the tasks of the whole system. An implementation of the proposed architecture is presented and a demonstrator spanning the campus of our university to test the system is described.

15:40 *An IoT Architecture Enabling Digital Senses*

Soumya Kanti Datta (EURECOM & Co-Founder, Future Tech Lab, France); Thomas Coughlin (Coughlin Associates, USA)

This paper presents a visionary concept, Digital Senses that aims to extend the human senses to machines. This will bring disruptive innovations in the consumer market. Towards that goal, this work examines how the Internet of Things (IoT) can enable digital senses and concentrates on an IoT architecture for the same. The building blocks of the architecture are identified as well as the operating phases are explained.

16:00 *Room Occupancy Detection: combining RSS Analysis and Fuzzy Logic*

Alessandro Baldini, Lucio Ciabattoni and Riccardo Felicetti (Universita' Politecnica delle Marche, Italy); Francesco Ferracuti (Polytechnic University of Marche, Italy); Sauro Longhi and Andrea Monteriù (Università Politecnica delle Marche, Italy); Alessandro Freddi (Università degli studi eCampus)

In this paper we focus our attention on the world of Internet of Things (IoT) objects and their potential for human indoor localization. Our aim is to investigate how Received Signal Strength (RSS) can be effectively used for identifying the position of a person at home, by exploiting common IoT communication networks. We propose a plug and play solution where the Anchor Nodes (ANs) are represented by smart objects located in the house, while the Unknown Node (UN) can be any smart object held by the user. The proposed solution automatically identifies the rooms where the smart objects are placed, by comparing a fuzzy weighted distance matrix derived from the anchor signals, with a threshold weighted distance matrix derived from the distances between rooms. The information can be easily integrated in any IoT environment to provide the estimation of the user position, without requiring the a priori knowledge of the positions of the anchor nodes.

16:20 *A Low Cost Smart Security and Home Automation System Employing an Embedded Server and a Wireless Sensor Network*

Semanur Karaca, İbrahiim Savruk and Alper Şişman (Marmara University, Turkey)

The advances in embedded technology and automation makes the human daily life easier. In this study, a smart home is presented an application including sensor and controller nodes connected to the custom design local wireless network. User reaches to the system using a web-base interface or using a smart phone application. We tested our system through conducted experiments and the results will be presented in the paper. The proposed system is a complete, low cost and user-friendly design for monitoring and remote control purposes.

Monday, September 5, 16:40 - 17:00

Coffee Break TOP

Room: Break Area

Monday, September 5, 17:00 - 18:00

Doctoral Workshop TOP

Room: Berlin 2
Chair: Alexander Huhn (Berliner Verkehrsbetriebe (BVG), Germany)

The Doctoral Workshop is an opportunity for PhD students to gain insightful feedback on their research and publication strategy from a panel of independent mentors.

In contrast to a usual paper presentation session, the Doctoral Workshop is an interactive session; an open dialogue between the PhD candidates and assigned mentors. Selected graduate students will first give a short version of their regular paper presentation, then engage in a discussion with the mentors about the content and context of the research. The mentors will then advise on the research direction, provide publication tips, as well as help to avoid out-of-date topics or potential research dead-ends.

Similar Doctoral Workshops in previous CE Society conferences have accelerated graduate students towards successful PhD completion.

Although the session is aimed at PhD students, it will be also interesting to other conference participants.

Women in Engineering Convention TOP

Room: Berlin 1
Chair: Takako Nonaka (Shonan Institute of Technology, Japan)

Monday, September 5, 18:00 - 19:00

Keynote 2: "New approaches for the integration of Haptic Garments, Big Data Analytics, and Serious Games for Extreme Environments"

Carolyn McGregor, University of Ontario, Canada TOP

Room: Berlin 1

Monday, September 5, 19:00 - 20:30

Welcome Reception / Poster Session 1 TOP

Room: Berlin 1
Chair: Jose-Maria Flores-Arias (University of Cordoba, Spain)

A Wireless Sensor Network Simulation Framework for Structural Health Monitoring in Smart Cities
Madhupreetha Rajaram (University of North Texas, USA); Elias Kougianos (Universtiy of North Texas, USA); Saraju P Mohanty and Prabha Sundaravadivel (University of North Texas, USA)
Structural health monitoring in automatic fashion is one of the key challenges of smart cities. Deployment of wireless sensor network (WSN) is considered as a possible solution. WSN are networks that monitor various parameters such as temperature, pressure, vibration, stress, and humidity. They find a wide range of applications in environmental monitoring, industrial monitoring, and structural monitoring. In this research, a WSN simulation framework is developed so that it could be integrated with a hardware prototype to monitor the structural health of bridges,

monuments, and skyscrapers. The simulation framework is developed in MATLAB/Simulink. The data integrity of the simulation framework is analyzed using cyclic redundancy check (CRC) and transmission error rate calculator.

New Solutions to the Premature Convergence Problem in Monte Carlo Localization
Chen-Chien Hsu and Wen-Chung Kao (National Taiwan Normal University, Taiwan)

In this paper, a new solution towards the premature convergence problem in Monte Carlo Localization for global localization under highly symmetrical environments is proposed. The algorithm employs a "standard direction" to allow particles to move so as to rearrange weights, providing better exploration as a result. Therefore, there are higher opportunities for particles to converge to the real robot pose and prevent premature convergence accordingly. Experiments have verified the proposed algorithm to be reliable and robust by offering notable improvements in the global localization performance.

Relative Depth-Map based on Single Sensor
Jongho Choi (eWBM Inc., Korea); Dongil Han (Sejong University, Korea)

In this paper, we propose a novel means of relative depth-map generation based on single sensor. The system of passive stereo is used to generate this. In this process, source is an RGB image, and references are blurred IR images based on the PSF model. In variable illumination, histogram stretching was used to re-adjust the sensitivity of the sensor adaptively. In consideration of error in blurred IR images, is performed the WLSSD. As a result, it is confirmed in the self-production environment that linear information of relative depth is extracted, and is applied to various applications. Also, it has been implemented in the hardware structure, and verified in real-time processing.

An Efficient Motion Estimation Hardware Architecture using Modified Reference Data Access (MRDAS) Skip Algorithm for High Efficiency Video Coding(HEVC) Encoder
Seongmo Park (ETRI, Korea)

In this paper, we propose an efficient motion estimation hardware architecture for High Efficiency Video Coding (HEVC) using a Modified Reference Data Access Skip (MRDAS) for reducing the minimum memory bandwidth. The memory bandwidth is responsible for the throughput limitations in motion estimation, especially when dealing with high quality video of a large frame size and search range. This architecture is designed for reducing the memory bandwidth using a memory access sequence and MRDAS. We save about 80% of the memory access cycles for the reference data compared to a conventional method with about 0.2 dB video quality degradation. The architecture is designed in Verilog HDL with a 65 nm cell library. The simulation results show that the architecture can achieve real-time processing of a 3,840 x 2,160 video image size at 30 fps at 350 MHz.

Capacitive Coupling Wireless Power Transfer with glass dielectric layers for Electric Vehicles
Young Soo You and Kang Hyun Yi (Daegu University, Korea)

This paper proposes a new capacitive coupling wireless power transfer for charging electric vehicles. The capacitive coupling wireless power transfer can replace a conventional inductive coupling wireless power transfer because it has no electromagnetic interference (EMI). However, the capacitive coupling wireless power transfer has limitation on charging electric vehicles with gab distance and power level because of too small coupling capacitance. Therefore, the new capacitive wireless power transfer uses glasses with a dielectric layer in a vehicle. The area and dielectric permittivity of glasses in the vehicle is large so the large coupling capacitance can be obtained. In addition, a switching loss of power conversion circuit is reduced by a LLC resonant operation with an impedance transformation. As results, the proposed capacitive power transfer can transfer large power and have good efficiency. A 1.2kW prototype is designed to verify operation and features of the proposed system and it has the 94% high efficiency in 1.2kW output power.

Improvement of Multicopter Detection Using an Infrastructure Camera
Chinthaka Premachandra (Shibaura Institute of Technology, Japan); Ryo Gohara, Takao Ninomiya and Kiyotaka Kato (Tokyo University of Science, Japan)

Determining unit position is very important for indoor autonomous aerial robots. In prior research, we used externally installed cameras to detect natural unit features to reduce the burden of measuring position, focusing on the elliptical trajectory of the rotating rotors while the unit was in flight as the natural feature of interest. Ellipse detection within images allows calculation of unit position. An outstanding problem is that ellipsis detection takes an extreme amount of time, and in some environments it is difficult to distinguish between the rotor and the background. In this study, we investigate methods for addressing these problems, proposing a novel algorithm for fast, lightweight ellipse detection. Furthermore, we record and accumulate change in the rotating rotor pattern over time to enable detection against previously problematic backgrounds. For verification, we fly a general-purpose unit in a variety of environments and measure unit position. The results show that the proposed method reduces processing times for ellipse detection and that position can be measured without reliance on the environment, and thus that unit position detection is improved through the use of infrastructure cameras.

Reduced Complexity Single Core based HEVC Video Codec Processor for mobile 4K-UHD Applications
Sukho Lee (ETRI, Korea)

A future video codec processor will have to adopt the newly standardized High Efficiency Video Coding (HEVC/H.265) in a short time because of the limit of H.264's coding efficiency for large sized UHD images. This paper combines our designed decoder and encoder for HEVC and proposes a low complexity HEVC video codec processor. We developed this codec processor with Samsung 28nm CMOS process in this year and the size of this low complexity codec keeps within the bounds of that of a conventional H.264/AVC chip. This single core based processor has an optimal mode decision with a simplified Rate Distortion Optimization (RDO) and a low power Skip mode. The encoder's BD-rate loss is 35% compared with HM-13.0 and the power consumption is below 250mW when entering the Skip mode. The chip and its internal SRAM size are 7.3 x 7.5mm^2 and 300kB each and the maximum frequency is 600MHz when 4K-UHD encoding mode at 30 fps.

Crosstalk Cancellation for Frame Memory Bus on TV Main Boards
Jeong-Keun Ahn and Bai-Sun Kong (Sungkyunkwan University, Korea)

Memory bus lines between a controller and frame memories on a TV main board are usually densely packed, which give rise to noise like crosstalk-induced jitter (CIJ) crosstalk-induced glitch (CIG), and(or) reflections. Since these types of noise can substantially limit the data rate between the controller and the frame memory, we may need a larger number of frame memories, an increased printed circuit board (PCB) layout size, and more PCB layers to minimize these noise components, resulting in an increased design cost. To cope with this issue, this work proposes 1/3 unit interval (UI) -staggering in the transmitter side and a capacitive coupling-induced crosstalk compensation in the receiver. Evaluation

results indicated that CIJ and CIG are reduced by up to 75% and 65% at 1Gbps data rate, respectively. They also indicated that the proposed method enables a safe 5Gbps operation per pin on a frame memory bus for TVs.

Tuesday, September 6

Tuesday, September 6, 09:00 - 10:20

Systems & Applications (I) TOP

Room: Berlin 1
Chair: Saraju P Mohanty (University of North Texas, USA)

09:00 *Global Localization of Monte Carlo Localization Based on Multi-Objective Particle Swarm Optimization*

Chiang-Heng Chien (National Taiwan Normal University, Taiwan); Chiang-Ju Chien (Huafan University, Taiwan); Wen-Chung Kao, Chen-Chien Hsu and Wei-Yen Wang (National Taiwan Normal University, Taiwan)

Premature convergence often happens when a Monte Carlo localization (MCL) algorithm tries to localize a robot under highly symmetrical environments. In this paper, we propose a novel method of solving such problem for global localization by incorporating a multi-objective evolutionary approach to resample particles with two objectives, including particle weights and population distribution. By employing a multi-objective particle swarm optimization (MOPSO), our approach is capable of enhancing the exploration ability to improve population diversity while maintaining convergence quality to successfully localize the global optima. Simulation results have confirmed that localization performance using the proposed approach is significantly improved.

09:20 *FPGA-Implemented Corner Feature Extracting Simultaneous Localization and Mapping*

Chiang-Heng Chien and Chen-Chien Hsu (National Taiwan Normal University, Taiwan); Chiang-Ju Chien (Huafan University, Taiwan); Wei-Yen Wang and Wen-Chung Kao (National Taiwan Normal University, Taiwan)

In this paper, a novel corner feature extracting simultaneous localization and mapping (CFESLAM) algorithm is proposed, which employs a mechanism of corner feature extraction that regards only corners as the landmarks to ease the computational burden. To further improve the overall computational efficiency, the proposed CFESLAM is implemented by hardware on a FPGA platform. By doing so, the proposed approach is capable of providing a robust, reliable, and low-cost real-time SLAM system. Experimental results have confirmed that notable improvement is made by using the proposed approach.

09:40 *Implementation of an External Intelligent Cooling System for Laptops using TECs*

Nirmani Ranchagoda, Najath Mohomed Akram, Charitha Vithanage and Nisabha Jayasundare (University of Ruhuna, Sri Lanka)

Laptop coolers are external devices, which are ancillaries to the existing cooling mechanism of laptops, in order to reduce their internal temperature. Available coolers do not provide efficient cooling in high ambient temperatures. This paper presents the implementation of an intelligent laptop cooler, which can vary its performance according to the laptop temperature and ambient temperature, and actively cool the air flow by using thermoelectric coolers (TECs). In this work, a dynamic air flow is intelligently cooled by the device and the process will be controlled, based on the feedback provided by a temperature sensor placed at exhaust vent of laptop. Further, the device is designed to reduce dust content in the air flow which passes through the laptop. Ultimately an effective cooling is provided to the laptop through this device while increasing the lifetime of the laptop.

10:00 *Hybrid Indoor Navigation Assistant for Visually Impaired People Based on Fusion of Proximity Method and Pattern Recognition Algorithm*

Walter Charles Sousa Seiffert Simões (UFAM - Universidade Federal do Amazonas, Brazil); Vicente F. Lucena, Jr. (University of Amazonas, Brazil)

This paper presents an audio guided Indoor Navigation Systems built in a wearable device designed to work with a hybrid mapping. This mapping consist of radio frequency markers as well as visual markers located in special places inside a known ambient. This system allows blind users a safe guided navigation with quick and low computational complexity. The chosen methodological approach divides the system in two stages: one offline and another online. In offline stage the indoor mapping is made through construction of markers to generate a contextual database that increases the quality of location indication. The online stage, where the indoor navigation is performed, is based on the proximity method, visual pattern recognition, odometry, and ultrasonic perception of barriers. Results showed rates of over 90.0% of the recognition of RF and visual markers with time of 0.4 seconds, as well as over 95.0% of positive ultrasonic perception of obstacles.

Communications TOP

Room: Berlin 2
Chair: Hans L. Cycon (HTW Berlin & Daviko GmbH, Germany)

09:00 *A Software Defined Radio Based DOCSIS 3.1 Measurement Receiver*

Florian Jackisch (Technische Universität Braunschweig, Germany); Daniel Rother (TU Braunschweig, Germany); Christoph Juchems (IAF GmbH, Germany)

The Data Over Cable Service Interface Specification (DOCSIS) provides internet access via cable TV networks. The latest version 3.1 replaces the Physical Layer of previous DOCSIS versions. With DOCSIS 3.1, broadband cable network operators want to accelerate their networks to gigabit-per-second speeds. Enhancements include an increased bandwidth per downstream channel of up to 192MHz, Orthogonal Frequency-Division Multiplex with a 4096 Quadrature Amplitude Modulation, and Low Density Parity Check Codes. These changes require new high performance hard- and software decoders. This paper presents the concept of a measurement receiver based on Software Defined Radio (SDR). The measurement receiver features a novel hardware frontend, an improved pre-FFT timing and frequency offset estimation under Roll-Off conditions, a high-performance LDPC decoder, and a Graphical User Interface for data analysis. It is shown that the SDR approach achieves good performance and is suitable for a DOCSIS 3.1 measurement decoder that focuses primarily on the Physical Link Channel.

09:20 *A Round-Robin-Based Resource Scheduling Method for D2D-Enabled Cellular Networks*

Yao-Liang Chung (National Taiwan Ocean University, Taiwan)

This paper proposes an efficient round-robin-based resource scheduling method performed over both the licensed and unlicensed bands in device-to-device-enabled cellular networks. Simulation results demonstrate that, in terms of the average transmission rate and the blocking ratio, the proposed method is superior to the conventional method.

09:40 *Improving Multimedia Streaming from the Network's Core*

Andreas Schmidt (Saarland University, Germany); Thorsten Herfet (Saarland University & Intel Visual Computing Institute, Germany)

In 2015, NetFlix made the headlines with nearly 37% of Internet traffic being caused by their streaming applications 1. The trend towards similar applications is further accelerated by increasing number of mobile devices used to consume high resolution video and interact with low latency. Hence, new challenges arise that can no longer be solved by solely altering the network's edge. Software-Defined Networking (SDN) and its most popular incarnation OpenFlow [1] cause a trend towards intelligent devices at the network's core. The end-to-end (E2E) principle, as proposed by Saltzer et al. [2] in 1984 and further discussed by Moors [3] in 2002, is one of the paradigms to be reconsidered in this new world. Theory and practice show that segmenting multiple transmission domains can provide benefits for the overall network performance. Current approaches, as e.g. Split-TCP [4], require changes to the end-hosts and applications to explicitly use this protocol, which can be avoided when using SDN technologies. We propose the novel networking pattern Transparent Transmission Segmentation (TTS) that allows to separate certain domains and lead to better performance, especially in heterogeneous environments. With most of multimedia streaming traffic being transmitted using Dynamic Adaptive Streaming (DASH) [5], it is straightforward to consider TCP transmissions. We identify network functions of TCP that can perform better when segmentation is employed and give a differentiated view on this using simulations measuring transmission times. The evaluation shows that although we have performance degradations of maximally 1% for mean, median and standard deviation for certain scenarios, our approach can achieve more than 14% improvement on certain scenarios and 3 - 10% on most scenarios. This shows that TTS has to be applied thoughtfully, but can provide significant improvements when employed in the scenarios with high loss and jitter.

10:00 *Localization Based on Angle of Arrival in EM Lens-Focusing Massive MIMO*

Sarmad Shaikh (Alpen-Adrea University, Austria); Andrea M Tonello (University of Klagenfurt & WiTiKee srl, Austria)

This paper proposes a novel algorithm for user localization using the angle of arrival (AoA) concept. We propose to combine the electromagnetic (EM) lens with the massive multiple-input multiple-output (MIMO) antenna array at the base station (BS). EM lens have the advantage of focusing the signal power on a subset of antennas as a function of the AoA. Thus, the provide an opportunity to estimate the location of user more efficiently with reduced number of radio frequency (RF) chains and computational costs. The obtained numerical results have shown that the EM lens based massive MIMO is capable of providing better AoA estimation.

Tuesday, September 6, 10:20 - 10:40

Coffee Break TOP

Room: Break Area

Tuesday, September 6, 10:40 - 11:40

Keynote 3: "Signal Enhancement in Cellphone Handsets, PCs, and Digital Still Cameras/Camcorders"

Akihiko Sugiyama, NEC TOP

Room: Berlin 1

Tuesday, September 6, 11:40 - 13:00

Young Professionals Seminar TOP

Room: Berlin 2

Chair: Thomas Coughlin (Coughlin Associates, USA)

Interface & Experiences for Users (I) ⬆ TOP

Room: Berlin 1

Chair: Simon Walz (Technische Universität Braunschweig, Germany)

11:40 *Choosing Audio Devices on the Basis of Listeners' Spatial Perception: A Case Study of Headphones vs In-earphones*

Carlos Silva (University of Minho & Centro de Computação Gráfica, Portugal); Sandra Mouta (Centro de Computação Gráfica, Portugal); Jorge Santos (University of Minho & Centro de Computação Gráfica, Portugal)

The Earphones and Headphones industry is steadily growing following the emergence of new technological advancements and new applications. New methods to determine listeners' performance using different types of audio output devices will be in high demand. In this paper we adapt a methodology for evaluation of listeners' auditory localization accuracy to support the choice between two devices. As a case study, we compare a particular set of in-earphones and headphones. Our goal was to present a method that allowed us to: (1) conclude which audio device provided the most accurate sense of auditory localization; (2) understand the effect of training on task performance; and (3) determine which type of device benefits the most from short sessions of training in auditory localization. Participants had better performances using headphones. Nevertheless, we can reduce the differences between devices if short training sessions are included and the same device is used between training and test.

12:00 *Collaborative Work in VR Systems: A Software-Independent Exchange of Avatar Data*

Ronny Klauck and Sebastian Lorenz (BTU, Germany); Christian Hentschel (Brandenburg University of Technology Cottbus-Senftenberg, Germany)

For the collaborative work in Virtual Reality Systems gestures and emotions of the involved persons need to be visualized exactly and exchanged in near real-time. Using point clouds for the representation of avatars guarantees a high level of detail, but processing these huge data set in real-time requires high computational resources. Furthermore, the exchange of avatars need a software-independent representation.

12:20 *Semi-automated Sanitizing of Component Dependencies after Subsystem Reconfiguration in Multimodal VR and AR Frameworks*

Thomas D. Lepich, Robert Roth, Reinhard Moeller and Christoph Brandau (University of Wuppertal, Germany)

Modern software for the development of augmented and virtual reality applications is designed with the aim to simplify its usability in order to provide services to a wider user base. The main purpose of our work is the implementation of a new approach for the simplification of the replacement and the reconfiguration of a simulation framework's subsystems. After a reconfiguration it is necessary to adapt existing simulation scenarios to the new foundation, to reconfigure connections, and to resolve possible new dependencies within the scenario. We defined a component-based framework in a way that makes it possible to automatically evaluate dependencies and simulation configurations. A sanitizer helps the user to adapt an existing simulation scenario to a new environment.

12:40 *How Bright of Luminance is Needed for Outdoor Commercial Display?*

Hee Eun Lee (LG Display, Korea); Jaehong Kim (LG Display Co., Ltd., Korea)

The purpose of this study is to identify luminance requirements for outdoor commercial display. To find luminance requirements, both outdoor and indoor experiments were carried out by considering actual viewing conditions of outdoor commercial display. As a result, luminance requirements are determined brighter than 3,000 cd/m2 when the ambient illuminance is 50,000 lux.

Tuesday, September 6, 13:00 - 14:00

Lunch & IFA TecWatch Tour ⬆ TOP

Room: Break Area

Tuesday, September 6, 14:00 - 15:00

Keynote 4: "The Memory of Cars"

Thomas M. Coughlin, IEEE Future Directions ⬆ TOP

Room: Berlin 1

Tuesday, September 6, 15:00 - 16:40

AV Processing ⬆ TOP

Room: Berlin 1

15:00 *Array Microphones and Signal Processing within an Ethernet-based AVB Network*
Thaden Cohrs and Lukas Treybig (Ilmenau University of Technology, Germany)
Array microphones are frequently used in the field of speech signal applications. In this paper a use case for array microphones combined with signal processing and IEEE 802.1 AVB Ethernet-based audio signal transmission is presented. The proposed application is intended for conferencing systems. The array microphones with beam steering and sound source localization algorithm are used to span multiple speakers' recording areas. The benefit is the elimination of separate table microphones for the speakers.

15:20 *A Buffer Dynamic Stabilizer for Low-Latency Adaptive Video Streaming*
Yongtao Shuai (Saarland University, Germany); Thorsten Herfet (Saarland University & Intel Visual Computing Institute, Germany)
HTTP-based adaptive streaming is today's predominating video delivery model over Internet. However, state-of-the-art bitrate adaptation algorithms are not suitable for low latency adaptive video streaming due to a distinct lack of buffer dynamic stabilization at the client. A small buffer size lacks resilience to the buffer fluctuation imposed by the mismatch between the network throughput and the average bitrate of the selected video chunk. This paper introduces a bitrate adaptation algorithm that minimizes buffer deviation from the desired level despite a buffering delay as small as a chunk-duration. We demonstrate the performance of our algorithm with respect to the quality-of-experience (QoE) using two evaluation frameworks and compare it against two well-known streaming algorithms, FESTIVE and DASH VLC plugin. The preliminary results show that our algorithm achieves at least 11% higher QoE in the simulation framework and 4% in the emulation framework.

15:40 *Workflow Steps to create a Digital Master Format*
Tristan Riedel (Technische Universität Ilmenau & Anhalt University of Applied Sciences, Germany); Matthias Schnöll (Anhalt University of Applied Sciences)
The typical result of an entire digital film production chain are multiple versions of a media file. This constitutes a great challenge in creating and managing for content creators. Especially in post production processes, different versions arise for final distribution of several resolutions, frame rates, languages and subtitles. The Interoperable Master Format (IMF) is a uniform master standard developed by SMPTE to improve interoperability and facilitate automation without requiring diverse distribution copies of content for each distribution company. Some of the largest international providers of video on demand (VOD) services have started to use IMF for content ingestion and are investing heavily in this emerging standard. Existing software and hardware solutions dealing with IMF are often very costly and subject to proprietary rights. In relation to that issue, a prototype of a web-based application was developed to create digital master formats. The prototype offers several web services to provide a better efficiency of working with digital master formats within media post production and distribution.

16:00 *Low Complexity HEVC Sub-Pixel Motion Estimation Technique and Its Hardware Implementation*
Ahmet Can Mert, Ercan Kalali and Ilker Hamzaoglu (Sabanci University, Turkey)
In this paper, a low complexity High Efficiency Video Coding (HEVC) sub-pixel motion estimation (SPME) technique is proposed. The proposed technique reduces the computational complexity of HEVC SPME significantly at the expense of slight quality loss by calculating the sum of absolute difference (SAD) values of sub-pixel search locations using the SAD values of neighboring integer pixel search locations. In this paper, an efficient HEVC SPME hardware implementing the proposed technique for all prediction unit (PU) sizes is also designed and implemented using Verilog HDL. The proposed hardware, in the worst case, can process 38 Quad Full HD (3840x2160) video frames per second.

16:20 *FPGA Implementation of HEVC Intra Prediction Using High-Level Synthesis*
Ercan Kalali and Ilker Hamzaoglu (Sabanci University, Turkey)
Intra prediction algorithm in the recently developed High Efficiency Video Coding (HEVC) standard has very high computational complexity. High-level synthesis (HLS) tools are started to be successfully used for FPGA implementations of digital signal processing algorithms. Therefore, in this paper, the first FPGA implementation of HEVC intra prediction algorithm using a HLS tool in the literature is proposed. The proposed HEVC intra prediction hardware, in the worst case, can process 35 full HD (1920x1080) video frames per second. Using HLS tool significantly reduced the FPGA development time. Therefore, HLS tools can be used for FPGA implementation of HEVC video encoder.

TOP

Electromagnetic Compatibility

Room: Berlin 2
Chair: Saraju P Mohanty (University of North Texas, USA)

15:00 *Electromagnetic Simulation for EMC / EMI - Modern EMC Design Flow*
Matthias Tröscher (Computer Simulation Technology - CST AG, Germany)
EMC compliance is a necessary precondition for releasing electronic products to the market. If these standards are not met, the product cannot be sold. EMC engineering has traditionally been the domain of measurement alone, with the result that EMC compliance was only considered late in the design process, since it required a working prototype. However, correcting EMC problems at this late stage can be very cost-intensive, especially if multiple prototype iterations are required. This presentation shows the advantages of EMC simulation in the design flow of modern electronics based on several applications from consumer electronics, automotive industry, home appliances and aerospace industry.

15:20 *From Radiated Emissions to Drone Assisted Antenna Evaluation - Automotive Electromagnetic Interference Measurements*
David Hamann (IAV GmbH, Germany)
Declaring the compliance of a given product with standards for electromagnetic compatibility (EMC) includes measurements of the electromagnetic fields, radiated by that product. However, for automotive EMC another important measurement has to be performed: the self-immunity, in other words, the noise at the terminals of the car's antenna,

generated by the car itself. In order to evaluate the results of that measurement in early development stages, knowledge of the antenna performance is mandatory. Such knowledge can be gained by means of a drone assisted antenna evaluation. This presentation gives an overview of the measurement methods for radiated emissions and introduces a method for the measurement of antennas with a drone assisted evaluation system.

15:40 *Electromagnetic Compatibility in Electronic Systems - An Introduction Using Problems with ICs and PCBs*
Christian Schuster (Technischen Universität Hamburg-Harburg, Germany)
The engineering discipline of electromagnetic compatibility (EMC) deals with the measurement, modeling, and mitigation of unwanted electromagnetic interferences resulting from electrical equipment and electronic devices. In practice EMC is a multidisciplinary field of engineering that draws from microwave engineering, power engineering, circuit design, measurement technology, and electromagnetic field theory. In this introduction to EMC interference problems arising from integrated circuits (ICs) and printed circuit boards (PCBs) will be used to showcase how these can be analyzed and alleviated.

16:00 *Dealing with Radiation and Coupling of Transmission Lines within ISM 60 GHz band*
Robert Trieb (Fraunhofer Institute for Integrated Circuits, Germany); Andy Heinig (Fraunhofer IIS/EAS, Germany)
The increasing demand of bandwidth has led to the application of more and more challenging frequency bands in mm-wave range. Within the upcoming 60 GHz band, the free space wavelength of about 5 mm will reach the length of a transmission line. Considering the high dielectric constant of substrate material, the wavelength can be even a fraction of the trace length. Thus, every transmission line will behave as a potential antenna. Focusing on this phenomenon, this presentation will introduce the scope of design possibilities, dealing with radiation and coupling effects. Critical aspect in the design of systems with transceiver front-ends will be indicated, e.g. connections from the front-end output to the antenna array.

Tuesday, September 6, 16:40 - 17:20

Coffee Break & meeting point TOP

Room: Break Area

Tuesday, September 6, 17:20 - 19:40

Tour to Fraunhofer, Heinrich Hertz Institute TOP

Room: Offsite

Tuesday, September 6, 19:40 - 22:00

Conference Dinner at Seehof Hotel TOP

Room: Offsite

Wednesday, September 7

Wednesday, September 7, 09:00 - 10:20

Interfaces & Experiences for Users (II) TOP

Room: Berlin 1
Chair: Jose-Maria Flores-Arias (University of Cordoba, Spain)

09:00 *Hand Detection Using Facial Information*
Sangpil Han (Chung-Ang University, Korea); Seokmok Park (University of Chung-Ang, Korea); Min-jae Kim (Chung Ang University, Korea); Joonki Paik (Chung-Ang University, Korea)
This paper presents a robust hand detection algorithm using the facial information. The proposed algorithm consists of four steps: (i) detection of a face, (ii) generation of regions of interest (ROI) to detect hands, (iii) skin color extraction from the face region, and (iv) detection of hands using the face skin color in the ROI. The proposed algorithm can reduce false detection caused by a similar skin color, and provides a successful detection rate up to 92 percent.

09:20 *A modular Middleware Approach for Exergaming*
Martina Eckert (Universidad Politecnica de Madrid & Research Center on Software Technologies and Multimedia Systems for Sustainability (CITSEM), Spain); Ignacio Gómez-Martinho

(Technical University of Madrid, Spain); Juan Meneses and José Martínez-Ortega (Universidad Politécnica de Madrid, Spain)

This paper presents the design of a new exergaming environment consisting of a modular middleware tool and an intelligent adventure game. The middleware provides a modular and user-adaptive interface for data exchange between different devices (to date it supports a motion capture camera, a mobile phone, and a VR headset) and Blender. The target group is formed by young people between ages 6 to 26 with different physical diseases (muscular dystrophy, cerebral palsy, accidents etc.). The gaming environment focuses especially on user awareness, immersion, and adaptability to special needs.

09:40 *Hand Gesture Recognition based on sEMG Signals using Support Vector Machines*
Gonzalo Pomboza-Junez and Juan Antonio Holgado-Terriza (University of Granada, Spain)

This paper demonstrates the application of electromyography (EMG) signals for controlling home devices. To achieve this we have used an armband called MYO® that has an array of eight sEMG sensors around the forearm. We have studied 15 different hand gestures to create a dictionary of gesture control. We have achieved gesture recognition using Support Vector Machines (SVMs) as a classification method. We tested different types of kernels (radial, polynomial and sigmoid) to achieve the optimum conditions for gesture learning and recognition as well as an accurate determination of these movements. Furthermore, to show the effectiveness and applicability of the results, a Gesture Control System has been implemented as an embedded system. The system also enable Bluetooth communication with the armband, send gesture control commands to household devices using iR protocol.

10:00 *Fast facial Expression Recognition for Emotion Awareness Disposal*
Martina Eckert (Universidad Politecnica de Madrid & Research Center on Software Technologies and Multimedia Systems for Sustainability (CITSEM), Spain); Almudena Gil, Diego Zapatero, Juan Meneses and José Martínez-Ortega (Universidad Politécnica de Madrid, Spain)

This paper presents a simple and fast expression recognition algorithm aimed at running in a secondary plane to provide emotion awareness for primary applications as e.g. exergames, in real time. The algorithm is based on the extraction of 19 facial landmarks which are used to detect some of the Action Units (AUs) defined in Facial Action Coding System (FACS) and a newly created one. In addition, the new concept of Combined Action Units (CAUs) is presented. Those are grouped AUs which are detected as a unit. The applied emotion classification is based on logical rules, no learning is involved. First implementations have been made on a mobile platform.

TOP

Infotainment & UI

Room: Berlin 2

09:00 *Java-based Graphical User Interface Framework for In-Vehicle Infotainment Units with WebGL Support*
Radivoje Ostojic (Faculty of Technical Sciences of Novi Sad, Serbia); Jasmina Pesic (Faculty of Technical Sciences, Serbia); Goran Stupar (University of Novi Sad & RT-RK Institute for Computer Based Systems, Serbia); Milan Z. Bjelica (University of Novi Sad, Serbia)

In-Vehicle Infotainment (IVI) applications are gaining more and more attention in the automotive industry. For application development different technologies are used, typically Linux-based, accompanied with various proprietary IDE tools. Cross-platform applications are therefore not easy to create, ramp up time to start a development project is large and require specific know-how. In this paper, we propose an application environment based on open technologies, such as HTML5 and JavaScript for IVI application development, fully utilizing WebGL for advanced graphical effects. To further facilitate the development, we created a Java-based framework which allows creating and portability of cluster and IVI applications to the proposed application environment. Evaluation shows the feasibility of our approach and adequate graphical performance.

09:20 *Supporting Sensor Fusion in Next Generation Android In-Vehicle Infotainment Units*
Kristina Omerovic (Faculty of Technical Sciences University of Novi Sad, Serbia); Joakim Janjatovic (Faculty of Technical Sciences, University of Novi Sad, Serbia); Milena Milosevic and Tomislav Maruna (RT-RK Computer Based Systems LLC, Serbia)

Each day vehicles are becoming more intelligent and users are presented with continuous enhancement of features and functions. In-Vehicle Infotainment (IVI) and Advanced Driver Assistance System (ADAS) are becoming very important for improved passenger experiences and safety within vehicles. Modern cars have multiple screens running in an environment based on multicore SoC (System on a chip), therefore it is necessary to design real time communication between ADAS and IVI. This paper proposes the communication solution between ADAS and IVI through Ethernet connection.

09:40 *Design and Implementation of a Four-quadrant and Voice Interaction User Interface of a Smartphone for the Visually Impaired Users*
Y. W. Bai, Wen-Cheng Hsu and Chun-Cheng Chan (Fu Jen Catholic University, Taiwan)

This paper presents a design of a four-quadrant and a voice interaction user interface for the visually impaired (VI) by using a smartphone. This design provides a simplified interface, big buttons, voice feedback, and some simplified functions. Moreover, it is suitable for those people who are visually impaired. This design also includes a telephone, a voice message, an emergency button, and an emergency shaking function.

10:00 *Securing Smartphones via Typing Heat Maps*
Frankie Inguanez and Samad Ahmadi (De Montfort University, United Kingdom)

Smartphones are the singular most utilised device able to track and monitor our activity continuously from which signatures such as our typing can be detecting. Various situations such as loss of phone, passing on to family members or friends require us to consider continuous modes of passive authentication. This paper explores how typing heat maps can improve user authentication for touch enabled devices. By revisiting the traditional typing digraph intervals, normally associated with typing biometric user authentication, this research investigates the strength of various features for user identification on smartphones. Considering the different methods of typing on a portable small device as opposed to the mechanical keyboard or pressure sensitive tablets, this research takes the touch screen data to present a new set of features which can be used as a passive mode of continuous authentication. Given the continuous

use of the device by the owner, a multilayer perceptron neural network is believed to be a plausible and viable approach for this task, which is also understudied for smartphones. The findings in this research highlight the strength of various touch related features in typing signatures.

Wednesday, September 7, 10:20 - 11:00

Coffee Break & Poster Session 2

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

Augmented Reality Obstacle Detection for In-Vehicle Sensor Fusion

Nikola Popovic (Faculty of Technical Sciences of Novi Sad, Serbia); Ognjen Djekic (Faculty Technical Sciences of Novi Sad, Serbia); Marko Kovacevic (Faculty of Technical Sciences, Serbia); Tomislav Maruna (RT-RK Computer Based Systems LLC, Serbia)

Advanced Driver Assistance System or ADAS is used in vehicles to make driving as safe as possible. For that reason ADAS uses sensors, lidars, radars and cameras to enable vehicles to perceive everything that surrounds them. So many different components require processing and analyzing large amounts of data. This paper proposes layered architecture for software which collects data from ultrasonic sensors, processes it and deploys to higher layers of the system.

A Solution to Software Scalability across ADAS Platforms

Ognjen Djekic (Faculty Technical Sciences of Novi Sad, Serbia); Veselin Gojak (Faculty of Tehnical Sciences, Serbia); Milos Ilic (Faculty of Technical Sciencis - University of Novi Sad, Serbia); Gordana Velikić (RTRK Computer Based Systems LLC, Serbia)

Recently Advanced Driver Assistance Systems (ADAS) use cases are growing in number and ubiquity with no common approach to software design and implementation to facilitate Advanced Driver Assistance Systems development. Thus we are presenting our scalable software model where we focus on data acquisition, processing units, and action intelligence. In this software module we present our Advanced Driver Assistance Systems Middleware design and communication with Advanced Driver Assistance Systems modules. The middleware design supports acquiring and processing data on different units with separation of concerns between the safety critical and non-critical data. This software model enables development of complex Advanced Driver Assistance Systems modules with higher efficiency based on standardized data types and data exchange between modules. The goal of this model is to help a researcher to reuse modules on different Advanced Driver Assistance Systems platforms.

IoT based Intelligent System for Fault Detection and Diagnosis in Domestic Appliances

Jorge Seabra (Universidade Federal do Amazonas, Brazil); Mário Júnior (Universidade Federal do Amazonas & UFAM, Brazil); Mateus Lucena (Federal University of Amazonas, Brazil)

Domestic appliances normally used on daily basis are gradually transitioning into the third internet wave, the internet of things. Mostly the end user is the only qualified actor to identify poor performance of these appliances. Moreover, such bad performance comes only to attention in extreme cases, when the appliance is not functioning anymore. This work describes an intelligent, low cost system, which monitors the behavior of electrical magnitudes of domestic appliances in real time. The system is able to analyze the collected data, detect possible faults, and report this situation to the user. An IoT device, designed to be adapted to any old generation consumer electronic device, is part of the proposed system. The complete system is able to identify instant faults, as well as, predict the need for a preventive maintenance. The user interface makes use of digital TV, mobile devices, or conventional computers to warn householders about necessary interventions.

Serious gaming approach for physical activity monitoring: a visual feedback based on quantitative evaluation

Luca Romeo (Universita' Politecnica delle Marche, Italy); Francesco Ferracuti (Polytechnic University of Marche, Italy); Lucio Ciabattoni, Federica Verdini and Giuseppe Lazzaro (Universita' Politecnica delle Marche, Italy)

This work presents the design of an exergaming interface and an assessment tool for the analysis of physical activities. Typically, exergaming aim to engage the user in physical or cognitive activities by qualitative goals that do not take into account the quantitative assessment of the exercise execution. In this work, authors propose an interactive interface which displays a human avatar and returns a real-time visual feedback highlighting where the user is mistaken. Moreover, the performance assessment is obtained by Dynamic Time Warping (DTW) algorithm based on quaternion-based pose distance. Differently from other approaches, a quantitative motion assessment is provided through the rotational constraint descriptors of physical exercises, chosen by specialists, allowing its implementation in eHealth context.

Design of the ARAIG Haptic Garment for Enhanced Resilience Assessment and Development in Tactical Training Serious Games

Carolyn McGregor, AM (University of Ontario Institute of Technology, Canada); Brendan Bonnis, Brodie Stanfield and Michael Stanfield (IFTech Inventing Future Technology Inc., Canada)

First person shooter virtual reality games have begun to be used for serious games for military or civilian tactical training for new approaches for resilience assessment and development as part of new approaches for mental health training. However, sensory stimulation has been largely constrained to visual and auditory sensations with limited tactile feedback through haptic controllers. This paper presents a design for the ARAIG haptic garment for enhanced resilience assessment and development in tactical training serious games.

Test Stream Generation for Digital Cable UHD Broadcasting Standard

Jaeil Kim, Jinyoung Yang and Donghyun Kwon (Telecommunications Technology Association, Korea)

This paper proposes a generation scheme of compliance test streams for verifying conformance of a digital cable UHD (Ultra High Definition)receiver including video and audio decoders as well as system and closed caption modules. The proposed test streams for video and audio decoders can test compliance with HEVC (High Efficiency Video Coding) standard and DTS (Digital Theater System)-HD (High Definition) specification. Especially, HEVC test steams includes syntax compliance and error resilience test streams for HEVC video compression standard. Moreover, the proposed test streams for system and closed caption modules can be used for verifying parsers for PSIP (Program and System Information Protocol) and closed caption.

A System for Remote Monitoring of Mental Effort

Pratyusha Das (Tata Consultancy Services, India); Debatri Chatterjee (TCS Innovation Lab, India); Avik Ghose and Aniruddha Sinha (Tata Consultancy Services, India)

Real-time monitoring of mental effort enables the possibility of dynamically adapting the challenge of a task given to an individual, thereby maintaining the skill-challenge balance. In this paper we propose a remote monitoring system for assessing mental effort or cognitive load using low cost Galvanic Skin Response (GSR) sensor. The variations in the skin conductance level measured using the GSR signal, is used to generate a score in real-time, which reflects the level of mental load experienced by an individual. This score gives an additional information about the efforts given by the participants and hence is an important value addition for assessing one's mental workload while doing any task. The score is initially transmitted to a mobile gateway device for local monitoring and later transmitted to a backend server for offline analysis and tracking of the performance over a period of time.

IPTV Game Test-Bed System based on Bluetooth Network

Gyuhyeok Choi and Mijin Kim (Dongseo University, Korea)

Game is one of the content services provided by an IPTV based on a Set-Top Box which is a terminal required for interactive multimedia communication at home. However, because IPTV service providers have an overall control of the Set-Top Box, game developers experience difficulty in fully testing the games before launching them. In this paper an IPTV game test-bed system is implemented based on Bluetooth network and Stick PC instead of the Set-Top Box. This can be interconnected with TV and a smart-phone controls game content instead of the conventional TV's remote controller. Our new system can provide a platform that satisfies a seamless IPTV game which allows game developers to freely test the games in a more convenient environment during the production process.

MAS-Med Alert System

Shivakumar Chandrasekaran and SathishKumar SenaMohan (Cisco Video Technologies, India)

In the past few years, Technology involvement in the Medical Science has increased tremendously, making life easier for both Patients and Doctors. Of the many Medical Devices, there are few Health Companion Devices that measures Patient's Blood Sugar (BS), Blood Pressure (BP), Heart Rate (HR) & other vital health data and displays on the Device. There are many innovative techno tools out in the market to help Medical Science for e.g., Omron HEM-7113 Automatic Blood Pressure Monitor and One Touch Select Simple Blood Glucose monitoring System. However there is no provision of Centralized Monitoring System with Emergency Alert System, and data storage for future use by Patient and Doctor or Hospital. One solution, we propose through this paper is "Med Alert System". Med Alert System is a solution which monitors patients' health condition by measuring BP, BS & HR at a regular interval of time and stores the same data in Cloud Computing system. The solution has an emergency system which alerts Doctors or Hospitals during emergency and seamlessly requests for Ambulance Service.

Wednesday, September 7, 11:00 - 12:20

⬆ TOP

Image & Video Processing (II)

Room: Berlin 1

Chair: Kousik Ramasubramaniam Sankar (CISCO Video Technologies, India)

11:00 *Fast Image Decoding for Block Compressed Sensing based encoding by using a Modified Smooth l0-norm*

Jieqiong Xiao (Beijing Institute of Technology, P.R. China); Carlos R. del-Blanco, Carlos Cuevas and Narciso García (Universidad Politécnica de Madrid, Spain)

This paper proposes a fast decoding algorithm for block-based compressed sensing images that combines a modified smooth l0-norm with the BCS-SPL algorithm. Experimental results have proven a significant reduction in execution time, while providing the same image quality.

11:20 *Efficient Fire Detection Using Fuzzy Logic*

Antonio Buemi, Davide Giacalone and Filippo Naccari (STMicroelectronics, Italy); Giuseppe Spampinato (ST Microelectronics, Italy)

This paper presents Horus, a novel algorithm for fire detection in videos. It exploits a fuzzy model to discern the frame's fire areas by color recognition. The classic Mamdani fuzzy inference process allows estimating the membership degree of each pixel to the set of fire colored pixels. The final check analyzes the motion dynamic of the areas classified as fire to reduce the risk of false positives.

11:40 *Embedded Microcontroller System for piecewise-linear Laser Projection*

Griselda Garcia-Santiago and Victor Manuel Jimenez-Fernandez (Universidad Veracruzana, Mexico); Jesús García-Guzmán (Universidad Veracruzana); Farah Helúe Villa-López (The University of Warwick, United Kingdom); Hector Vazquez Leal, Uriel Filobello-Nino and Norberto Carrillo-Ramon (Universidad Veracruzana, Mexico)

This paper describes a first approach of a microcontroller system specifically dedicated to implement the so called piecewise-linear method for laser projection. An embedded system based on the Atmel AVR microcontroller is designed to control a dual-axis galvo motor/mirror assembly in accordance with the evaluation of a couple of one-dimensional piecewise-linear functions. Such functions are derived from a parametric decomposition of the curve to be sketched by

laser projection. By this hardware realization, the well-known advantages (less memory consumption and sharpness of projected figures) of the piecewise-linear method over the commercial point-based, standard can be verified.

12:00 *High Dynamic Range Video Streams Based on Inexpensive Image Sensors*
Sheng-Yi Peng, Yu-Chi Wu and Pao-Chi Chang (National Central University, Taiwan)
This paper proposes a High Dynamic Range (HDR) system with low computation complexity based on inexpensive electronic devices. It utilizes advanced hardware structure with CMOS sensors that can generate multiple frames consisting of long and short exposures. In addition, the interval time between long and short frames can be set to a few msec or even less. Existing HDR recovering and compression techniques are used in the proposed system. Both the regular mode and the HDR mode share the same image processor and keep the same sensor characteristics. It exhibits minimum impact to the image processing unit while demonstrates excellent HDR performance.

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Systems & Applications (II)

Room: Berlin 2

11:00 *A novel RSSI based Approach for human Indoor Localization: The fuzzy discrete Multilateration*
Alessandro Baldini, Lucio Ciabattoni and Riccardo Felicetti (Universita' Politecnica delle Marche, Italy); Francesco Ferracuti (Polytechnic University of Marche, Italy); Sauro Longhi and Andrea Monteriù (Università Politecnica delle Marche, Italy); Alessandro Freddi (Università degli studi eCampus)
In this paper a new algorithm for indoor localization, namely Fuzzy Discrete Multilateration (FDM), is proposed. As its name suggests, it elaborates data from any number of transmitters (anchor nodes), and returns the estimated position of an unknown receiver. Furthermore two cascade fuzzy inference systems are employed to evaluate the reliability of the data gathered from each beacon. The algorithm has been tested in different real world environments, where the anchor nodes are smart objects and the unknown node is any smart object held by the user to be localized. The performances of our approach algorithm has been compared with those of three well known localization algorithms (with a beacon density ranging from 0.03 to 0.1 beacon/m^2) and results are shown.

11:20 *Augmenting OFDM Wireless Local Networks with Motion Detection Capability*
Christian Brauers (TU Dortmund University, Germany); Wolfgang Endemann (Dortmund University of Technology, Germany); Ruediger Kays (TU Dortmund University, Germany)
Ubiquitous wireless local networks which use channel transfer function estimation to compensate for echoes on the wireless channel are uniquely suited for motion detection as a secondary use. In this way, added value can be provided without additional hardware. This paper presents a procedure with uses channel state information of an IEEE 802.11 High throughput wireless link to reliably detect the presence of moving items, such as people crossing a room. By leveraging CSI instead of RSSI, the frequency-selective fading characteristic of indoor wireless channels can be taken into account while eliminating the effect of power level fluctuations in consumer-grade wireless hardware.

11:40 *Optimized Light Output For Passive Stereoscopic Projection in VR-Systems*
Thomas Rößler (Brandenburg University of Technology Cottbus-Senftenberg, Germany); Stephan Rogge (Rolls-Royce Deutschland, Germany); Christian Hentschel (Brandenburg University of Technology Cottbus-Senftenberg, Germany)
This paper presents a simple and effective method to increase the light output in passive stereoscopic projection environments. We realized a processing chain with Liquid Crystal on Silicon (LCoS) projectors, taking advantage of the already polarized projector light. Minimizing light losses could be achieved with retarders instead of polarizers in the optical path in combination with changes in the electrical signal path. The efficiency could be greatly improved.

12:00 *Digital Circuit Petri Nets: A new Petri Net Type to Describe and Transform Digital Circuits for Product Safety Engineering*
Christoph Brandau, Nils Potthoff, Dietmar Tutsch and Thomas D. Lepich (University of Wuppertal, Germany)
This paper introduces a new type of Petri nets to design digital circuits. Digital Circuit Petri Nets (DCPN) extend standard Petri nets with a bunch of new elements for the net description of input and output points. Additional a hierarchical structure is given to support clear readable designs of Petri nets with many elements. These DCPN will be used to design digital circuits for safety components. Several strategies are presented to generate digital circuits from such a Petri net description. The reachability graph will be used for the most of this strategies. They are implemented into the Tool "Logical PetriNet".

Wednesday, September 7, 12:20 - 13:20

Keynote 5: "Visual Computing for the Entertainment Industry"

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Jean-Charles Bazin, Disney Research

Room: Berlin 1

Wednesday, September 7, 13:20 - 13:40

Closing Remarks & Awards TOP

Room: Berlin 1

Wednesday, September 7, 13:40 - 18:00

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Room: Offsite