

THE EVENT THAT GATHERS ENGINEERS IN SOUL ACADEMY . INDUSTRY . HOBBYISTS . COMMUNITIES

ZINC

GALVANIZE YOUR CREATIVITY

3105 & 0106 2017

GoZinc.org

Young
LIONS

RT-RK
COMPUTER BASED SYSTEMS

SCHEDULE

Time	A1	B1	Cafeteria	Hall	Outside
Wednesday, May 31					
09:30-10:00				Registration	
10:00-10:30	Opening				
10:30-11:10	K1: Keynote session 1				
11:10-11:30			Coffee break		
11:30-13:10	S1: Image & Video	S2: Connectivity and IoT			
12:30-13:10	K2: Keynote session 2				
13:15-14:15			Lunch		
14:15-17:00		S3: Consumer healthcare		Consumer electronics research exhibition	
15:15-15:30			Coffee break		
15:30-16:50		S4: Enabling technologies			
20:00-22:00					Dinner at the Petrovaradin fortress
Thursday, June 1					
09:30-10:00				Registration	
10:00-11:20	S5: Automotive & Transport	WS1: Workshop: Little Secrets of Success in Business Environment: Feedback			
11:20-11:40			Coffee break		
11:40-13:00	K3: Keynote session 3	WS2: Workshop: Project Initiative Diagnostics			
13:00-14:00			Lunch		
14:00-15:20	S6: User Experience & HMI	Lighting talks of the Young inventors	WS3: Workshop: Make a silent alarm system		
15:20-15:30			Coffee break		
15:30-16:00	Best Paper Award, Closing				

Wednesday, May 31

09:30 - 10:00 Registration, Room: Hall

10:00 - 10:30 Opening, Room: A1, **Chair: Gordana Velikić** (RTRK Computer Based Systems LLC, Serbia)
Opening words
Miroslav Popović (University of Novi Sad, Serbia), **Vladimir Katić** (University of Novi Sad, Serbia)

10:30 - 11:00 **K1: Keynote session 1**, Room A1, **Chair: Christian Bolzmacher** (CEA LIST, France)

10:30 Hybrid and Flexible Computing Architectures for Deep Learning Systems

Nabil Ouerhani (Applied Science University Western Switzerland, Switzerland)

Artificial Intelligence (AI) is literally invading all industrial sectors, from finance to retails and even to manufacturing. Deep Learning, which is a branch of AI has been an important enabler in this spectacular evolution of AI systems. However, most of the innovations and value creation

in the field of deep learning systems are dominated by big players like Google, Facebook, Amazon, Apple and IBM. Two reasons among many others could explain this monopole. First, deep learning based systems need huge amount of training data in order to achieve acceptable accuracy and performance. Unlike small players, the mentioned big players dispose of enough training data. Secondly, designing and tuning deep learning based systems, which can be deployed for real world applications, requires considerable effort. The BonsEyes project, funded by the EU commission through its Horizon 2020 Research and Innovation Program, has the objective to address these challenges in order to allow also small players to build deep learning based systems by providing a data market place for data and models and also by decreasing the needed development and deployment effort. The University of Applied Sciences Western Switzerland (UAS WS), which is a partner of the BonsEyes project, is responsible for the Work Package "Universal Developer Reference Platform". This work package aims at providing guidelines and sample implementations to deep learning systems developers with the goal to speed up the development cycles of end-to-end deep learning based systems. Thanks to the outcome of this WP, deep learning system developers are expected to have the flexibility to develop and deploy their applications on the edge or on the cloud or even combining both alternatives depending on their specific needs and constraints. The development cycle acceleration will be achieved at two major stages of the entire deep learning systems. The first stage is the development and deployment of edge deep learning applications, the inference phase, on embedded devices. The second stage concentrates on the integration of the embedded deep learning applications into a wider Internet of Things ecosystem with two main goals: 1) the connection of the embedded deep learning system to business applications that exploits the data provided by this system and 2) the delegation of certain classification and recognition tasks to the cloudbased deep learning capabilities due to lack of computation power on the edge. As for the acceleration of embedded deep learning applications and systems, the project will provide software and hardware components that help developers to port existing models and application to different target embedded platforms. The main contribution will be the generation of application codes and executables out of a set of specifications (network model architecture and parameter weights). The generated codes and executables will run, seamlessly, on a set of preselected embedded target platforms. For the acceleration of the integration of the embedded deep learning systems into a wider IoT ecosystem, the project will extend the FIWARE platform to cope with our reference platforms. Connectivity challenge of heterogeneous devices in terms of communication protocols and data formats will be addressed by the project. The delegation of inference to external deep learning facilities will also be addressed by the project. The adaptation of existing general or specific enablers as well as the development of own enablers will be kept as alternatives to achieve the envisioned results.

11:10 - 11:30 **Coffee break**, Room: Cafeteria

11:30 - 12:30 **S1: Image & Video**, Room: A1, **Chairs: Dmitry Vavilov** (TSystems RUS, Russia), **Mario Vranješ** (J. J. Strossmayer University of Osijek & Faculty of Electrical Engineering, Croatia)

11:30 Video Quality Monitoring by using Satellite Receiver Bit Error Rate

Ioan Tache (University Politehnica Bucuresti, Romania)

This paper aims to determine the video quality dependence on Bit Error Rate measured at the end user satellite receiver, through experimental measurements performed on satellite broadcasted television channels. The results proved that if the Bit Error Rate is below a threshold value the video quality is very good. The threshold value depends on the broadcasting and video compression standards and on the video content type. By using these threshold values, the satellite television service providers are able to monitor the video quality at the end user terminal by monitoring the Quality of Service parameters and mainly the Bit Error Rate, without using measurement solutions that involve expensive Perceptual Video Quality and Quality of Experience field monitoring equipment.

11:50 FSO Transmission of Halftoned Image Over the Rician turbulence Channel

Stefan Panić (University of Niš & University of Priština, Serbia); **Bojan Prlinčević** (Higher Technical Professional School Zvečan, Serbia)

In this paper, FSO transmission of the halftoned image over the Rician turbulence channel is analyzed. First, halftoning method, and algorithm for FSO transmission simulation are explained. Then, transmission of halftoned image is described. Obtained simulation results are shown in tables and graphically presented. Finally, performance analysis has been carried out, and it has been shown that the halftoned image can be successfully transmitted through FSO channel with K parameter value of $K = 6$

12:10 Challenges in 4K UHD multimedia device testing

Luka Petrinsak (RTRK Institute for Computer Based Systems, Croatia); **Ratko Grbić** (University of Osijek, Faculty of Electrical Engineering, Croatia); **Zvonimir Kaprocki** (RTRK Institute for Computer Based Systems, Serbia); **Milos Subotic** (Faculty of Technical Sciences, University of Novi Sad, Serbia)

As 4K UHD market constantly increases, the development of 4K UHD multimedia devices is becoming more important and profitable. Important aspect in 4K multimedia devices development and deployment is testing which can be done using blackbox approach. In this paper, two main challenges regarding 4K UHD device blackbox testing are identified and explored, namely problem of raw 4K UHD video transmission and its realtime processing for the purpose of video quality analysis.

11:30 - 13:10 **S2: Connectivity and IoT**, Room: B1, **Chairs: Marija Antić** (RTRK, Serbia), **Ištvan Papp** (University of Novi Sad, Serbia)

11:30 Multi Channel Sensor Measurements in Fog Computing Architecture

Ilija Radovanovic (ICEF, Serbia); **Ivan Popovic** (School of Electrical Engineering, University of Belgrade, Serbia); **Dejan Drajić** (DunavNET, Serbia)

This paper presents the design concept of multi channel based sensing application at the physical edge of IoT network. The approach is based on reference Fog computing model, where sensor devices are connected to the edge fog node enabling the implementation of distributed realtime sensing application. The proposed concept implies that the sensor data processing is moved to the connected fog node, reducing hardware and power requirements of the sensor device. The reference fog node architecture, as well as application layer services for data communication, aggregation and processing are also given.

11:50 FRRED: Fourier Robust RED Algorithm to Detect and Mitigate LDoS Attacks

Zhaomin Chen (Nanyang Technological University, Singapore); **Diep Pham** (Nanyang Technical University, Singapore); **Chai Kiat Yeo, Bu Sung Lee and Chiew Tong Lau** (Nanyang Technological University, Singapore)

As most of consumer electronics are connected to the Internet, network attacks can cause massive damage and loss of data to the users. By sending periodic packet bursts to bottleneck routers, Low-Rate Denial-of-Service (LDoS) attacks can degrade the throughput of TCP applications while being hard to be detected. In this paper, we introduce Power Spectrum Density Entropy (PSD-entropy) to detect LDoS attacks. We also propose a Fourier transform based Robust RED (FRRED) queuing algorithm to preserve TCP throughput when faced with LDoS attacks. This novel Active Queue Management (AQM) Algorithm firstly detects the suspicious attack packets based on their arrival

time and then filter the attack packets based on Power Spectrum Density (PSD) entropy. We perform extensive simulations in NS3 to evaluate the performance of FRRED. Compared to other AQM algorithms, FRRED has the lowest False Positive Rate and can preserve nearly the full TCP throughput.

12:10 Using Software Defined Radio for RF Measurements

Dusan Grujic (School of Electrical Engineering, University of Belgrade & Lime Microsystems, Serbia); **Pavle Jovanovic and Milan Savic** (Lime Microsystems, Serbia)

Internet of Things (IoT) is driving the need for wireless connectivity to unprecedented scale. High development costs and risks of ASIC development have been deterring startups and small companies to innovate and disrupt the IoT market. Software defined radio (SDR) platforms have democratized wireless innovation, allowing everyone to enter markets reserved for big players. Although SDR platforms are intended for wireless communications, they can be used for RF measurements as well. This paper presents the (mis)use of LimeSDR for RF measurements.

12:30 Architecture and Partial Implementation of the Remote Monitoring Platform for Patients with Movement Disorders

Lazar Berbakov (Institute Mihailo Pupin, Serbia); **Bogdan Pavkovic** (RTRK, Novi Sad & FTN, Novi Sad, Serbia); **Vladana Marković and Marina Svetel** (Neurology Clinic, Clinical Center of Serbia, Belgrade, Serbia)

In the coming years, the Internet of Things offers great promises for healthcare. The possibility to remotely monitor patient's vital parameters offers a number of benefits: doctors can be aware of patient's condition in real time and timely react in the case of emergency. Besides, patients are much more comfortable to stay at homes while avoiding expensive hospitalization costs. In this paper, we propose an architecture of a remote monitoring system for patients with movement disorders. We have developed one of building blocks wireless inertial sensors platform that can be used in evaluation of therapy effectiveness for patients with spasmodic torticollis. Finally, we have demonstrated the effectiveness of our prototype TremorSense application: by analysing measurements acquired from patients with head dystonic tremor we have numerically confirmed effectiveness of the botulinum toxin injection treatment.

12:30 - 13:10 K2: Keynote session 2, Room: A1, **Chair: Gordana Velikić** (RTRK Computer Based Systems LLC, Serbia)

12:30 Universum called Engineer

Dragan Sataric (Ministry of Education, Science and Technological Development, Serbia)

If you think that you are completely profiled after graduation, think twice! A true story of a surreal engineering path from student years and radar jammer, via computing center and beginnings of C, start ups, professorship, leadership, and Ministry.

13:15 - 14:15 Lunch, Room: Cafeteria

14:15 - 15:15 S3: Consumer healthcare, Room: B1, **Chair: Ioan Tache** (University Politehnica Bucuresti, Romania)

14:15 Virtual Environments For Training Visually Impaired For A Sensory Substitution Device

Alin Moldoveanu (Politehnica University of Bucharest, Romania); **Iulia Stanica and Marialuliana Dascalu** (University Politehnica of Bucharest, Romania); **Constanta-Nicoleta Bodea** (Bucharest University of Economic Studies, Romania); **Daniel Flamaropol, Florica Moldoveanu and Bogdan Taloi** (University Politehnica of Bucharest, Romania); **Runar Unnthorsson** (University of Iceland, Iceland)

Virtual reality represents an emerging technology, which can be successfully used to develop training tools in many domains, such as military, space, education or healthcare. The current paper proposes a training strategy for a sensory substitution device in order to improve the ability of visually impaired people to be autonomous, thus to increase the quality of their lives. The core of the strategy is a highly interactive virtual training environment, composed of 3D scenes simulating both realistic and imaginary settings. The training is based on gamification principles, as the virtual environment is designed as a highly immersive serious game, with essential elements such as quests, rewards or increasing complexity of tasks which can maintain its users motivated and help them acquire useful daytoday life skills. Also, a series of minigames are available in the training environment, as repetitive actions can facilitate the improvement of specific skills. By using appropriate hardware equipment, the virtual training environment can be rendered to the visually impaired users through acoustic and haptic means. The paper presents our proposed training strategy based on virtual reality in the context of numerous challenges of offering efficient training experiences to users with special needs.

14:35 The TRAVEE Neuromotor Rehabilitation System: in-Vivo Testing

Oana-Maria Ferche (University Politehnica of Bucharest, Romania); **Alin Moldoveanu** (Politehnica University of Bucharest, Romania); **Mari-aluliana Dascalu** (University Politehnica of Bucharest, Romania); **Constanta-Nicoleta Bodea** (Bucharest University of Economic Studies, Romania); **Robert Gabriel Lupu** (Gheorghe Asachi Technical University of Iasi, Romania); **Danut Irimia** (Technical University "Gh. Asachi" of Iasi, Romania); **Florica Moldoveanu** (University Politehnica of Bucharest, Romania)

The TRAVEE system is a Virtual Reality (VR) based system that will assist patients disabled as a result of a cerebrovascular accident as well as doctors, physicians and physiotherapists working alongside the patients toward the rehabilitation of their upper limbs. The system has been developed throughout the past two years and it has reached the state of the first in-vivo tests with the patients. The initial testing sessions were directed towards discovering any potential improvements that can be brought to the system regarding ease of use, comfort as well as performance and accuracy. The feedback received from the patients showed the great potential TRAVEE has in the field of rehabilitation as well as the openness of the patients towards a VR rehabilitation solution.

14:55 Smart Home Based Patronage Solution

Dmitry Vavilov (TSsystems RUS, Russia); **Alexey Melezhik** (Gazprom Promgaz, Russia); **Ivan Platonov** (St.Petersburg State Polytechnical University, Russia)

Smart Home deployment remains within the early adopter phase. In spite of relatively moderate penetration of the patronage and healthcare functionality in the already installed devices, this feature is considered as one of the highest potential drivers for Smart Home deployment. We suggest the complex approach for medical assistance based on Smart Home usage. We propose also how to organize the human activities in response for received alarms. Several scenarios are discussed to demonstrate the alarm response procedures. A patronage service is considered as one of the actors in these scenarios.

14:15 - 17:00 Consumer electronics research exhibition, Room: Hall

15:15 - 15:30 Coffee break, Room: Cafeteria

15:30 - 16:50 **S4: Enabling technologies**, Room: B1, **Chair: Constanta-Nicoleta Bodea** (Bucharest University of Economic Studies, Romania)

15:30 Acquisition of current impulses in electrical discharge machining

Branislav Batinic (Faculty of Technical Sciences, Serbia); **Dragan Rodić, Nikola Laković and Marin Gostimirović** (University of Novi Sad, Serbia); **Nenad Kulundžić** (Faculty of Technical Sciences, Serbia)

This paper presents a solution for the acquisition of electrical impulses generated in electrical discharge machining of material. These electrical impulses may be relevant when examining the material properties. Although the device used for electrical discharge machining doesn't have the possibility for this acquisition, choosing the predefined processing condition predicts arithmetic mean of electrical impulses, and that is the reason to expect a certain roughness of the processed material. Upgrading the acquisition system to the existing device enables continuous recording of impulses during processing. The measuring device consists of a sensor that works on the Hall element principle, a microcontroller which collects and sends data and the software on the PC that performs data acquisition. Maximum detection speed of electrical impulses of the measuring device is 1 Msps, in the 10-bit resolution, and the amplitude of the electrical impulse is 30 A. The sensitivity of the electrical sensor is 66 mV/A.

15:50 Modular WSN Node for Environmental Monitoring with Energy Harvesting Support

Zivorad Mihajlovic, Vladimir Milosavljevic and Ana Joza (Faculty of Technical Sciences, Serbia); **Mirjana Damjanovic** (University of Novi Sad, Faculty of Technical Sciences, Serbia)

Environmental protection is one of the most challenging tasks for humanity. All of the latest technologies to certain extent are applied in this area, among others, wireless sensor networks as well. In this paper a wireless sensor node designed specifically for monitoring of environmental parameters is described. The main advantage of this node is the use of energy harvesting techniques and supercapacitor as power supply method. The absence of batteries affects the reduction of maintenance costs and environmental impact. The paper shows that combination of energy harvesting and supercapacitor represents a sustainable solution of constant power supply of wireless sensor network node.

16:10 Online PowerAware

Scheduling Strategy Based on Workload Power Profile Measurement

Ivan Popovic (School of Electrical Engineering, University of Belgrade, Serbia); **Strahinja Jankovic and Lazar Saranovac** (University of Belgrade School of Electrical Engineering, Serbia)

Deeply embedded systems represent large portion of devices connected in Internet of Things. Because of great number of deployed devices, power management of deeply embedded systems is an emerging aspect of their operation. The most actual power management techniques are hardware-centric and do not take runtime workload execution properties into account. We propose a novel power aware scheduling strategy for deeply embedded systems. Task-based power profiling is used to generate task power model utilized for power-aware or energy-aware task scheduling. The proposed concept dynamically changes the scheduling parameters of best-effort tasks to fit optimization goal while maintaining system hard realtime requirements. Concept is application design agnostic and can be easily integrated as a power management service available under realtime operating system support.

16:30 Extending Valgrind framework with the MIPS MSA support

Tamara Vlahovic (RTRK, Institute for Computer Based Systems, Serbia); **Marko Misic** (University of Belgrade, School of Electrical Engineering, Serbia); **Milo Tomasevic** (University of Belgrade, School of Electrical Engineering Serbia, Serbia); **Aleksandra Karadzic and Aleksandar Rikalo** (RTRK, Institute for Computer Based Systems, Serbia)

This paper presents an extension of Valgrind framework for dynamic binary code analysis to support MIPS MSA instruction set which includes instructions for vector (SIMD) processing of integer and floating-point data of different widths. First, a background on MIPS and its MSA extension is given. Then, Valgrind features for code instrumentation are described. Several changes have been made to Valgrind intermediate representation in order to support new instruction set. The implementation issues regarding the structures, formats, and functions needed for extension are discussed. Some low-level details and examples are also presented. Upgraded Valgrind tools are verified using dedicated regression test suite on the Linux platform.

16:50 Low Power Stochastic Sensor in Internet of Things Environment

Platon Sovilj (Faculty of Technical Sciences, University of Novi Sad, Serbia); **Bojan Vujičić** (Faculty of Technical Sciences, University of Novi Sad, Serbia); **Svetlana AvramovZamurovic** (United States Naval Academy, USA); **Jarosław Makal** (Bialystok University of Technology, Poland); **Dragan Pejić and Đorđe Novaković** (Faculty of Technical Sciences, University of Novi Sad, Serbia)

The low power stochastic sensor is proposed, and its suitability for operation in Internet of Things (IoT) environment is emphasized. Unlike typical digital sensors, instead of a digitizing module, this sensor has a digital stochastic measurement module (DSMM). DSMM enables low-power yet fast and accurate functioning of the sensor. Assessment model includes test signal generator, the standard calibrator, DSMM of the sensor.

20:00 - 22:00 Dinner at the Petrovaradin fortress, Room: Outside

Thursday, June 1

09:30 - 10:00 Registration, Room: Hall

10:00 - 11:20 S5: Automotive & Transport, Room: A1, Chairs: **Bogdan Pavkovic** (RTRK, Novi Sad & FTN, Novi Sad, Serbia), **Nebojsa Pjevalica** (University of Novi Sad, Serbia)

10:00 Calculation of Number of Integration Cycles for Systems Synchronized Using the AS6802 Standard

Miladin Sandić (Faculty of Technical Sciences, Bosnia and Herzegovina); **Ivan Velikić** (RTRK, Serbia); **Aleksandar Jakovljević** (RTRK Institute, Serbia)

Correctly maintained synchronization between devices is very important in deterministic networks like TTEthernet where is used AS6802 standard for this purposes. In this paper is depicted how to calculate number of integration cycles per cluster period depending on accuracy of clocks implemented in network devices. Influence of the number of integration cycles to bandwidth utilization is analyzed too.

10:20 One solution for persistent data storage in automotive industry

Dragan Radanovic (University of Novi Sad, FTN & RTRK Institute for Computer Based Systems, Serbia); **Ivan Kastelan** (University of Novi Sad, Faculty of Technical Sciences, Serbia); **Milovan Vidovic and Radovan Prodanovic** (RTRK Institute for Computer Based Systems, Serbia)

Persistent data storage problem in modern automotive vehicles can be trivially viewed, as function of storing favorite radio stations, all the way up to safety critical functions, like black box. In this paper we present one solution for persistent data storage and quick integration in automotive industry. Goal of this paper is to develop adaptive software solution, with ability for quick response to input requirements changes.

10:40 Smart Grid technologies in electric traction: mini inverter station

Mikołaj Bartłomiejczyk (Gdańsk University of Technology & Faculty of Electrical and Control Engineering, Poland)

The growing number of trams and trolleybuses equipped with recuperation systems contributes to the increase in the amount of energy recovered during braking. It involves questions about the possibility of its use. One possibility is the use of smart grid technology. The paper presents a case study of the use of braking energy in the trolleybus system for external loads by implementing mini inverter stations. Analysis is based on the measurement realized in Gdynia (Poland) trolleybus system.

11:00 Modern technologies in energy demand reducing of public transport - practical applications

Mikołaj Bartłomiejczyk (Gdańsk University of Technology & Faculty of Electrical and Control Engineering, Poland)

City of Gdynia (Poland) exploits one of the most modern trolleybus system in Europe, which has been involved in many activities related to the reduction of energy consumption. Some of them are related with improving the energy breaking recovery usage, f.g. in period 2012-2014 there was tested an experimental stationary storage system at Północna substation. In 2014 there was installed the storage energy system in Wielkopolska substation. It is the first such big stationary supercapacitor storage system installed in trolleybus supply system in the Middle - Eastern Europe. Moreover, PKT started applications of Smart Grid technologies in supply network: the bilateral supply system was introduced between to first substation was introduced. The paper presents results of these two novel investments.

10:00 - 11:20 WS1: Little Secrets of Success in Business Environment: Feedback, Room: B1, Chair: **Velibor Milić** (RTRK Computer Based Systems LLC, Serbia)

free of charge application for the session is required

How many of you have graduated, just to realize that your freshly acquired high expert skills are not enough to succeed in competitive business environment? That social skills are greatly important. That communication has its little secrets. The communication secrets in which we can get better if we recognize, understand, and practice them.

During the workshop, you will understand the importance of feedback in communication and our personal and professional development. In addition, you will find the answers to questions such as:

How to have constructive communication in business environment? What are the obstacles that create misunderstandings and how to avoid them? How to tell when you do not agree with your colleague without making him angry? How to accept feedback and get the most out of it?

11:20 - 11:40 Coffee break, Room: Cafeteria

11:40 - 13:00 K3: Keynote session 3, Room: A1, Chair: **Milan Vidaković** (University of Novi Sad Faculty of Technical Sciences, Serbia)

11:40 Biomedical Engineering in Cognitive Neuroscience

Platon Sovilj (Faculty of Technical Sciences, University of Novi Sad, Serbia)

Cognitive neuroscience is the scientific area oriented to the study of the biological processes and phenomena that underlie cognition, with a specific focus on the neural system in the brain which is included in mental processes. It addresses the questions of how cognitive activities are affected or controlled by neural system in the brain. Cognitive neuroscience is a branch of both neuroscience and psychology, overlapping with disciplines such as physiological psychology, cognitive psychology, and neuropsychology. Cognitive neuroscience is based on theories in cognitive science coupled with evidence from neuropsychology, and computational modelling. Because of its multidisciplinary nature, cognitive neuroscientists may have backgrounds in neurobiology, neurophysiology, neurochemistry, bioengineering, neurology, physics, computer science, linguistics, philosophy, and mathematics. Biomedical methods employed in cognitive neuroscience include experimental procedures from psychophysics and cognitive psychology, functional neuroimaging, electrophysiology, cognitive genomics, and behavioural genetics.

12:20 Strengthening capacities for financing innovations and research

Goran Stojanovic (University of Novi Sad, Serbia)

Goran will speak about funding opportunities for innovative small and medium companies from different financial sources: from EU and national level to crowdfunding platform. These funds will help you develop your concepts and ideas through demonstration activities, prototyping, testing, pilot projects and networking leading to commercialisation of your products/services. It is created to stimulate all forms of innovation in SMEs, targeting those with the potential to internationalise and to grow into world-leading companies.

11:40 - 13:00 **WS2: Workshop: Project Initiative Diagnostics**, Room: B1, **Chair: Milenko Berić** (RTRK Institute, Serbia)

13:00 - 14:00 **Lunch**, Room: Cafeteria

14:00 - 15:20 **S6: User Experience & HMI**, Room: A1, **Chairs: Ratko Grbić** (University of Osijek, Faculty of Electrical Engineering, Croatia), **Milena Vujošević Janičić** (University of Belgrade, Faculty of Mathematics, Serbia)

14:00 Electro vibration: Influence of the Applied Force on Tactile Perception Thresholds

Harald Zophoniasson, Christian Bolzmacher, Margarita Anastassova and Moustapha Hafez (CEA LIST, France)

We present a study on the influence of the applied force on tactile perception thresholds, during exploration of tactile textures generated with electrovibration. From a first user study, three force levels corresponding to the light (0.2 N-1.5 N), medium (1.5 N-3.0N), and high force (3.0N-7.0N) categories were deduced. In a second study, the users were asked to apply these force levels while following a line on the screen. We determined the perception thresholds of 10 participants for specific electrovibration stimuli (100 Hz, 160 Hz, 240 Hz, 360 Hz, and 540 Hz sinusoidal signals) using a staircase method. No force effect on the perception threshold has been measured for 100 Hz and 160 Hz, while it decreased with increasing applied force at 240 Hz, 360 Hz, and 540 Hz.

14:20 Realization of Graphical User Interface for TV Application Electronic Program Guide

Mijo Vračević (RTRK, Croatia); **Mario Vranješ** (J. J. Strossmayer University of Osijek & Faculty of Electrical Engineering, Croatia); **Marko Kovacevic** (Faculty of Technical Sciences, Serbia); **Nikola Teslic** (University of Novi Sad, Serbia)

Electronic program guide (EPG) is an application that provides information about current and upcoming events on all available channels to the digital television (DTV) users. This article presents design and implementation of one EPG application based on metadata from DTV transport stream (TS). The application is interactive and displays the data in Graphical User Interface (GUI). GUI is implemented using Qt framework while data obtaining and processing are realized in C/C++ programming languages. Target platform is Linux based system.

14:40 Environment for Automatic Testing and Dynamic Analysis of Electronic Program Guide TV Application

Matko Turalija (RTRK Institute for Computer Based Systems Osijek, Croatia); **Ratko Grbić** (University of Osijek, Faculty of Electrical Engineering, Croatia); **Marko Kovacevic** (Faculty of Technical Sciences, Serbia); **Ilija Bašičević** (RTRK Institute for Computer Based Systems Novi Sad, Serbia)

Testing in the industry is a very critical component of every project. It is necessary to confirm and provide a guarantee that the requirements for the system are fulfilled. Testing embedded systems is a challenging and exhaustive process. In order to achieve a better quality of the system and to reduce final costs, it is important to start testing as soon as possible. In this paper, an environment for automatic testing and dynamic analysis of electronic program guide TV application is presented. The previously mentioned environment consists of dynamic analysis (memory consumption, heap and stack profiling etc.) and unit testing part. The main feature of the presented environment is automation of the testing process, which allows fast application testing in every phase of development.

15:00 Combining Photogrammetry, 3D Modeling and Real Time Information Gathering for Highly Immersive VR Experience

Časlav Livada (Faculty of Electrical Engineering, Computer Science and Information Technology Osijek, Croatia); **Denis Vajak** (Faculty of Electrical Engineering, Computer Science and Information Technology, Croatia)

The fast popularization of virtual reality equipment has brought unrivalled convenience and entertainment experience in human life. Cardboard, Oculus Rift, HTC Vive and PSVR are gradually being accepted and recognized. The realization of VR for information purposes and remote exploration of new areas will become the key point of the application of VR technology in the field of education. This paper demonstrates the realization of VR for information purposes and remote exploration of new areas using HTC Vive. By using HTTP requests, official announcements from the faculty can also be fetched and presented to the user. We propose a system to match a given pair of virtual and physical world for immersive VR navigation. We first take images of the physical world in order to model it via the photogrammetry method. The second task is to 3D model the environment in Blender with all the props in it. After that, custom textured model is introduced to Unity game engine where all the scripting is done.

14:00 - 15:20 **Lighting talks of the Young inventors**, Room: B, **Chair: Milena Milošević** (RTRK Computer Based Systems LLC, Serbia)

14:00 - 15:20 **WS3: Workshop: Make a silent alarm system**, Room: Cafeteria, *free of charge application for the session is required*

Do you think someone is tampering with your property? Are you afraid that your car can be stolen? Makers will help you protect. In this workshop, we will show you how to make a silent alarm that can notify you in a case of an incident. We will help you with the basics of microcontroller programming, sensors and GSM modules. At the end of the workshop you will get a working demo. Makers will guide you through this process and no prior experience is necessary. All you need is a good will and a mobile phone that can receive SMS messages. Vladimir Dmitrović and Veselin Gligorin

15:20 - 15:30 **Coffee break**, Room: Cafeteria

15:30 - 16:00 **Best Paper Award, Closing**, Room: A1, **Chair: Milan Z. Bjelica** (University of Novi Sad, Serbia)

Closing words

Miroslav Popović (University of Novi Sad, Serbia), **Gordana Velikić** (RTRK Computer Based Systems LLC, Serbia)

Dear Friends,

Here we are again! The spirit of big conferences continues to grow. Last year we were the “new kid on the block”. This year we see many familiar faces and new friends.

Thank you for keeping the spirit going on. We hope that you will enjoy what we prepared together.

Best regards from Yours truly,

The ZINC Team

Committees

Gordana Velikić, General Chair, RT-RK Institute, Novi Sad, Serbia
Milan Z Bjelica, TPC Chair, University of Novi Sad, Novi Sad, Serbia

Organizing committee core group

Gordana Velikić, General Chair, RT-RK Institute, Novi Sad, Serbia
Branislav Todorović, General Co-Chair, RT-RK Institute, Novi Sad, Serbia
Stefan Mozar, General Co-Chair, RT-RK Institute, Novi Sad, Serbia
Jelena Gajić, Technical Coordinator, RT-RK Institute, Novi Sad, Serbia
Djordje Sarić, RT-RK Institute, Novi Sad, Serbia
Goran Miljković, RT-RK Institute, Novi Sad, Serbia
Vukota Peković, RT-RK Institute, Novi Sad, Serbia
Petar Jovanović, RT-RK Institute, Novi Sad, Serbia
Tomislav Maruna, RT-RK Institute, Novi Sad, Serbia
Nikola Teslić, RT-RK Institute, Novi Sad, Serbia
Nenad Jovanović, RT-RK Institute, Novi Sad, Serbia
Milena Milošević, RT-RK Institute, Novi Sad, Serbia

Organizing Committee Advisors

Dragan Satarić, Ministry of Science, Serbia
Aleksa Zejak, RT-RK Institute, Novi Sad, Serbia
Branislav Todorović, RT-RK Institute, Novi Sad, Serbia
Stefan Mozar, CCM Consulting, Australia
Tom Wilson, Platomics GmbH, Austria
Snježana Rimac-Drlje, CRO

Publicity Committee

Konstantin Glasman, Publicity Chair, St.Petersburg State University of Film and Television, RU
Vera Teslić, Publicity Chair, RT-RK Institute, Novi Sad, Serbia
Marko Bodiroža, RT-RK Institute, Novi Sad, Serbia
Miloš Mandić, RT-RK Institute, Novi Sad, Serbia
Bojan Košić, RT-RK Institute, Novi Sad, Serbia
Dejan Popov Tapavički, RT-RK Institute, Novi Sad, Serbia
Sebastian Novak, RT-RK Institute, Novi Sad, Serbia
Nevena Jovanov, RT-RK Institute, Novi Sad, Serbia
Nikola Đurić, FTN, University of Novi Sad
Vojkan Stefanović, Official Conference Photographer

Administration

Milenko Berić, finance chair, RT-RK Institute, Novi Sad, Serbia
Stevan Djurović, RT-RK Institute, Novi Sad, Serbia

Technical Program Committee

Milan Bjelica, TPC Chair, University of Novi Sad - Faculty of Technical Sciences, Serbia
Mario Vranješ, TPC Co-Chair
Florina Almenares, Universidad Carlos III de Madrid, Spain
Francisco Bellido Outeiriño, University of Córdoba, Spain
Thomas Coughlin, Coughlin Associates, USA
Soumya Kanti Datta, EURECOM, France
Goran Dimić, University of Belgrade, Serbia
Ivan Kaštelan, Publication Chair, University of Novi Sad, Faculty of Technical Sciences, Serbia

Björn Krüger, Bonn University, Germany
Chao-Hsien Lee, National Taipei University of Technology, Taiwan
Petar Marić, University of Novi Sad, Serbia
Bogdan Pavković, RT-RK Institute, Serbia
Vukota Peković, RT-RK Institute, Serbia
Thinakaran Perumal, University Putra Malaysia, Malaysia
Vesna Petrović, The Higher Education Technical School of Professional Studies, Serbia
Nebojša Pjevalica, Faculty of Technical Sciences, University of Novi Sad, Serbia
Marija Punt, University of Belgrade, School of Electrical Engineering, Serbia
Eduardo Quevedo, Oceanic Platform of the Canary Islands, Spain
Kousik Sankar, CISCO Video Technologies, India
Helena Sarmiento, Inesc-ID/IST/TU Lisbon, Portugal
Euiseong Seo, Sungkyunkwan University, Korea
Pierluigi Siano, University of Salerno, Italy
Su-Lim Tan, Singapore Institute of Technology, Singapore
Andrea Tonello, University of Klagenfurt, Austria
Dmitry Vavilov, T-Systems RUS, Russia
Milan Vidaković, University of Novi Sad - Faculty of Technical Sciences, Serbia
Milena Vujošević-Janičić, University of Belgrade, Serbia

Technical management committee

Đorđe Sarić, RT-RK Institute, Novi Sad, Serbia
Zoran Vukobrat, RT-RK Institute, Novi Sad, Serbia
Žarko Kulić, RT-RK Institute, Novi Sad, Serbia
Ivan Nemet, RT-RK Institute, Novi Sad, Serbia
Vladimir Njegomir, RT-RK Institute, Novi Sad, Serbia
Miroslav Knežević, RT-RK Institute, Novi Sad, Serbia
Marjan Bogdanov, RT-RK Institute, Novi Sad, Serbia
Jovan Čegar, RT-RK Institute, Novi Sad, Serbia

IEEE Officers

Vera Marković
IEEE Serbia and Montenegro Section Chair
Sharon Peng
IEEE CE Society Chair

Young Lions Committee

Nenad Jovanović, Novi Sad, Serbia
Milena Milošević, Novi Sad, Serbia
Nevena Jovanov, Novi Sad, Serbia
Dejan Nađ, Novi Sad, Serbia
Sebastian Novak, Novi Sad, Serbia
Nikola Stanković, Novi Sad, Serbia
Nina Fat, Novi Sad, Serbia
Veselin Gojak, Novi Sad, Serbia
Joakim Janjatović, Novi Sad, Serbia
Duško Gajić, Novi Sad, Serbia
Vida Ružičić, Novi Sad, Serbia
Igor Stefanović, Novi Sad, Serbia
Milica Matić, Novi Sad, Serbia
Tatjana Erić, Novi Sad, Serbia