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interaction frameworks. Cloud computing environments will be instrumental in allowing for worldwide availability of knowledge about the preferences and needs of individuals as well as services for ambient intelligence to build applications easily. This talk will analyze the opportunities offered by these technologies to support the realization of adaptable operations and intelligent services for smart living in ambient intelligent infrastructures.

Monday, September 3 12:00 - 13:00

Smart Cities

Room: Berlin 1

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

12:00 ***Audio-based early warning system of vehicle approaching event for improving pedestrian's safety***

Chih-Jung Lee, Yu-Hao Tseng and Pao-Chi Chang (National Central University, Taiwan)

This paper presents an audio-based early warning system of vehicle approaching event for improving pedestrian's safety. Sound signals were collected by an external directional microphone connected to a smart phone. Multiple feature techniques, such as root mean square, zero crossings, spectral centroid, and spectral rolloff, were applied to short-time frames of audio samples. Multiple machine learning classifiers, such as K nearest neighbor, multi-layer perceptron, decision tree, and random forest, were applied to classify the audio frames to effectively detect vehicle approaching sound. The experimental results showed that the accuracy of the system is as high as 97% for two class (NoVehicle and Vehicle) classification .

12:15 ***Temperature Variation Tolerance High Resolution Real-time Liquid Level Monitoring System***

Chih-Hsing Lin and Sheng-Wei Wang (NARLabs, National Chip Implementation Center, Taiwan); Chen-Chia Chen (National Applied Research Laboratories & National Chip Implementation Center, Taiwan); Chien-Ming Wu and Chun-Ming Huang (National Chip Implementation Center, Taiwan)

The main issues of flooding in the urban are usually caused by the overflow of gully blockages and sewers. In this paper, we proposed a real-time liquid level monitoring system. This system can predict potential blockage incidents and provide adequate early alert, which makes the staffs clean the blockage and leakage within the sewer infrastructure in time. Hence, the number of urban sewer flooding incident can be reduced. The proposed monitoring system consists of frequency generator, data acquisition (DAQ), loudspeaker, microphone sensor, and temperature sensor. The resolution of the proposed monitoring system can achieve 0.667mm and then possess the functionality of temperate tolerance that is better than commercial ultrasonic sensor HC-SR04 with resolution 3mm. Users can arbitrarily choose and adjust the liquid level resolution based on their measured environment. Experiment results show that our proposed system can be used in real world environment.

12:30 ***A Smart Home Services Demonstration: Monitoring, Control and Security Services Offered to the User***

Martina Botticelli (Università Politecnica delle Marche, Italy); Lucio Ciabattoni (Universita' Politecnica delle Marche, Italy); Francesco Ferracuti and Andrea Monteriù (Università Politecnica delle Marche, Italy); Stefano Pizzuti and Sabrina Romano (ENEA, Italy)

The Italian Ministry of Economic Development and the Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA) have entered into a Program Agreement for the execution of the research and development lines of General Interest for the national elec- tricity system. In particular, as part of the "Development of an integrated model of the Urban Smart District" project, an experimental demonstration of a Smart Home network has been carried out in the Centocelle district of Rome, called "Centocelle Smart Home". This project aims to develop a replicable model of Smart Home able to monitor energy consumption, the degree of comfort and safety in residential buildings, transmitting them to a higher level technological platform where data are analyzed and aggregated to provide a series of feedbacks to the user and to the community. The objective is to reduce the final consumption of energy (electric and thermal) of domestic consumers through a path of growth of energy awareness, also providing additional services on security. This paper presents the architecture proposed in the ENEA project for monitoring the energy consumption and increasing the degrees of comfort and safety of domestic users. The proposed security service is presented here together with the developed "Out of Home" App.

12:45 ***PHYSIM - A Physical Layer Simulation Software***

Florian Jackisch (Technische Universität Braunschweig, Germany)

Modern communication systems use different physical layer (PHY) techniques with diverse performance characteristics. Each PHY configuration option introduces trade-offs for spectral efficiency, robustness, out-of-band emissions, peak-to-average power ratio, and implementation complexity. This paper introduces the cross-platform PHYSIM software framework. PHYSIM can compare established modulations like orthogonal frequency-division multiplexing (OFDM) with modern alternatives, e.g., filter bank multi-carrier, universal filtered multi-carrier, and filtered-OFDM. Additionally, PHYSIM can draw performance comparisons between new coding schemes like polar codes and more established methods like low-density parity-check codes and turbo codes. The PHYSIM graphical user interface (GUI) assists in the design of physical layer parameters. The GUI offers plots to compare the performance of PHY configurations in transmission channels. The plots display the transmitted spectra, the received constellation diagrams, as well as the modulation, bit, and frame error ratios. Hence, the PHYSIM simulation framework assists the designer of a physical layer system and helps to find PHY settings for a target application.

DL Applications in CE 1

Room: Berlin 2

Chair: Soumya Kanti Datta (EURECOM, France)

12:00 ***Studying the Effects of Feature Extraction Settings on the Accuracy and Memory Requirements of Neural Networks for Keyword Spotting***

Danilo Pietro Pau (STMicroelectronics, Italy); Muhammad Shahnawaz (Politecnico di Milano, Italy); Emanuele Plebani and Ivana Guarneri (STMicroelectronics, Italy); Marco Marcon (Politecnico di Milano, Italy)

Due to the always-on nature of keyword spotting (KWS) systems, low power consumption micro-controller units (MCU) are the best choices as deployment devices. However, small computation power and memory budget of MCUs can harm the accuracy requirements. Although, many studies have been conducted to design small memory footprint neural networks to address this problem, the effects of different feature extraction settings are rarely studied. This work addresses this important question by first, comparing six of the most popular and state of the art neural network architectures for KWS on the Google Speech-Commands dataset. Then, keeping the network architectures unchanged it performs comprehensive investigations on the effects of different frequency transformation settings, such as number of used mel-frequency cepstrum coefficients (MFCCs) and length of the stride window, on the accuracy and memory footprint (RAM/ROM) of the models. The results show different preprocessing settings can change the accuracy and RAM/ROM requirements significantly of the models. Furthermore, it is shown that DS-CNN outperforms the other architectures in terms of accuracy with a value of 93.47% with least amount of ROM requirements, while the GRU outperforms all other networks with an accuracy of 91.02% with smallest RAM requirements.

12:15 ***IVLFood-WS: Recognizing food in the wild using Deep Learning***

Gianluigi Ciocca (University of Milano-Bicocca, Italy); Paolo Napoletano (University of Milan, Bicocca, Italy); Raimondo Schettini (University of Milano Bicocca, Italy)

Health care on food and good practices in dietary behavior are drawing people's attention recently. In this paper we present a system for food recognition in the wild, implemented as a set of web services (IVLFood-WS). It integrates different solutions based on Deep Learning and Convolutional Neural Networks that we have developed in recent years within past and ongoing projects. The system tackles different aspects of image food analysis such as food localization, classification and retrieval. Results show that a complete system that integrates our solutions can be effectively exploited for supporting user in keeping track of their daily food consumption in uncontrolled environment (i.e. in the wild).

12:30 ***Estimation of User-Indoor Spatial Information Using Deep Neural Networks***

Minho Lee and Jungrae Cho (Kyungpook National University, Korea)

Recent research on application of human body detection technology is actively under way for smart home appliances. This paper presents a method to estimate the indoor partial space with deep neural networks for air conditioner to blow air selectively into the main living area of residents. The information regarding the distance from the camera in an air conditioner is added to the 2-dimension human body detection histogram obtained from the camera to make a 3-dimensional saliency map that is preprocessed through filtering and interpolation. Deep neural network learns the human body detection saliency map to estimate the living or non-living area of the residents. Finally, temporal space estimation for human living area is performed by accumulating sequential predictions of DNN.

12:45 ***A deep learning-based system to track and analyze customer behavior in retail store***

Andrea Generosi and Silvia Ceccacci (Università Politecnica delle Marche); Maura Mengoni (Università Politecnica delle Marche, Italy)

The present work introduces an emotional tracking system to monitor Shopping Experience at different touchpoints in a retail store, based on the elaboration of the information extracted from biometric data and facial expressions. A preliminary test has been carried out to determine the system effectiveness in real context regarding to emotion detection and customers' sex, age and ethnicity discrimination. To this end, information provided by the system have been compare with the results of a traditional video analysis. Results suggest that the proposed system can be effectively used to support the analysis of customer experience in a retail context.

Monday, September 3 13:10 - 14:10

Lunch

Room: Break Area

Monday, September 3 13:15 - 14:00

Keynote 2: Bernd Grohmann

Smart Living, simply exciting?

Bernd Grohmann

Room: Berlin 2

Chair: Christian Groß (VDE, Germany)

The smart living market is booming - once again the IFA shows in Berlin numerous new products from the fields of smart home, entertainment and consumer electronics. And the other forecasts sound promising: According to a VDE study, more than one billion euros of value will be spent in the Smart Living segment over the next four years. The new economic initiative Smart Living wants to open this future market for German companies. Smart Home means implementation

of digitization and networking in private homes and involves very different aspects: on the one hand, Smart Home is the automation of classic building functions such as light, shading and heating. On the other hand, Smart Home stands for the networking of home appliances from the areas of multimedia, household and comfort with both the smartphone and each other. Current developments indicate that the boundary between the two definitions is becoming increasingly blurred - the formerly separate industries are increasingly discovering and developing interfaces with each other. The smart home is evolving into a consumer-driven marketplace that focuses on comfort and lifestyle. Smart Building describes the automation and central operation of the technical equipment of functional buildings such as office buildings, airports, shopping centers or production halls. Core issues are the security of the building - e.g. by fire alarm technology or dynamic escape route planning - as well as the energetic optimization of the building operation, which saves a large amount of operating costs. The electrical industry supplies numerous innovative products and solutions for smart buildings that are already tried and tested in new buildings. Energy efficiency in particular has already achieved great successes: it has been shown that automation can reduce the energy requirements of an office building by up to 30%.

Monday, September 3 14:15 - 15:15

Automotive 1

Room: Berlin 1

Chair: Nikolaos Athanasios Anagnostopoulos (TU Darmstadt, Germany)

14:15 ***A Multiple Cyclic-Route Generation Method for Strolling Based on Point-of-Interests***

Tensei Nishimura (Waseda University, Japan); Kazuaki Ishikawa and Toshinori Takayama (Zenrin DataCom Co., LTD., Japan); Masao Yanagisawa and Nozomu Togawa (Waseda University, Japan)

With the spread of map applications, route generation has become a familiar function. Most of route generation methods search a rapidly movable route to a destination, but more enjoyable route generation is recently focused on. Particularly, cyclic-route generation for strolling requires to suggest to a user more than one routes passing through several POIs (Point-of-Interests), to satisfy the user's preferences as much as possible. In this paper, we propose a multiple cyclic-route generation method for strolling based on POIs. Firstly, our proposed method finds out a set of reference points based on the route length constraint. Secondly, we search a non-cyclic route from one reference point to the next one and finally generate a cyclic route by connecting these non-cyclic routes.

14:30 ***Hypervisor based approach for integrated cockpit solutions***

Shravan Karthik, Karthik Ramanan and Nikhil Devshatwar (Texas Instruments, India); Vishal Mahaveer (Texas Instruments, USA); Subhajit Paul (Texas Instruments, India); Manoj Vishwanathan and Sheng Zhao (Texas Instruments, USA); Chetan Matad (PathPartner Technology, India)

Rapid advances in SoC architectures have resulted in a shift in the automotive industry to integrate in-vehicle entertainment (Infotainment) and selected ADAS functionality onto a single system, reducing system cost and payload. Standalone electronic control units (ECU) for surround-view (SRV), rear-view camera (RVC), heads-up display (HUD) and digitally instrument cluster are being substituted by integrated cockpit systems. Integrating the standalone ECUs into a single system represents a dichotomy of safety versus generality. Advanced driver assistance systems (ADAS) are expected to be fault-tolerant and are traditionally managed by a safety-certified RTOS. Infotainment applications have fewer constraints on safety but stress on interoperability. Thus, Infotainment applications are driven by open-source libraries and are managed by a high-level operating systems (HLOS). To achieve an integrated cockpit system while adhering to each systems constraints, a hypervisor based solution is proposed. The hypervisor facilitates running multiple operating systems simultaneously, partitioning of system resources and providing virtualization of shared peripherals. The result of the proposed architecture is an integrated cockpit system with ADAS and Infotainment components isolated from each other, and the ability to run multiple HLOS sharing the peripherals.

14:45 ***Combining heart and breathing rate for car driver stress recognition***

Paolo Napoletano (University of Milan, Bicocca, Italy); Stefano Rossi (STMicroelectronics, Italy)

This paper investigates the use of heart rate (HR) and breathing rate (BR) signals for the automatic recognition of car driver stress. The problem is defined as a binary classification problem, that is stress vs no-stress, and it is tackled by using the Support Vector Machines classification strategy. We propose the use of a combination of traditional state of the art features and raw values of the acquired signals as data representation. Experimentation is carried out on a subset of data belonging to a publicly available dataset of simulated driving. The HR and BR signals are acquired with an adrenergic sensor connected to a chest strap that is worn underneath the driver's clothing. The experiments are made considering the leave-one-subject-out configuration, that is the subject under test is not included in the training set. The goodness of HR and BR is tested separately and then a combination of them. The results obtained are very encouraging, especially considering also that the leave-one-subject-out configuration was adopted. The results reach a mean average accuracy of about 70% in the case where the combination of HR and BR is adopted.

15:00 ***A CNN Architecture for Efficient Semantic Segmentation of Street Scenes***

Davide Mazzini and Marco Buzzelli (University of Milano-Bicocca, Italy); Danilo Pietro Pau (STMicroelectronics, Italy); Raimondo Schettini (University of Milano Bicocca, Italy)

We propose a novel modular CNN architecture that provides semantic segmentation and understanding of outdoor street environment images. Our solution processes a 512x1024 resolution image on a single Titan Xp GPU at 37.4 FPS attaining 70.4% IoU on the Cityscapes test dataset.

Image and Video 1

Room: Berlin 2

Chair: Antonio Navarro (University of Aveiro, Portugal)

14:15 ***Client-side solution for QoS measurement of video content delivery over IP networks***

Milan Ivošević (RT-RK Institute For Information Technologies Osijek, Croatia); Mario Vranjes (University of Osijek, Faculty of Electrical Engineering, Computer Science and Information Technology, Croatia); Vukota Pekovic (Veriest Venture Serbia DOO, Serbia); Zvonimir Kaprocki (RT-RK Institute for Computer Based Systems, Serbia)

The number of IP Digital TeleVision (DTV) services has been growing rapidly in last decade. In order to provide the high quality video content to the end users, it is necessary to measure and monitor the Quality of Service (QoS) for mentioned services. In this paper the problem of QoS measurement in IP DTV services, from the client standpoint, is explored. As a solution, a computer application for measurement of QoS parameters through analysis of data provided by network protocols, is proposed. Communication protocols, which are a part of the IP DTV services standard, are presented. Metrics provided by the measurement application and methods of their extraction through protocol analysis are defined. Multiple existing software solutions for network QoS measurement are evaluated. The most suitable solution is integrated into the measurement application. Measurement accuracy is tested by comparing the measurement results with results provided by the reference analysis software (Wireshark). Results obtained by the implemented application are competitive to these obtained by the reference analysis software.

14:30 ***A Spectrally Adaptive Noise Filling Tool for Perceptual Transform Coding of Still Images***

Christian R. Helmrich (Fraunhofer HHI, Germany); Sebastian Bosse (Fraunhofer Heinrich Hertz Institute, Germany); Paul Keydel and Heiko Schwarz (Fraunhofer HHI, Germany); Detlev Marpe (Fraunhofer Institute for Telecommunications - Heinrich Hertz Institute, Germany); Thomas Wiegand (Fraunhofer HHI, Germany)

Modern perceptual image coders reach impressively high subjective quality even at low bit-rates but tend to denoise or "detexturize" the coded pictures. Traditionally, two independent parametric approaches, known as texture and film grain synthesis, have been applied in the spatial domain as pre and post-processors around the codec to counteract such effects. In this work, a unified alternative, operating directly within the spectral domain of conventional transform codecs with tight coupling to the transform coefficient quantizer, is proposed. Due to its design, this spectrally adaptive noise filling tool (SANFT) enables highly input adaptive realizations by reusing the coder's existing optimized spatial and spectral partitioning algorithms. Formal subjective evaluation in the context of a "main still picture" High Efficiency Video Coding (HEVC) implementation confirms the benefit of the proposal.

14:45 ***QP Adaptation Algorithm for Low Complexity HEVC based on a CNN-Generated Header Bits Map***

Takafumi Katayama (University of Tokushima, Japan); Tian Song (University of Tokushima & Synthesis, Japan); Takashi Shimamoto (University of Tokushima, Japan)

Modern video use high resolution and frame rate to achieve high perceptual visual quality. This demand induces significant computation complexity increasing. This work proposed a QP adaptation algorithm for low complexity high efficiency video coding (HEVC) based on a convolutional neural network (CNN) generated header bits map. The proposed algorithm based on a new framework that is consisted of a traditional video encoder and an embedded object detection module with a CNN function. This framework with low complexity and low power consumption has widely demands in the future. Firstly, the header bits map is generated using a state-of-the-art object detection algorithm, namely YOLO. Using the generated header bits map, significant complexity reduction can be achieved by reducing redundant motion estimation for inter prediction of random access mode. Furthermore, an efficient QP adaptation algorithm is proposed based on the map. The simulation results show that the proposed algorithm can achieve 26.8% encoding time saving comparing to the original HEVC algorithm with tiny bit increasing.

15:00 ***Real-Time Low-Complexity Digital Video Stabilization in the Compressed Domain***

Vasileios Avramelos (Ghent University - imec, IDLab, Belgium); Glenn Van Wallendael (Ghent University - imec, Belgium); Peter Lambert (Ghent University - imec & IDLab, Belgium)

Undesired vibration in videos is more and more common due to the rise of hand-held or vehicle mounted cameras. Non-indented motion of a video capturing device causes an unpleasant vibrating effect for the consumer. Therefore, video stabilization has been an extremely active field of research in the past years. Motion estimation is the most computationally expensive step of the video stabilization process. Our goal is to circumvent this expensive step in order to achieve real-time performance. We do so by using the precomputed motion vectors from the encoded video streams and thus operate in the compressed domain. These vectors already contain an approximation of the needed motion information. A low-level motion model is used for mitigating complexity, and a low-pass filter performs motion smoothing before the final motion compensation step which is used for correcting the video. In many real-time applications where the video vibration is moderate, the proposed framework can reach online video stabilization at 30 frames per second for high definition video and 60 frames per second for lower resolutions, while retaining satisfactory performance in video correction, comparable to pixel-based equivalent algorithms.

Monday, September 3 15:20 - 16:05

Keynote 3: Nahum Gershon, Gordana Velikic

50 Shades of Things, Humans & All in Between

Nahum Gershon, Gordana Velikic

Room: Berlin 1

Chair: Thomas Coughlin (Coughlin Associates, USA)

The tale of the boy and wolf in the light of technology shows that old problems are now disguised in use of "things". Technology has a purpose, given by the humans. However, very often, the another level of use requires creativity and/or knowledge. Bonseyes.com platform can help with the knowledge. A bit of common sense, and a bit of wits can help with the purpose of the technology making them a "thing" instead of "nothing".

Monday, September 3 16:10 - 16:55

Poster Session 1 / Coffee Break

Rooms: Berlin 1, Break Area

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

Extraction of Time Delay in Stress Fluctuation during Excavation Work for KANSEI Feedback Control System in Hydraulic Excavators

Risa Nara (KEIO University, Japan); Yasue Mitsukura (Keio University, Japan); Nozomu Hamada (Malaysia Japan International Institute of Technology, Malaysia)

In this paper, we aimed to extract time delay in stress fluctuation during excavation work to realize a control system of hydraulic excavators (KANSEI feedback control system). In recent years, there is a growing demand to remove stress caused by harsh working environments, because they may cause life-threatening diseases including depression. We focused on construction sites as examples of harsh working environments. Attempts have been made to reduce noise and vibration of hydraulic excavators to improve the environment surrounding workers. These attempts do not consider operability however, which is also a considerable cause of stress. We attempted to improve the operability of hydraulic excavators by realizing automatic control system using stress values (KANSEI feedback control system). In order to realize this system, there are two phases: finding correlation between control output and stress (Phase 1), and finding correlation between control input and stress (Phase 2). In this research, we aimed to achieve Phase 1, and extracted the time delay in stress fluctuation of operators with different skill levels using different types of hydraulic excavators. As a result, it was confirmed that the time delay tended to increase with working time.

Visualizing Functional Verification in Adaptive AUTOSAR

Jelena Jovicic (Faculty of Tehnical Sciences & RT-RK, Serbia); Mila Kotur (Faculty of Technical Sciences, Serbia); Milan Z. Bjelica and Istvan Papp (University of Novi Sad, Serbia)

The automotive industry is developing more and more these days. New features and functions like autonomous driving, digital cockpit, communication between vehicle and cloud, software updates over the air and many other requiring an increasing amount of software. Such a complex software environment is difficult to verify. There are many solutions in this regard in the industry, however, the problem of software testing and verification is still huge. It can also be challenging to demonstrate feature set and assist functional verification procedures, which are very relevant in agile development practices which require sprint-based demonstrations. In this paper, we present an approach to functionally verify software through visualization, in the scope of Adaptive AUTOSAR stack.

Driver Monitoring implementation in Adaptive AUTOSAR environment

Milan Djokic (Faculty of Technical Science & RTRK, Serbia); Stefan Nicetin (Faculty of Technical Sciences & RTRK, Serbia); Gordana Velikić (RTRK Computer Based Systems LLC, Serbia); Tihomir Andjelic (RT-RK Computer Based Systems LLC, Serbia)

Advanced Driver Assistance System (ADAS) algorithms are of significant importance in the modern automotive industry. The algorithms have changed the approach to two important issues of the industry: traffic efficiency, and safety. ADAS algorithms have very demanding requirements, such as real time execution and low memory consumption. Thus, one of the main challenges is to satisfy these requirements without compromising the reliability. Although all components that add to the safety are important, one that is most commonly addressed is drowsiness detection, because the drowsiness is at the top causes of traffic accidents. Automotive grade standards have changed periodically to include and tailor recent techniques and models. In this paper, we present driver drowsiness detection solution which is implemented on the Adaptive AUTOSAR platform.

Adaptive AUTOSAR for vision based algorithms

Vladimir Lazic (Faculty of Technical Science & RT-RK, Serbia); Milan Djokic (Faculty of Technical Science & RTRK, Serbia); Gordana Velikić (RTRK Computer Based Systems LLC, Serbia); Branimir Kovacevic (RT-RK Computer Based Systems LLC, Serbia)

Significance of algorithms as part of Advanced Driving Assistance Systems is one that has been the growing focus of the automotive industry. We in the automotive industry strive to improve the consumers driving experience and safety. Often times when developing any algorithm on an embedded platform it will either run slow, not long enough and will have trouble receiving inputs and displaying the processing result. Nowadays the automotive industry looks for more software oriented solutions (e.g. software stacks, in car computing platforms) and a common situations is that multiple algorithms will run under the same System on Chip. So the need for more computation power is greater than ever. Each new platform that can support the computational costs, or to enable better optimization, flexibility, and scalability, such adaptive AUTOSAR requires platform specific redesign of existing methods. In this paper we present developing vision based algorithms on an Adaptive AUTOSAR platform.

A Design Method of Consumer Electronics Products Based on Supervisory Control and Model Checking

Shingo Yamaguchi (Yamaguchi University, Japan)

Consumer electronics products are being exposed to the rapid changing of the market. To survive competition, they must be improved to adapt to the

change. In this paper, we proposed a method to design consumer electronics products based on supervisory control and model checking. Supervisory control enables us to restrict the behavior of a product to fulfill given specifications. Model checking enables us to exhaustively and automatically check whether the controlled product preserves a requirement like logical correctness. The advantage of this method is to achieve a balance between the restriction and the requirement. We also illustrated the proposed method with a design example of multi-threading process within a consumer electronics product.

Road traffic flow estimation via public IP cameras

Ricardo Sciberas and Frankie Inguanez (MCAST, Malta)

In this research we propose a low cost and scalable system where traffic congestion can be monitored from IP camera without the need of on-site setup. During this research Google Traffic was launched, yet we found that this is not very accurate, at least in our area. We have created a prototype that uses IP camera feeds available for free on a site as a proof of concept. Using background reduction and Haar we were able to identify vehicle motion and estimate their velocity, with which traffic flow could be estimated. In the next phase of this research we shall focus on improving estimation with use of classifiers, developing a system where this concept can be offered as a service via an API, and to gather feedback.

Design and Experimental Prototype Testing of a Hybrid Digital Theremin System

Jesús García-Guzmán (Universidad Veracruzana & Instituto de Ingeniería Avanzada, Mexico); Daniel Salazar-Pérez, Gisell Celis-Ronzón and Jorge Alberto Vélez Enríquez (Universidad Veracruzana, Mexico)

A theremin is a musical instrument which is played as a non-contact haptic device. Two antennas are used in combination with the hands of the player to generate two oscillatory signals, one for the tone and one for the volume of the audio signal produced. The design and experimental results of a hybrid digital theremin system are presented in this report. The design consists of two components: a hardware section based upon a previously designed system to which modifications have been made. Schmitt Trigger digital gates are used for the generation of the control voltages for the oscillators which in turn generate two signals at different frequencies. These signals are fed to a data acquisition board and from this sent to the second and novel component of the system: virtual instrument software developed in LabVIEW and running on a computer for the control of parameters of the musical signals produced. Virtual instrumentation is also used to enhance the output, by adding harmonic components and performing equalisation. A general description of the system and results of the prototype testing are reported here.

Personalized TV Distribution to Adaptive HTTP Streaming Clients

Kristina Lazova, Ali El Essaili and Mohamed Ibrahim (Ericsson, Germany); Thorsten Lohmar (Ericsson GmbH, Germany)

There is a growing interest in delivering personalized viewing experiences where the media content is tailored to the individual user. Personalized advertisements are used today by content providers to enhance user experience and increase revenue. The impact of personalized media distribution on the end-to-end system, in particular Content Delivery Networks (CDNs), is largely unstudied. In this paper, we study the delivery of personalized TV to a plurality of streaming clients leveraging adaptive HTTP streaming technologies. A personalized TV channel is composed of a sequence of video and Ad slots which are customized for the user. We quantify the personalization overhead and propose different approaches for efficient delivery of personalized DASH content. Results from a CDN simulator indicate that significant reductions in CDN traffic and storage requirements can be achieved without deteriorating the streaming bitrate of the clients.

Context-Aware Contrast Enhancement Using Shadow Region Estimation and Bright Channel

HeunSeung Lim (Chungang University, Korea); Kwanwoo Park (Chung-Ang University, Korea); Minseo Kim (Chungang University, Korea); Soohwan Yu and Joonki Paik (Chung-Ang University, Korea)

This paper presents a contrast image enhancement method using a shadow region estimation and bright channel. To separate the dark and bright regions, the proposed method estimates the shadow map by selecting the darkest pixels of a low-contrast image. The bright channel represents the brightest pixel among the red, green, and blue pixels and it preserves the bright region of an input image. The resulting image is obtained by synthesizing the input and brightness enhance images using shadow map and bright channel. Experimental results show that the proposed method can provide the enhanced images without undesired artifact brightness saturation and color distortion.

Optical Character Recognition on images with colorful background

Matteo Brisinello (RT-RK Institute for Computer Based Systems, Croatia); Ratko Grbić (University of Osijek, Faculty of Electrical Enginneering, Croatia); Dejan Stefanovic (RT-RK, Serbia); Robert Peckai-Kovac (RT-RK d.o.o., Serbia)

In this paper, a preprocessing method is presented for improving Tesseract Optical Character Recognition (OCR) performance on images with colorful background. The proposed method consists of two steps. At first, a text segmentation method is performed which attempts to extract the text from the colorful background. This step is based on input image clustering into k images. In the second step, a classifier is used to identify the image containing text among k images resulting from the previous step. OCR is then performed on the identified image. The proposed preprocessing method improves Tesseract OCR performance by approximately 20%.

Vehicle2X communication proposal for Adaptive AUTOSAR

Robert Sandor and Mia Stepanovic (Faculty of Technical Sciences & RTRK, Serbia); Milan Z. Bjelica (University of Novi Sad, Serbia); Dragan Samardzija (Bell Labs, Nokia, USA)

Expansion of Internet of Things (IoT) technologies through the years was swift. Interconnected devices have found their way to the automotive industry. This paper covers a brief analysis of available solutions and evaluates the usage of MQTT protocol for heterogeneous device communication in a realistic software environment within AUTOSAR Adaptive stack.

An Accuracy Generalization Benchmark for Wireless Indoor Localization based on IMU Sensor Data

Odongo Steven Eyobu (Kyungpook National University & Makerere University, Korea); Alwin Poulose and Dong Seog Han (Kyungpook National University, Korea)

One major challenge in indoor localization systems is the determination of the ground truth data and generalization of accuracy results. Additionally, there isn't any existing accuracy generalization benchmark for indoor positioning systems. Existing indoor localization systems are built and validated based on the environment being considered. Therefore the results for accuracy and the precision may not be generalizable once different ground truth approaches are used to test the same system or positioning algorithm used. This calls for the need to formulate experimentation benchmarks for accuracy determination. This paper first presents selected ground truth approaches used in indoor positioning literature, and then propose benchmarking criteria based on the discrete point approach for fixing ground truth data for indoor localization with the goal of improving on the generality of the accuracy results. From our experiments, the accuracy generality analysis based on single and multiple discrete point ground truth data confirms varying accuracies using the same position estimation system. The proposed accuracy generalization benchmark is based on the similarity of accuracy results in various scenarios. Similarity of accuracies is determined based on affinity propagation.

Monday, September 3 17:00 - 18:15

Security of CE HW/SW

Room: Berlin 1

Chair: Tolga Arul (TU Darmstadt, Germany)

17:00 ***Comparing methods for the estimation of a stationary battery's capacity***

Patrick Santos and Antonio Seabra (Universidade de São Paulo, Brazil); Emilio del Moral Hernandez (University of Sao Paulo, Brazil)

In this article different methods, such as neural networks, fuzzy logic and adaptability are used to measure the capacity and the aging of stationary batteries. The objective was to estimate the battery's capacity using its internal resistance and capacitance. The obtained data is presented, analyzed and compared.

17:15 ***A New Key Establishment Protocol and its Application in Pay-TV Systems***

Peter Roelse (Irdeto BV, The Netherlands)

A pay-TV consumer uses a decoder to access encrypted digital content. To this end, the decoder contains a chip capable of decrypting the content if provisioned with the appropriate content decryption keys. A key establishment protocol is used to secure the delivery of the content decryption keys to the chip. This paper presents a new protocol and shows how the protocol can be applied in a pay-TV system. Compared to existing protocols, the presented solution reduces the risk that decoders need to be replaced in order to correct a security breach. The new protocol has recently been incorporated in an ETSI standard.

17:30 ***Multi-Model authentication using keystroke dynamics for Smartphones***

Darren Cilia and Frankie Inguanez (MCAST, Malta)

By the year 2018 it is predicted that 84% of the total world's population would own a smartphone device. Intruders that gain access to someone's phone can easily obtain personal and sensitive data about them, such as emails and messages, or even impersonate the rightful owner. Although an intruder can easily obtain the owner's smartphone's password by looking over their shoulder, it would be very hard for them to match the owner's typing signature. However if the owner's typing signature is only based on one typing mode, such as standing still and typing with one hand, it would be very inconvenient for the owner to always stand still and type with one hand as otherwise they'd likely be marked as intruders and get frustrated over time. This research addresses exactly this. We found that models covering different typing modes and activities such as standing or moving and typing one handed or two handed, can be achieved with Equal Error Rate values as low as 0.44%. The best results were obtained using a Least Squares SVM classifier with RBF kernel. We also explore and discuss any differences in classifying between typing activities, Digraphs vs Trigraphs, feature importance, misclassification analyses and full typing sessions vs sentence by sentence based classification.

17:45 ***Consideration of IoT Structure in Mitigation Against Mirai Malware***

Hiroaki Tanaka and Shingo Yamaguchi (Yamaguchi University, Japan)

In recent years, damage caused by IoT malware targeting IoT devices has been rapidly increasing. Among them, IoT malware called Mirai, which was discovered in 2016, is damaging by a large-scale DDos attack and attracts a lot of attention. Our research team constructed a mathematical model to describe Mirai infection phenomena using PN2 (Petrinet in Petrinet). We used the model to quantitatively evaluate the cost and effect of countermeasures by the worm Hajime which does not have the function of rebooting the IoT device or DDoS attack. We also considered that the network structure of the IoT device is largely related to the infection rate of Mirai, and made a model of Star type, Tree type, Ring type and changed the placement of Hajime in different places. We evaluated the relationship between the network structure and the arrangement of Hajime and infection rate of Mirai.

18:00 ***Designing Subspecies of Hardware Trojans and Their Detection Using Neural Network***

Tomotaka Inoue and Kento Hasegawa (Waseda University, Japan); Yuki Kobayashi (Data Science Research Laboratory, NEC Corporation, Japan); Masao Yanagisawa and Nozomu Togawa (Waseda University, Japan)

Due to the recent technological development, home appliance and electric devices are equipped with high-performance hardware devices. Since demand of hardware devices is increased, production base becomes international to mass-produce hardware devices with low cost, and hardware vendors outsource their products to third-party vendors. Accordingly, malicious third-party vendors can easily insert malfunctions (also known as ``hardware Trojans'') into their products. In this paper, we design six types of hardware Trojans at gate-level netlists, and apply a hardware-Trojan detection method using neural networks (NN) to them. The designed hardware Trojans are different in trigger circuits. In addition, we insert them into normal circuits, and detect hardware Trojans using an NN-based hardware-Trojan detection method. In our experiment, we learned Trojan-infected benchmarks using NN, and performed cross validation to evaluate the learned NN. The experimental results demonstrate that the average TPR (true positive rate) becomes 72.9%, and the average TNR

(true negative rate) becomes 90.0%.

DL Applications in CE 2

Room: Berlin 2

Chair: Francesco Ferracuti (Università Politecnica delle Marche, Italy)

17:00 ***An Implementation of Deep Learning based IoV System for Traffic Accident Collisions Detection with an Emergency Alert Mechanism***

Liang-Bi Chen, Ke-Yu Su, Yu-Ching Mo, Wan-Jung Chang, Wei-Wen Hu, Jing-Jou Tang and Chao-Tang Yu (Southern Taiwan University of Science and Technology, Taiwan)

This paper proposes a deep learning based Internet of vehicles system, which consists of an in-vehicle infotainment telematics platform with collisions detection sensors, a cloud based deep learning training server, and a web-based service platform. The proposed system implements deep learning based techniques to achieve traffic accident collisions detection and to provide related emergency announcement. As a result, the experimental result showed that the accuracy of traffic accident collisions detection can be achieved up to 96% and the average response time for related emergency announcement is approximately 7 seconds.

17:15 ***Activity monitoring from RGB input for indoor action recognition systems***

Gianluigi Ciocca and Alessio Elmi (University of Milano-Bicocca, Italy); Paolo Napoletano (University of Milan, Bicocca, Italy); Raimondo Schettini (University of Milano Bicocca, Italy)

In this work we want to show a specific application of some state-of-the-art action recognition techniques, tailored for a scenario of indoor human activities. At first we introduce the most relevant algorithms involved and eventually we present a practical implementation based on the solely RGB input. Our preliminary results show that the proposed implementation achieves competitive results with methods in the state of the art that take advantage of multiple modalities.

17:30 ***CNN Inference: Dynamic and Predictive Quantization***

Kumar Desappan, Mihir N Mody and Manu Mathew (Texas Instruments, India); Pramod Kumar Swami (Texas Instruments India Pvt Ltd, India); Praveen Eppa (Project Lead, India)

Deep Learning techniques like Convolutional Neural Networks (CNN) are the de-facto method for image classification with broad usage spanning across automotive, industrial, medicine, robotics etc. Efficient implementation of CNN inference on embedded device requires a quantization method, which minimizes the accuracy loss, ability to generalize across deployment scenarios as well as real-time processing. Existing literature doesn't address all these three requirements simultaneously. In this paper, we propose a novel quantization algorithm to overcome above mentioned challenges. The proposed solution dynamically selects the scale for quantizing activations and uses Kalman filter to predict quantization scale to reduce accuracy loss. The proposed solution exploits the range statistics from previous inference processes to estimate quantization scale, enabling real-time solution. The proposed solution is implemented on TI's TDA family of embedded automotive processors. The proposed solution is running real time semantic segmentation on TDA2x processor within 0.1% accuracy loss compared floating point algorithm. The solution performs well across multiple deployment scenarios (e.g. rain, snow, night etc) demonstrating generalization capability of the solution.

17:45 ***Discriminative Deep Audio Feature Embedding for Speaker Recognition in the Wild***

Simone Bianco (University of Milano Bicocca, Italy); Elia Cereda (University of Milano-Bicocca, Italy); Paolo Napoletano (University of Milan, Bicocca, Italy)

In this paper we face the problem of speaker recognition in the wild. We tackle the speaker identification and verification problems with the use of Deep Convolutional Neural Networks (CNN). We propose the modification of two Residual CNN architectures (ResNet) in order to be used with the spectrograms of the audio data as input images. The proposed architectures, trained with a contrastive-center loss, have been tested on the VoxCeleb and SIWIS datasets on both the speaker identification and verification tasks. The experimental results show the effectiveness of the proposed solution with respect to the state of the art. The proposed network shows to be robust in unconstrained conditions and, more important, it shows to be quite robust in a multilingual scenario.

18:00 ***Deep Tracking Using Convolutional Features and Adaptive Frame Update***

YeongBin Kim (University of Chung-Ang, Korea); Hasil Park and Joonki Paik (Chung-Ang University, Korea)

This paper presents a robust tracking algorithm using convolutional features. The proposed tracking algorithm consists of three steps: i) training correlation filters using features extracted by a convolutional neural network, ii) localizing the target position in the next frame by multiplying weight and correlation response of each layer, and iii) re-training correlation filters every 10-frame using the proposed position error weight. Experimental results show that the proposed algorithm outperforms and existing deep learning-based tracker.

Monday, September 3 18:30 - 19:30

Welcome Reception

Room: Berlin 1

Tuesday, September 4

Tuesday, September 4 10:00 - 10:30

Coffee Break

Room: Break Area

Tuesday, September 4 10:00 - 18:00

Registration

Room: Registration Area

Tuesday, September 4 10:30 - 11:30

Image and Video 2

Room: Berlin 1

Chair: Paolo Napoletano (University of Milan, Bicocca, Italy)

10:30 ***Efficient Reference Frame Selection Method for Lightweight HEVC Encoder***

Sang-hyo Park (Yonsei University, Korea); Jinwoo Jeong, Sungjei Kim and Yonghwan Kim (Korea Electronics Technology Institute, Korea)

As a demand of video resolution increases highly, video encoder can face difficulties on the computational complexity to process huge pixel data with real-time environment. Many researches have focused on the complexity of high efficiency video coding (HEVC) test model (i.e., HM) which is far from real-time encoding for even high-definition video. However, it has been rarely studied in literature to establish a lightweight HEVC test model (LHM) and to decrease the complexity of LHM further. In this paper, LHM that equips fast encoding options is newly established, and a fast motion estimation (ME) method is proposed to challenge decreasing the encoding complexity of LHM. The proposed method exploits the intriguing correlation of the motion information of merge/skip mode with the information of other motion partitions to minimize the required number of reference frames in ME process. Experimental results showed that the proposed method could substantially decrease the complexity of LHM in view of encoding time as well as memory access.

10:45 ***Behavioral Workload Generation for IPTV***

Tolga Arul and Nikolaos Athanasios Anagnostopoulos (TU Darmstadt, Germany); Stefan Katzenbeisser (Technische Universität Darmstadt, Germany)

The increasing number of households with access to broadband communication networks makes the transmission of broadcast content in the form of Internet protocol television feasible. In this context, IPTV is attractive both as an instrument of customer retention as well as an additional source of revenue for telecommunication providers. The bi-directional properties of this transmission method not only enable new use cases but also allow for the continuous development and employment of novel algorithms, components and architectures. For testing these improvements synthetic workloads of IPTV traffic are utilized. In this work, we propose a workload generation model which is able to generate traffic that features the properties of real user access patterns when properly configured. In comparison to existing literature the proposed behavioral workload model takes a higher number of parameters into account resulting in a more comprehensive and flexible solution.

11:00 ***Retargeting UHD 4k Video for Smartphones***

Rohit Kumar (University of Aveiro & Instituto de Telecomunicações, Portugal); Lino Ferreira (Polytechnic Institute of Leiria / Instituto de Telecomunicacoes, Portugal); Pedro A. Amado Assuncao (Instituto de Telecomunicacoes & Politecnico de Leiria, Portugal); Antonio Navarro (University of Aveiro, Portugal)

This paper evaluates a new video-retargeting algorithm jointly with two others previously published in the literature. Four Ultra High Definition (UHD) 4K resolution video sequences were used for subjective assessment. Subjective testing results show that the proposed algorithm yields the best performance when UHD 4K video is retargeted to 1920x1080 resolution. The main application of these retargeting algorithms is to increase the quality of experience (QoE) provided to consumers when playing UHD videos on small screen devices like smartphones

Gaming

Room: Berlin 2

Chairs: Antonio Navarro (University of Aveiro, Portugal), Alessandro Tonacci (Institute of Clinical Physiology (IFC) National Research Council of Italy (CNR), Italy)

10:30 ***Eyeball Model Construction and Matching for Visible-Spectrum Gaze Tracking Systems***

Wen-Chung Kao and Yi-Chin Chiu (National Taiwan Normal University, Taiwan)

The visible-spectrum gaze tracker (VSGT) provides better user experience than the traditional infra-ray based one. But the design challenge becomes considerably higher due to various projection shapes of the eyeball as well as illumination conditions. The accuracy/precision of the gaze tracker highly depends on the accuracy of the eyeball model and the corresponding model matching performance. In this paper, we propose a comprehensive algorithm for eyeball model construction and refine the matching equations. The experimental result shows the proposed algorithm significantly improves the overall eyeball matching performance.

10:45 ***A Blender plug-in for comparing Structure from Motion pipelines***

Davide Marelli (University of Milano-Bicocca, Italy); Simone Bianco (University of Milano Bicocca, Italy); Luigi Celona and Gianluigi Ciocca (University of Milano-Bicocca, Italy)

Structure from Motion (SfM) is a pipeline that allows three-dimensional reconstruction starting from a collection of images. A typical SfM pipeline comprises different processing steps each of which tackle a different problem in the reconstruction pipeline. Each step can exploit different algorithms to solve the problem at hand and thus many different SfM pipelines can be built. There are many SfM pipelines available in the literature. How to choose the best among them? We present a Blender plug-in that provides an easy to use tool to compare them under different conditions using both real and synthetic datasets.

11:00 ***Adapting Strategies to Display Simulations of Electric Fields Spawned by Point Charges for Augmented Reality Application***

Robert Roth (University of Wuppertal, Germany); Tomasz Grzejszczak and Michał Niezabitowski (University of Technology, Poland); Reinhard Moeller (University of Wuppertal, Germany)

During the time of research of electric fields, the state of art generated several approaches of visualization. The omnipresence of electric fields in this day and age makes it hard to avoid the subject, all the more for people who interact with a variety of electronic devices surrounding them both in working and home life. On the other hand to this date the conceptualizations of visualizing electric fields focus on academic needs and therefore lack an intuitive access for the average consumer. A three-dimensional presentation using augmented reality technology seems appropriate for the present period whereat additional problems arise. Different options for displaying simulations of electric fields spawned by point charges are discussed in respect of human machine interaction and preexisting implementations and their issues in view of augmented reality application are explored. Afterwards, requirements of algorithms and opportunities for their fulfillment are established, two suitable algorithms are proposed and discussed in view of advantages and disadvantages.

11:15 ***ARC: Augmented Reality for Catering***

Luke Benjamin Cassar and Frankie Inguanez (MCAST, Malta)

Augmented reality is establishing itself evermore as a fundamental tool in the modern world, not only as a recreational tool but also in the educational, medical and tourism sectors. In this research we demonstrate how to have an industry level augmentable representation of meals, propose a solution for customers to place orders in a modern restaurant, and gathered feedback. In this research we had to use different techniques such as laser scanning and photogrammetry, utilising Unity, Vuforia and Remake. Having demonstrated our prototype and surveyed around 70 individuals and interviewed a restaurant owner we are confident that Augmented Reality can really be a great tool in the catering industry.

Tuesday, September 4 11:35 - 12:20

Keynote 4: Soumya Kanti Datta

Impact of the Internet of Things in Industry 4.0

Soumya Kanti Datta

Room: Berlin 1

Chair: Gordana Velikić (RTRK Computer Based Systems LLC, Serbia)

The fourth industrial revolution or Industry 4.0 signifies the current trend of smart automation and Machine-to-Machine data exchange in manufacturing technologies. It includes Cyber Physical Systems (CPS), the Internet of Things (IoT), Cloud Computing, Automation and other next-generation technologies. Together, these technologies can achieve the design principles of Industry 4.0 - Interoperability, Information Transparency, Automation and Decentralized Decision Making. This presentation will explore how IoT impacts the design principles to realize a Smart Factory of future.

Tuesday, September 4 12:25 - 13:10

Poster Session 2

Room: Berlin 1

Chair: Alessandro Tonacci (Institute of Clinical Physiology (IFC) National Research Council of Italy (CNR), Italy)

Semantic Food Segmentation for Automatic Dietary Monitoring

Sinem Aslan (University of Milano-Bicocca & International Computer Institute, Italy); Gianluigi Ciocca (University of Milano-Bicocca, Italy); Raimondo Schettini (University of Milano Bicocca, Italy)

Automatic food analysis has been an important task for not only personal dietary monitoring to treat and control health-related problems, but can also find usage at public environments such as smart restaurants where food recommendations are made based on calorie counting. In such applications a very crucial stage for correct calorie measurement is the accurate segmentation of food regions. In this work, we address semantic segmentation of food images with Deep Learning. Additionally, we explore food and non-food segmentation by getting advantage of supervised learning. Experimental results show that followed approach brings appealing results on semantic food segmentation and significantly advances on food and non-food segmentation.

End to End Learning based Self-Driving using JacintoNet

Prashanth Viswanath (Valeo Vision Systems, Ireland); Soyeb N Nagori, Mihir N Mody and Manu Mathew (Texas Instruments, India); Pramod Kumar Swami (Texas Instruments India Pvt Ltd, India)

Automated driving functions, like highway driving and parking assist, are getting increasing deployed in high-end cars with the trend moving towards the self-driving car. With the advent of deep learning, many traditional computer vision techniques have been replaced by deep convolutional neural networks (CNN). End to end learning is one of the paradigm for self-driving, in which user provides a input images from the front facing camera to the given neural network and the network outputs the car control signals such as throttle, steering and braking. The paper proposes an embedded friendly convolutional neural network, 'Jacintonet', to demonstrate self-driving using end to end learning paradigm in a virtual simulation environment. Paper discusses key learning during the training methodology and presents the results on embedded platform. Texas Instruments (TI) TDA2x System on Chip (SoC) is used as embedded platform for running 'Jacintonet', real-time to demonstrate self-driving car in the virtual simulator.

Fast Rain Removal Using Rain Map and Temporal Filtering for Consumer Imaging Applications

Kwanwoo Park (Chung-Ang University, Korea); Minseo Kim and HeunSeung Lim (Chungang University, Korea); Soohwan Yu and Joonki Paik (Chung-Ang University, Korea)

This paper presents the severe weather image enhancement method using for consumer imaging systems. The proposed method performs the rain removal based on a rain map, which estimated by the difference among the adjacent frames. In the video frames, since the rain streaks can be regarded as the object moving in a constant direction, we can analyze the position of the rain streaks using the difference between the previous and next frames. In addition, we refine the rain map using the saturation channel in HSV color space and low-pass filtering. Experimental results show that the proposed method can provide better restored image at fast processing time compared with existing methods.

Hear to see - See to hear: a Smart Home System User Interface for visually or hearing-impaired people

Lucio Ciabattoni (Universita' Politecnica delle Marche, Italy); Francesco Ferracuti (Università Politecnica delle Marche, Italy); Gabriele Foresi (Universita' Politecnica delle Marche, Italy); Andrea Monteriù (Università Politecnica delle Marche, Italy)

In this paper, we introduce a novel approach to design a user interface for commercial Smart Home Systems (SHS), following the needs of visually or hearing-impaired users. The interface is able to transform visual information and alarms into audio signals and vice versa by using a mobile application. The aim of the interface is to make a commercial SHS usable for visually or hearing impaired people, while maintaining a high level of acceptability, due to the use of an inclusive device, i.e., the smartphone.

InGene: a multimodal approach to the genotype-phenotype association in neuromuscular diseases

Raffaele Conte, Francesco Sansone and Alessandro Tonacci (Institute of Clinical Physiology (IFC) National Research Council of Italy (CNR), Italy); Stefano Roccella, Andrea Spezzaneve and Giovanni Rateni (Scuola Superiore Sant'Anna, Italy); Mario Tesconi (Adatec, s. r. l., Italy); Marco Calderisi (Kode, s. r. l., Italy); Maria Fantacci (University of Pisa, Italy); Guja Astrea and Filippo Santorelli (IRCCS Stella Maris Foundation, Italy)

Neuromuscular Diseases require a careful study of the genotype-phenotype association in order to be properly diagnosed and to undertake a personalized, efficient treatment planning. To this extent, the merging of genetic, instrumental, muscular, physiotherapy, cardiovascular data is pivotal to define the profile of each single patient and to help the clinicians in defining treatment plans, monitoring the pathological course and, finally, in the patients' care. In this document, we briefly describe a multimodal approach addressing this topic, focusing on the solutions composing the relevant platform as a whole, adding some brief cues on the future use of such solution.

An Improved Algorithm for Single Image Haze Removal

Hung-Yuan Chung (National Central University, Taiwan); Yao-Liang Chung (National Taiwan Ocean University, Taiwan); Yu-Shan Chen (National Central University, Taiwan)

Here, an algorithm for effectively removing image haze that combines an improved dark channel prior algorithm with the White-Patch Retinex algorithm is introduced. The proposed algorithm can, given its effective design, not only remove haze from an image, but also prevent the following problems that can result from use of the dark channel prior algorithm: 1) halo effect, 2) color distortion, and 3) excessively long operating time. The experimental results provide clear evidence that the new algorithm has superior performance and effectiveness compared to the dark channel prior algorithm, indicating its good potential for use in various applications.

Fire Recognition Using Spatio-Temporal Two-Stream Convolutional Neural Network with Fully Connected Layer-Fusion

Joongchol Shin (Chung Ang University, Korea); Hasil Park and Joonki Paik (Chung-Ang University, Korea)

The fire recognition using only shape of single image may cause the misrecognition problem because of objects similar to fire. To solve this problem, we present a spatio-temporal two-stream convolutional neural net based fire recognition method. Furthermore, we also present a fusion method in the fully connected layer. Experimental results show that proposed method outperforms 2D convolutional neural net by 7.12% in terms of accuracy.

Practical use of Artificial Intelligence for Clinical Staff Other than Physicians

Eisuke Hanada (Saga University & Faculty of Science and Engineering, Japan); Koki Wada (Saga University, Graduate School of Science and Engineering, Japan); Kouji Oda, Kouki Nishi and Koutaro Kawazoe (Kimura Information Technology Co., Ltd., Japan)

Trials to introduce artificial intelligence (AI) in clinical settings have been done for several decades, but the movement toward such introduction remains slow. In the past, AI systems were mainly to support physicians. They were "rule-based" and specifically designed to assist in diagnosis or to recommend drugs to be prescribed to patients. Current clinical medicine is not performed by a physician acting alone, but through cooperation between staff with various occupations. Kimura Information Technology Co., Ltd. (KIT, Japan) has built a system named "AI-Q" that works on the Japanese version of IBM's Watson and with which it is possible to build arbitrary problem solving systems. AI-Q was made to serve a variety of purposes, and a system for pharmacists has been built for drug information. In this paper, we illustrate how practical applications of AI can be designed for use by medical staff other than physicians and discuss how the system can be extended to other fields. Specifically, we expanded the AI system for pharmacists to one for certified clinical engineers (CCE) and herein evaluate it.

A method for synchronization of audio and video signals

Toni Livaja (RT-RK Institute for Computer Based Systems Osijek, Croatia); Marijan Herceg (Faculty of Electrical Engineering, Croatia); Dejan Stefanovic (RT-RK, Serbia); Gordana Velikić (RTRK Computer Based Systems LLC, Serbia)

In order to successfully receive the Hybrid Broadcast Broadband Television (HbbTV) certificate, each device has to pass a series of tests. One of these tests is audio-to-video (AV) synchronization test. In this paper, a method which analyzes video sequences and detects whether their audio and video components are synchronized is proposed and implemented. The application is written in C++ programming language and uses several open-source libraries for reading video and extracting audio.

Maximizing the Efficiency of Automotive Software Development Environment Using Open Source Technologies

Stefan Nicetin (Faculty of Technical Sciences & RTRK, Serbia); Goran Stupar (University of Novi Sad & RT-RK Institute for Computer Based Systems, Serbia); Nikola Teslic (University of Novi Sad, Serbia); Robert Sandor (Faculty of Technical Sciences & RTRK, Serbia)

The automotive industry is undergoing dramatic changes nowadays. New functionalities, such as complex digital cockpit solutions, driver assistance algorithms and more, are all based on software. The shortening of the development time while maintaining a high quality of software releases is an uneasy task. Many solutions in this regard exist in the industry, however, the cost prevents the wider developer community from participating in fair terms. In this paper, we argue that many open source technologies may be utilized in addition to field-proven automotive software development technologies, to reduce the total cost and reduce the development time needed on testing and error checking. Specifically, we extend the basic development process by utilizing build automation tools and servers to decrease the build and unit test time, code-based analysis tools such as static and dynamic code analysis to increase the software quality and version control system combined with application lifecycle management tools to increase bug and error traceability.

Application lifecycle management in automotive: Adaptive AUTOSAR example

Mia Stepanovic (Faculty of Technical Sciences & RTRK, Serbia); Jelena Jovicic (Faculty of Tehnical Sciences & RT-RK, Serbia); Goran Stupar (University of Novi Sad & RT-RK Institute for Computer Based Systems, Serbia); Marko Kovacevic (Faculty of Technical Sciences, Serbia)

Currently, automotive industry is facing with rapid development and is the subject of great changes. This expansion emphasizes the need for new functionalities, like applications for "over the air" updating, in-vehicle infotainment, driving assistance algorithms or managing lifecycle of in-car applications. Managing lifecycle and defining terms in which different applications are executed is very challenging task. What also extends this challenge is lack of provided solutions due to sudden necessity for knowledge in this area. Today, one of the leading automotive standards AUTOSAR has been extended with Adaptive Platform (AA). AA is a new architecture which offers support for new automotive features. This paper presents solution for managing lifecycle of different in-car applications, following AA functional cluster, Execution Management.

Modernizing laboratories for automotive industry related curricula

Mario Vranjes (University of Osijek, Faculty of Electrical Engineering, Computer Science and Information Technology, Croatia); Gordana Velikić (RTRK Computer Based Systems LLC, Serbia); Ratko Grbić (University of Osijek, Faculty of Electrical Enginneering, Croatia); Ivan Kastelan (University of Novi Sad, Faculty of Technical Sciences, Serbia); Marijan Herceg (Faculty of Electrical Engineering, Croatia); Denis Vranješ (Faculty of Electrical Engineering, Computer Science and Information Technology Osije, Croatia)

By recognizing the needs of both global and local labor market related to the automotive industry, the Faculty of Electrical Engineering, Computer Science and Information Technology (FERIT) Osijek, Croatia and the Faculty of Technical Sciences (FTN) Novi Sad, Serbia, have launched new study programs oriented towards education of engineers specialized for automotive software and hardware. It is therefore necessary to enable students to work with the latest equipment, which in the case of automotive industry is quite expensive. Thus FERIT and FTN have applied for a joint project of cross-border cooperation between Croatia and Serbia, named "Modernizing Laboratories for Innovative Technologies" (DRIVE), which is approved and currently is in implementation, starting in July 2017. Using the funds of the DRIVE project, until now faculties have acquired the valuable equipment, which serves them for teaching students through modern courses in the automotive field. This paper describes the procured equipment and the content of few key courses of new study programs that students of these faculties make ready for the fastest growing part of the labor market, both locally and globally across Europe.

Keynote 5: Akihiko Sugiyama

Technical Writing Clinic

Akihiko Sugiyama

Room: Berlin 2

Chair: Shingo Yamaguchi (Yamaguchi University, Japan)

This lecture presents a way to identify the principle behind a solution. Through a process of clarifying the problem-solution relationship in technical writing, a better logic for the paper is built. A solid logic directly benefits the author(s) by making reviewers understand the contribution of the paper easily, leading to a higher acceptance rate. It is emphasized that the earlier mentioned clarification process to establish a solid logic often unveils a more general principle behind a solution, which may open a door to another research. Some examples to convince the audience support the value of technical writing.

Tuesday, September 4 13:15 - 14:00

Keynote 6: Akihiko Sugiyama

What I wish I knew when I was an entry level engineer

Akihiko Sugiyama

Room: Berlin 2

Chair: Shingo Yamaguchi (Yamaguchi University, Japan)

This lecture presents useful tips from the experiences of the lecturer as an industry engineer for three decades and as a supervisor for junior engineers and 70+ internship students. Many common problems have been identified in himself, junior engineers, and students, or near-future engineers-to-be, in the daily life of research and development. It was necessary for a supervisor to point out the same problem again and again. It could only be possible to avoid such a repeated and inefficient process by preparing a document of do's and don'ts and having them read through it as a first step. An outcome is this lecture. It covers from daily communication with colleagues and bosses, what is good research, importance of intellectual properties, efficient paper writing, good presentation materials, fast and efficient growth, and to carrier building. Each topic is mostly accompanied by examples, and thus, should also be useful for young professionals in industry as well as those in academia.

Tuesday, September 4 13:15 - 14:15

Lunch

Room: Break Area

Tuesday, September 4 14:20 - 15:35

Automotive 2

Room: Berlin 1

Chair: Milan Z. Bjelica (University of Novi Sad, Serbia)

14:20 ***Recognition of driver distractions using deep learning***

Leonel Cuevas (Norwegian University of Science and Technology, Italy); Paolo Napoletano (University of Milan, Bicocca, Italy); Raimondo Schettini (University of Milano Bicocca, Italy)

Driver distraction has a great impact on the safety of people and it is a relevant topic for a number of applications, from autonomous driving assistance to insurance companies and investigations. In this paper we tackle the problem of automatic recognition of driver distractions by exploiting deep learning and convolutional neural networks. We propose and present a comparison of different deep learning-based methods to classify driver's behaviour using data from 2D cameras. Evaluation has been carried out on the State Farm dataset, which consists of 10 different actions performed by 26 subjects such as, normal driving, texting, talking on the phone, operating the radio, drinking, reaching behind, etc. Results, achieved using 3 rounds of 5-fold cross validation, show that all the evaluated methods exceed the 90% of accuracy with the best achieving about 97%.

14:35 ***Utilizing IoT technologies for Remote Diagnostics of Next Generation Vehicles***

Marko Dragojevic (Faculty of Tehnical Sciences & RTRK, Serbia); Stevan Stevic (University of Technical Sciences & RT-RK, Serbia); Goran Stupar (University of Novi Sad & RT-RK Institute for Computer Based Systems, Serbia); Dusan Zivkov (RT-RK, Institute for Computer Based Systems, Serbia)

One of the most notable extensions in next generation vehicles are related to connectivity mechanism. Remote access to the car allows users, manufacturers and service personnel to track, maintain and improve vehicles in the abundance of use cases. Implementation of remote access involves software technologies, which are prone to security threats. On the other hand, proliferation of Internet of Things (IoT) brings connectivity solutions that may be

applied in automotive. In this paper, we present a design where existing IoT technology is utilized to enhance automotive middleware (Adaptive AUTOSAR) and enable remote monitoring and diagnostics services for vehicles. This way we give indication of feasibility of today's IoT in automotive context.

14:50 ***A Multi-Task CNN Framework for Driver Face Monitoring***

Luigi Celona and Lorenzo Mammana (University of Milano-Bicocca, Italy); Simone Bianco and Raimondo Schettini (University of Milano Bicocca, Italy)

One of the primary causes of road accidents is related to driver inattention or drowsiness. In this paper we propose a vision-based Multi-Task Driver Monitoring Framework (MT-DMF) that simultaneously analyzes head pose, eyes and mouth status, and drowsiness level of the driver. Experimental results on both frame-level and sequence-level classification show the effectiveness of the proposed framework.

15:05 ***Digital Cockpit in AUTOSAR Adaptive Context***

Mila Kotur (Faculty of Technical Sciences, Serbia); Marko Dragojevic (Faculty of Tehnical Sciences & RTRK, Serbia); Gordana Velikić (RTRK Computer Based Systems LLC, Serbia); Ilija Basicevic (University of Novi Sad, Serbia)

Recent applications for highly automated driving, Car-to-X communication, and users which are requiring comfortable user experience, pose new challenges and demands to a software platform. These demands has become a foundation for AUTOSAR - an open, standardized software architecture for the automotive industry. AUTOSAR introduced a new standard based on POSIX operating system: "AUTOSAR Adaptive Platform". The key advantage of this new concept is to develop Electronic Control Unit (ECU) applications independently. Thus, autonomous driving and infotainment can run within one framework with different safety levels. Since Linux operating system is POSIX based, we can use Linux as a backbone for AUTOSAR Adaptive. In this paper we will demonstrate Digital Cockpit on Linux operating system, within AUTOSAR Adaptive Platform.

15:20 ***Selective LED Flicker Detection and Mitigation Algorithm for Non-HDR Video Sequences***

Nicolai Behmann (Leibniz Universität Hannover & Institute of Microelectronic Systems, Germany); Gregor Schewior (Dream Chip Technologies GmbH, Germany); Sebastian Hesselbarth (DreamChip Technologies GmbH, Germany); Holger Blume (Leibniz Universitaet Hannover, Germany)

With the rise of pulse-width modulated LED light sources in car headlights and peripheral illumination, in-vehicle cameras for traffic sign recognition and electronic mirror replacement face new issues with flicker artifacts due to misaligned irradiation and imager integration times. In this paper, we propose a novel post-processing algorithm based on three consecutive frames, being able to detect and filter those artifacts without the need for high-dynamic range imaging.

Consumer Healthcare

Room: Berlin 2

Chair: Susanna Spinsante (Università Politecnica delle Marche, Italy)

14:20 ***Heart Rate Estimation Method by Measuring Pulse Wave Through Conductive Fibers Mounted on Forearms***

Yoshiki Mashiyama, Masaki Nagura and Yasue Mitsukura (Keio University, Japan); Nozomu Hamada (Malaysia Japan International Institute of Technology, Malaysia)

In this paper, we propose a method for estimating heart rate from pulse wave measured through conductive fibers mounted on forearms. In recent years, heart rate is an effective index for describing mental and physical condition. Accordingly, many types of wearable heart rate measuring devices have been developed. However, there are problems such as uncertainty in the measured waveform caused by contact failure and large burdens on subjects caused by wearing oppression. Hence, it is necessary to have a device that causes less burdens and can measure stably. In this research, we propose a forearm-mounted pulse wave measuring device made of stretchable conductive fibers that can be comfortably worn and can reduce contact failure. In addition, we propose a method for estimating heart rate from pulse wave measured by proposed device. In order to evaluate the effectiveness of the proposed method, we show the accuracy of measuring heart rate and the sample entropy of the heart rate variability waveform. As a result, it was confirmed that pulse wave can be measured stably irrespective at both rest and moving state.

14:35 ***Using the Hilbert-Huang transform to increase the robustness of video based remote heart-rate measurement from human faces***

Thomas Pursche, Moeller, Roland Clauß and Bernd Tibken (University of Wuppertal, Germany)

Measuring the heart rate(HR) in a conventional way using eg. electrocardiogram, leads to several disadvantages for the patient like skin irritation or discomfort. Because of this remote based measurement techniques become more and more popular in recent years. Most of the methods presented in the last years using recordings of human faces. These methods recon minimal changes, invisible to the human eye, in the color spectrum of a persons face to measure the heart activity. As a side product it is also possible to acquire the breath frequency by this method. But measuring HR out of a persons video is a challenging problem, as seen in the last years. One of the most biggest problems is an ambient light change during the process. To resolve this problem and enhance the robustness of the measurement technique, a new approach is proposed in this paper. By using the empirical mode decomposition of the Hilbert Huang transformation and the independent component analysis (ICA), it is possible to reduce the effects of changes in ambient light conditions noticeable. The proposed combination of this two techniques, is able to achieve a much greater robustness towards changes in light conditions, therefore a better accuracy and can be used in a more realistic application environment.

14:50 ***Classification of Indoor-Outdoor Location using Blood Oxygen Saturation Signal***

Gökhan MEMİŞ (Unknown, Turkey); Mustafa Sert (Baskent University, Turkey)

Wearable technology, one of the most significant trends in the mobile computing evolution, has been changing our daily life. It has become increasingly

popular in many different areas such as military, healthcare, entertainment, and education. In this paper, we aim to find out a person's indoor-outdoor location by oxygen saturation (SpO2) sensor. To this end, we build a new dataset consisting of twelve subjects between the ages of 20-65 and propose an ensemble learning based method for indoor-outdoor classification. We provide comparative tests with Naive Bayes (NB), k-nearest neighbor (kNN), and support vector machine (SVM) algorithms on the dataset and present empirical results regarding the SpO2 usage in different age groups. Our experimental results on real examples show that using RF gives best classification rates with an average accuracy of 69.33% for all test scenarios. Also, we see that, as the age increases, the oxygen saturation in the person's blood decreases.

15:05 ***Assistive System for Elders Suffering of Dementia***

Athanasios Kakarountas, Eleni Boumpa, Ioanna Charalampou and Anargyros Gkogkidis (University of Thessaly, Greece); Argyro Ntaliani (University of Piraeus, Greece); Evdoxia Kokkinou (University of Thessaly, Greece)

This work proposes an innovative information home support system to be established at the houses of people suffering from dementia. The main innovations of the system are its transparent character that overcomes the need for training of the patient, as well as the exploitation of a well-known technique for dementia, namely music therapy. It addresses the need of people suffering from dementia as well as their familiars to be recognized by them and have better interaction and collaboration. The system offers a ubiquitous recognition system, just by using smart devices like smart-phones or smart-wristbands. When a familiar person is detected in the house, then a sound file is reproduced on smart speakers placed in the house, in order to trigger the memory, based on the principles of music therapy. To the best of the authors' knowledge, this is the first system of its kind ever reported in the literature, and in this work, the hardware part is mainly presented.

15:20 ***Privacy-Aware and Acceptable Lifelogging services for older and frail people: the PAAL project***

Francisco Flórez (University of Alicante, Spain); Alex Mihailidis (University of Toronto, Canada); Martina Ziefle (RWTH Aachen University, Germany); Liane Colonna (Stockholm University, Sweden); Susanna Spinsante (Università Politecnica delle Marche, Italy)

Developed countries around the world are facing crucial challenges regarding health and social care because of the demographic change and current economic context. Innovation in technologies and services for Active and Assisted Living stand out as one promising solution to address these challenges, while profiting from the economic opportunities. For instance, lifelogging technologies may enable and motivate individuals to pervasively capture data about them, their environment, and the people with whom they interact in order to receive a variety of services to increase their health, well-being, and independence. In this context, the PAAL project presented in this paper has been conceived, with manifold aim: to increase the awareness of the ethical, legal, social, and privacy issues associated to lifelogging technologies; to propose privacy-aware lifelogging services for older people, evaluating their acceptability issues and barriers to familiarity with technology, and to develop specific applications referred to relevant use cases for older and frail people.

Tuesday, September 4 15:40 - 16:25

Keynote 7: Dr. Bernhard Grill

Immersive Audio

Dr. Bernhard Grill

Room: Berlin 1

Chair: Reinhard Moeller (University of Wuppertal, Germany)

Bernhard Grill will talk about the latest developments and trends in the field of the next-generation audio system for UHDTV, 4K streaming and VR/AR systems. Next generation audio systems enable an immersive and enveloping sound experience that pulls viewers into the center of the action. Furthermore, viewers can personalize their audio experience according to their preferences, for example by changing the balance between dialogue and ambiance. Mr. Grill will explain the underlying working principles and provide an overview of the available systems. The first next-generation audio system on the air in a regular UHDTV service is MPEG-H Audio. It has also been selected for the Chinese 3D Audio standard for UHDTV.

Tuesday, September 4 16:30 - 17:00

Coffee Break

Room: Break Area

Tuesday, September 4 17:05 - 18:20

Panel Discussion: Future Directions

Tom Coughlin, Benjamin Klotz

Room: Berlin 1

Chairs: Thomas Coughlin (Coughlin Associates, USA), Soumya Kanti Datta (EURECOM, France)

Tom Coughlin

BIO - Tom Coughlin, President, Coughlin Associates is a widely respected digital storage analyst as well as a business and technology consultant. He has over 36 years in the data storage industry with engineering and management positions at high profile companies. Dr. Coughlin has many publications and six patents to his credit. Tom is also the author of Digital Storage in Consumer Electronics: The Essential Guide, which is now in its second edition with Springer. Coughlin Associates provides market and technology analysis as well as Data Storage Technical and Business Consulting services. Tom publishes the Digital Storage Technology Newsletter, the Media and Entertainment Storage Report, the Emerging Non-Volatile Memory Report and other industry reports. Tom is also a regular contributor on digital storage for Forbes.com and other blogs. Tom is active with SMPTE (Journal article writer and Conference Program Committee), SNIA (including a founder of the SNIA SSSI), the IEEE, (he is past Chair of the IEEE Public Visibility Committee, Past Director for IEEE Region 6, President Elect for IEEE USA and active in the Consumer Electronics Society) and other professional organizations. Tom is the founder and organizer of the Annual Storage Visions Conference (www.storagevisions.com as well as the Creative Storage Conference (www.creativestorage.org). He was the general chairman of the annual Flash Memory Summit for 10 years. He is a Fellow of the IEEE and a member of the Consultants Network of Silicon Valley (CNSV).

TITLE: The Future of Consumer Electronics.

ABSTRACT: The IEEE Future Directions Committee and the IEEE Consumer Electronics Future Directions Committee are exploring the future of technology and its application to consumer technology. This talk will explore trends in 5G, block chain, artificial intelligence, mobile power, cloud computing, VR/AR, new computing architectures and other emerging technologies will transform consumer products and the consumer experience.

Benjamin Klotz

BIO - Benjamin Klotz is a PhD student at EURECOM and BMW Research, New Technologies Innovation on the topic of Semantic Technologies for Vehicle Data. Benjamin has an engineering background in embedded systems and real-time computing. He released the first extensible vehicle signal ontology and is an active member of the World Wide Web Consortium to standardize an automotive data model, as co-chair of the big data automotive task force and the description and interactions of connected vehicles in the Web of Things.

TITLE: Cross-domain interactions for connected cars.

ABSTRACT: Current and future vehicle are being more and more connected to the massive ecosystem of devices and mobile things. However, the massive amount of data involved, the unique interaction with the users and the complexity of driving context require to understand more than car sensor data itself. The Web of Things and the domain semantics enable interactions based on cross-domain contextual data.

Network Technologies

Room: Berlin 2

Chair: Raffaele Conte (Institute of Clinical Physiology (IFC) National Research Council of Italy (CNR), Italy)

17:05 ***An approach to beacons-based location for AAL systems in broadband communication constrained scenarios***

David Zambrano-Montenegro (Universidad Tècnica de Manabì, Ecuador); Rodolfo Garcia-Bermudez (Universidad Técnica de Manabí, Ecuador); Francisco J. Bellido-Outeiriño (University of Córdoba, Spain); Jose-Maria Flores-Arias (University of Cordoba, Spain); Alexander Huhn (Berliner Verkehrsbetriebe (BVG), Germany)

The general objective of this article is to implement an Ambient Assisted Living (AAL) system aimed at monitoring the care of the elderly in the particular conditions of Ecuador (South America). It is intended that the system contributes to the welfare state of these people through the monitoring of significant variables of their activity and that of the caregiver, and specific events such as daily activity, falls or location among others. To this end, it is planned to deploy a network of wireless sensors in the home environment that have a high autonomy, in addition to some sensors integrated in a single wearable device very small and comfortable. In this article we will focus on the evaluation of indoor location by studying the signal strength (RSSI) received from the beacon carried by the user with respect to the central reading nodes. Once the internal location has been set, the reading of other data from additional sensors will allow monitoring adapted to the AAL environment. The key to this work lies in the development of a low-cost system with broadband communications restrictions typical of the territory of Ecuador, where its application is foreseen for the monitoring of elderly or dependent persons.

17:20 ***A New Distributed Weighted Connected Dominating Set Algorithm for WSNs***

Mustafa Tosun and Elif Haytaoglu (Pamukkale University, Turkey)

A new distributed weighted minimal connected dominating set algorithm is proposed. The new algorithm consists of two phases. In the first phase the dominating set is constructed by selecting nodes having low weight and connects more different nodes compared to their neighbours. In the second phase, a dominatee node(s) that merges many different partial trees, is selected as a dominator to connect the dominators. The proposed algorithm is implemented in Cooja WSN simulator. According to the simulation results, the new algorithm uses fewer messages, selects fewer dominators and constructs dominating set having less weight as well as uses less time than its counterpart to construct a connected dominating set.

17:35 ***Mobile Localization-Based Service Based on RSSI Fingerprinting Method by BLE Technology***

Tsung-Yu Tsai, Chen-Chien Hsu, Hsin-Han Chiang and Wei-Yen Wang (National Taiwan Normal University, Taiwan)

Technologies of Indoor positioning are widely used in commercial applications in the modern society; among them, fingerprinting is the most utilized method. The main challenge in fingerprinting-based localization is the severe fluctuations of received signal strength (RSS). Due to the fluctuations, localization results are often unstable. Therefore, we propose to define membership functions based on the distribution of RSS with a technique of fuzzy logic; specifically, a fuzzy rule is defined with offline data. Finally, fingerprinting method can find out the localization efficiently. The result of experiment

show that the new method is effective to increase the stability of localization.

17:50 ***Proposal of Novel MPTCP Congestion Control to Suppress QoS Fluctuation for WebQoE Improvement***

Kensuke Noda and Yoshihiro Ito (Nagoya Institute of Technology, Japan)

This paper proposes a new congestion control of Multi-Path TCP (MPTCP) for improvement of Quality of Experience (QoE). This method controls the congestion window for each subflow so as to suppress the fluctuation of Quality of Service (QoS). The fluctuation of QoS is estimated from that of the Round Trip Time, and the congestion window is controlled according to the estimated fluctuation. The authors implemented the proposed method and evaluate QoS by experiment. The experimental results show that the proposed method can suppress the fluctuation of QoS as compared with the existing congestion controls of MPTCP under congestion.

18:05 ***A Proposed Academic Version of Distributed Control System (DCS)***

Engr. Syed Rizwan Ali (Bahria University Karachi Campus, Pakistan); Azmat Khan (Bahria University, Pakistan)

Due to lack of university-industry linkages in a country, especially the students at undergraduate level faced practical difficulties when they exposed to local industries after their graduation. In this research paper, a solution is proposed to overcome such difficulties. The solution is based on the idea to design or implement the technology of the industry at institute level for hands-on training. A four-layer architectural model has proposed which is based on an industrial technology called Distributed Control System (DCS). DCS is a system where control is distributed. Controllers are being controlled from supervisory level and they can further control other controllers or field devices. This DCS model is integrated with software and hardware that aims to reconstruct the existing industrial technology at small scale for hands-on training in universities labs and also bridge this gap between academia and industry

Tuesday, September 4 20:00 - 22:00

Gala Dinner

Room: Outside

Wednesday, September 5

Wednesday, September 5 10:00 - 10:30

Coffee Break

Room: Break Area

Wednesday, September 5 10:00 - 11:00

Registration

Room: Registration Area

Wednesday, September 5 10:30 - 11:45

IoT and IoE

Room: Berlin 1

10:30 ***Recognition of Edible Vegetables and Fruits for Smart Home Appliances***

Marco Buzzelli (University of Milano-Bicocca, Italy); Federico Belotti (University Milano-Bicocca, Italy); Raimondo Schettini (University of Milano Bicocca, Italy)

We present a state of the art method for vegetable and fruit recognition based on convolutional neural networks. We developed our solution around the concept of a smart kitchen/refrigerator equipped with an on-board camera. With this objective in mind, we adopted a dataset that was specifically collected and annotated according to the eating characteristics of the portrayed items. We performed two types of experiment: we first trained and evaluated different state-of-the-art neural architectures on the task of vegetable and fruit recognition. Secondly, we designed and tested a solution that exploits the hierarchical nature of such classes to further improve the final performance of our system. Experimental results demonstrate the quantitative superiority of the proposed solution compared to existing approaches.

10:45 ***Visual-based sentiment logging in magic smart mirrors***

Simone Bianco (University of Milano Bicocca, Italy); Luigi Celona (University of Milano-Bicocca, Italy); Paolo Napoletano (University of Milan, Bicocca, Italy)

This paper describes the hardware and software architectures of a smart magic mirror able to acquire and track the user's face, recognize his identity, analyze and log his facial expressions and emotional states. The magic mirror is basically a see-through mirror made smart by a led display placed behind the mirror that enables to display the User Interface (UI). The mirror is connected to a small single-board computer attached to a set of input sensors (a traditional RGB camera to enable vision-based interaction, a microphone to enable voice interaction, temperature and humidity sensors, and proximity sensors) and to an embedded machine intelligence platform that performs all the neural computations.

11:00 ***Ontology-Supported Verification Method for Implementation of IoT Service Design with Petri Net***

Mohd Anuaruddin Bin Ahmadon and Shingo Yamaguchi (Yamaguchi University, Japan)

In this paper, we embrace the concept of ``design once, provide anywhere'' for IoT service design and implementation. We proposed a verification method of device implementation into service design. Although the service is reusable, the devices used for the implementation may change. However, due to strict specifications, most devices are not implementable for the service thus the design phase is repeated unnecessarily. We use ontology tree and behavioral inheritance to verify whether a device is implementable or not. Our verification method improves the rate of devices that can be implemented for a service. Finally, we showed the effectiveness by quantitative evaluation of our method with a comparison to a conventional method.

11:15 ***Anomaly detection in IoT devices via monitoring of supply current***

Athanasios Kakarountas, Georgios Spathoulas and Dimitrios Myridakis (University of Thessaly, Greece); Dimitris Schoinianakis and Joachim Lueken (Nokia Bell Labs, Germany)

This work presents a methodology that correlates the supply current of a smart device to its functional characteristics in order to detect a manufacturing or a security anomaly in IoT devices. It is proven that awareness of the typical operation of a smart device via functional parameters (like the supply current), may offer valuable security indicators since any deviation from normal operational boundaries may be indicative of a security compromise or a functional anomaly. The paper offers the results from two experiments that prove this assumption and contribute towards a holistic security approach for the era of the Internet of Things (IoT).

11:30 ***IoT-based Software Update Proposal for Next Generation Automotive Middleware Stacks***

Stevan Stevic (University of Technical Sciences & RT-RK, Serbia); Vladimir Lazic (Faculty of Technical Science & RT-RK, Serbia); Milan Z. Bjelica and Nemanja Lukic (University of Novi Sad, Serbia)

Automotive software in modern vehicles is becoming very complex and various new features and opportunities are offered. Main problem for manufacturers is to ensure that new features, bug fixes and improvements are quickly applied to vehicles, as today's methods of software updates in repair shops are unpractical. Over-the-Air (OTA) updates as a faster way of suppling new software without driver interruption are considered instead. This requires the development of a platform with possibility of dynamic deployment and update of applications which is Adaptive AUTOSAR. These procedures shall not violate proper work of safety critical electronic control units (ECUs), and shall keep the system safe from external intrusions. In this paper, we present a solution for vehicle update that includes integration of IoT technologies with Adaptive AUTOSAR platform, usage of access policies, and installation flow.

Mobile Device Technology

Room: Berlin 2

Chair: Gabriele Foresi (Universita' Politecnica delle Marche, Italy)

10:30 ***A Robust Indoor/Outdoor Detection Method based on Sparse GPS Positioning Information***

Sae Iwata (Waseda University, Japan); Kazuaki Ishikawa and Toshinori Takayama (Zenrin DataCom Co., LTD., Japan); Masao Yanagisawa and Nozomu Togawa (Waseda University, Japan)

Cell phones with GPS function as well as GPS loggers are widely used and we can easily obtain users' geographic information. Now classifying the measured GPS positions into indoor/outdoor positions is one of the major challenges. In this paper, we propose a robust indoor/outdoor detection method based on sparse GPS positioning information utilizing machine learning. Given a set of clusters of measured positions whose center position shows the user's estimated stayed position, we calculate the feature values composed of: positioning accuracy, spatial features and temporal feature of measured positions included in every cluster. Then a random forest classifier learns these feature values of the known data set. Finally, we classify the unknown sequence of measured positions into indoor/outdoor positions using the learned random forest classifier. The experiments demonstrate that our proposed method realizes the F1 measure of 0.9836, which classifies measured positions into indoor/outdoor ones with almost no errors.

10:45 ***Performance Measurement Automation for Linux Embedded Devices***

Wooram Ann, Prabhat Awasthi and Jihun Chae (Samsung Electronics, Korea); Taeyoung Lee (Samsung Electronics. Co., Ltd, Korea); Cheulhee Hahm (Samsung Electronics, Korea)

In this paper, we analyze the usage scenarios of the various functions provided by the recent smart TV to derive a common usage model. From this model, we propose a method to measure and evaluate the performance from various perspectives. Using the proposed method, we were able to develop a system that automatically measures performance and provides analysis information to the developers. Experimental results show that the automatic measurements have a difference of only 2.3% compared to human measurements.

11:00 ***Development of a Mobile App for training health professionals in diagnostic imaging: a progress report***

Raffaele Conte, Michele Gravina, Francesco Sansone, Andrea Grande, Alessandro Tonacci and Anna Paola Pala (Institute of Clinical Physiology (IFC) National Research Council of Italy (CNR), Italy)

Mobile Apps are nowadays pervasive in our lives, employed for several purposes, among which education, representing a useful integration of web-based applications to which they add portability and much larger employability. Specifically, in healthcare, Mobile Apps can support e-learning/e-

training programs devoted to health professionals in diagnostic imaging, allowing the end-users to continuously update their skills. Here, the ongoing implementation of a Mobile App, designed for iOS, is presented, whose aim is to provide medical doctors, nurses and healthcare professionals at large with a complete platform to update their knowledge in the field of biomedical images interpretation. Both an e-learning and an e-training part are present and several functions of both are currently under development. We plan to complete the implementation of basic features of the App within the end of the year, in order to collect the first feedbacks from medical community by the first half of 2019.

11:15 ***Feasibility of employing AHRS algorithms in the real-time estimation of sensor orientation using low-cost and low sampling rate wearable sensors in IoT application***

MReza Naeemabadi, Samira Najafi, Mikkel Thøgersen, John Hansen and Birthe Dinesen (Aalborg University, Denmark)

In this paper, the feasibility of using wearable wireless low-cost motion trackers equipped with magnetic/inertial sensors in daily human activities was investigated. Consequently, five previously introduced attitude estimation algorithms were chosen and implemented in Windows IoT environment. Texas Instrument CC2650STK wireless sensor was utilized to capture the raw magnetic/inertial data. The raw data was streamed to a DragonBoard 410c single board computer in real-time via Bluetooth low energy with the low sampling frequency. The sensor attitude was estimated using the attitude estimation algorithms continuously. Shimmer 3 AHRS system was utilized as a reference and orientation of the rigid body was acquired with Shimmer Consensys PRO 1.5 software. The experimental test showed poor agreement between the estimated and reference orientations. Also, it has been shown the calculated orientation was dependent on the initial calibration. Based on the preliminary results and regarding the current limitations in the wearable motion trackers, we may conclude that a precise estimation of a rigid body angle may not be achieved using wearable motion tracker in daily activities and other clinical applications

11:30 ***Bicycle Behavior Recognition using Sensors Equipped with Smartphone***

Yuri Usami (Waseda University, Japan); Kazuaki Ishikawa and Toshinori Takayama (Zenrin DataCom Co., LTD., Japan); Masao Yanagisawa and Nozomu Togawa (Waseda University, Japan)

It becomes possible to prevent accidents beforehand by predicting dangerous riding behavior based on recognition of bicycle behaviors. In this paper, we propose a bicycle behavior recognition method using a three-axis acceleration sensor and three-axis gyro sensor equipped with a smartphone. We focus on the periodic handlebar motions for balancing while running a bicycle and reduce the sensor noises caused by them. After that, we use machine learning for recognizing the bicycle behaviors, effectively utilizing the motion features in bicycle behavior recognition. The experimental results demonstrate that the proposed method accurately recognizes the four bicycle behaviors of stop, run straight, turn right, and turn left and its F-measure becomes around 0.9 while the F-measure of the existing method just reaches 0.6-0.8.

Wednesday, September 5 11:50 - 12:35

Keynote 8: Pierluigi Siano

Demand response and transactive energy exchanges in local energy markets: a novel platform based on IoT
Pierluigi Siano

Room: Berlin 1

Chair: Lucio Ciabattoni (Universita' Politecnica delle Marche, Italy)

In the last decades, the innovation in the new renewable energy technologies, the incentives to renewable sources usage and the introduction of the Information and Communication Technologies (ICTs) have been some of the drivers to the restructuring of the electric power industry. One of the main innovations in the electrical energy management has been the introduction of smart grids, which are electric grids integrating advanced sensing technologies, control methodologies and communication infrastructures. In this way, the interaction of all connected users with the objective of efficiently managing the variation of load demand is facilitated. At the distribution level, the smart grid concept is realized by microgrids, electrical networks composed of small-scale independent power producers, Distributed Generators (DGs), local storage devices and controllable loads managed by hierarchical system control architecture in a small geographical area. In this complex environment, an essential role is played by Demand Response (DR) which denotes variations of the electric consumption by users in response to the energy price changes over the time, or in the presence of financial incentives and reliability signals. The transactive energy concept is relevant for DR and building energy management. The GridWise Architecture Council defines TE as "A system of economic and control mechanisms that allows the dynamic balance of supply and demand across the entire electrical infrastructure using value as a key operational parameter". The keynote will highlight the challenges for DR initiatives for residential loads in smart grids and will describe an Internet of things (IoT) based Platform for Peer-to-Peer Transactive Energy Exchanges.

Wednesday, September 5 12:40 - 13:10

Closing Remarks and Awards

Room: Berlin 1

Chair: Reinhard Moeller (University of Wuppertal, Germany)