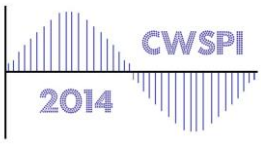
7th Cyprus Workshop on Signal Processing and Informatics

University of Cyprus, *Nicosia, Cyprus*
New Campus, THEE001 ROOM 148

July 15, 2014 13:45-19:20 hrs



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FINAL PROGRAM AND BOOK OF ABSTRACTS

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IEEE EMBS Cyprus Section

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Preface:

Following the successful one-day workshop we had in the last six years, we would like to cordially invite you to participate in the upcoming 7th Cyprus Workshop on Signal Processing and Informatics (CWSPI 2014).

The overall objective of CWSPI 2014 is to disseminate new research results in several areas and help establish industry, university, and multi-university collaborations. The workshop is mainly targeted to our graduate students to present their most recent findings.

This one-day workshop hosts presentations by faculty, students, and industry researchers in the areas of signal processing image processing and analysis and informatics. A total of 16 abstracts are presented into 3 different sessions. These sessions are the following: *Intelligent and Cognitive Systems, Biomedical Signal, Image and Video Processing,* and *Signal & Image Processing & Analysis.*

Furthermore, we would like to express our thanks to Prof. Nikos Papanikolopoulos, for willing to give the keynote talk entitled: *Computer vision and mental health (autism, ocd, schizophrenia, anxiety). How computer vision can do Behavioural Assessment through Behaviour Analysis.*

Last but not least, we would like to express our sincere thanks to IEEE Cyprus Section, the IEEE EMBS/Signal Processing Cyprus Chapter, the IEEE CIS Cyprus Chapter and the IET Cyprus Network for their support and sponsorship.

Wishing you a fruitful and joyful event.

E. Kyriacou, C. P. Loizou, A. Spanias, C.S. Pattichis
July 2014

Topics:

- Digital signal and image processing
- Sensor networks and signal analysis
- Biomedical signal, image, and video analysis
- Wireless communications and signal processing
- Multimedia systems
- Speech, and audio, processing
- Cognitive systems
- FPGAS in signal, image and video processing.

Workshop Organizing Committee:

Chair:	*C. P. Loizou,* Intercollege, Cyprus
Co-Chair:	*E. Kyriacou,* Frederick University, Cyprus
Program Chair:	*A. Spanias,* Arizona State University, USA
Program Co-Chair:	*M.S. Pattichis,* University of New Mexico, USA
Local Arrangements:	*C. S. Pattichis,* University of Cyprus, Cyprus
Publications:	*M. Neophytou,* University of Cyprus, Cyprus
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Technical Program

TIME	SESSIONS
13:45	**Introductions and Refreshments**
13:55	**Welcome** *Andreas Spanias*, Arizona State University, USA
14:00-16:00	**SPECIAL SESSION 1: Intelligent and Cognitive Systems** **Chair:** *Kleanthis Neokleous,* Dept. of Computer Science, University of Cyprus, & Silversky3D Ltd
14:00-14:15	**Cognitive Modeling of Visual Selective Attention and Virtual Reality applications** *Kleanthis* Neokleous, Dept. of Computer Science, University of Cyprus, & Silversky3D Ltd Marios Avraamides, Department of Psychology, University of Cyprus
14:15-14.30	**Virtual reality in behavioral research and practice** *Marios N*. Avraamides, Experimental Psychology Lab, Department of Psychology, University of Cyprus
14:30-14:45	**Automatic Emotion Recognition based on Body Movement Analysis** *Zacharatos Haris & Chrysan*thou Yiorgos, Computer Graphics Lab, Department of Computer Science, University of Cyprus
14:45-15:00	**Facial Aging Research Using the FG-NET Aging Database: Methodologies, Benchmark Results and Future Directions** *Gabriel Panis & Andreas Lanitis, Visual Media Computing Lab, Dept. of Multimedia and Graphic Arts, Cyprus University of Technology*
15:00-15:45	**Keynote Lecture:** **Computer vision and mental health (autism, ocd, schizophrenia, anxiety). How computer vision can do Behavioral Assessement through Behavior Analysis** *Prof. Nikos* Papanikolopoulos, Distinguished McKnight University Professor, Department of Computer Science and Engineering University of Minnesota
15:45-16:00	**Discussion**
16:00-16:15	**Coffee Break**
16:15-18:00	**SESSION 2: Biomedical Signal, Image, and Video Analysis** **Chair:** *Efthyvoulos Kyriacou*, Frederick University
16:15-16:30	**M-Health Video Communication Systems: Current Status and Future Directions** *Z. Antoniou, A. Panayides, M.S. Pattichis, A. G. Constantinides, A. Spanias, and C. S. Pattichis, Dept. of Computer Science, University of Cyprus, Nicosia, Cyprus, Dept. of Electrical and Electronic Engineering, Imperial College, London, UK. Dept. of Elect. and Comp. Eng., University of New Mexico, Albuquerque, USA, Sch. of Elec., Comp., and Energy Eng. at Arizona State University (ASU), Tempe, USA*
16:30-16:45	**The development of an automated framework that will be used for the timely and efficient assessment of different video encoding methods** *I. Rodotheou, A. Argyrou, A. Panayides , C. Pattichis , Dept. of Computer Science, University of Cyprus, Nicosia, Cyprus* *C. Loizou, Intercollege, Cyprus* *M.S. Pattichis, Dept. of Elect. and Comp. Eng.,University of New Mexico, Albuquerque, USA*

	A. Spanias, Sch. of Elec., Comp., and Energy Eng. at Arizona State University (ASU), USA *A.Panayides , Dept. of Electrical and Electronic Engineering, Imperial College, London, UK*
16:45- 17:00	**Real-time transmission of ultrasound video over High Speed Packet Access (HSPA) wireless infrastructure using open source technologies** *A. Argyrou, I. Rodotheou, C. Pattichis* *Dept. of Computer Science, University of Cyprus, Nicosia, Cyprus* *C. Loizou, Intercollege, Cyprus* *E. Kyriacou, Department of Computer Science and Engineering, Frederick University, Cyprus* *M.S. Pattichis, Dept. of Elect. and Comp. Eng.,University of New Mexico, Albuquerque, USA* *A. Spanias, Sch. of Elec., Comp., and Energy Eng. at Arizona State University (ASU), Tempe, USA* *A. Panayides, Dept. of Electrical and Electronic Engineering, Imperial College, London, UK*
17:00- 17:15	**Characterisation of attenuation and respiratory motion artefacts in Single Photon Emission Tomography (SPECT) Myocardial Perfusion Imaging (MPI) and their influence on diagnosis** *Isabelle Chrysanthou-Baustert, Antonios Lontos, Antonis Antoniou, Yiannis Parpottas, Frederick Research Centre, Cyprus* *Ourania Demetriadou, Christoforos Panayidis, Dimitris Kaolis, Stelios Christofides, Medical and Public Health Services, Ministry of Health, Cyprus* *Irene Polykarpou, Lefteris Livieratos, King's College London, UK*
17:15- 17:30	**Discriminating between wakefulness and anesthesia: a graph theoretical study** *Eleni Demarchou, Nicoletta Nicolaou, and Julius Georgiou, Holistic Electronics Research Lab, Dept. of Electrical and Computer Engineering, University of Cyprus, Cyprus*
17:30- 17:45	**Decoding EEG motion signals with Echo State Networks: A Brain-Computer Interface approach** *Michalis Agathocleous, Chris Christodoulou, Department of Computer Science, University of Cyprus*
17:45- 18:00	**Pre hospital emergency care Management System** *S. Christou, R. Constantinou, E. Kyriacou, Department of Computer Science and Engineering, Frederick University, Ambulance Department, Ministry of Health*
18:00- 18:15	**Coffee Break**
18:15- 19:15	**SESSION 3: Signal & Image Processing & Analysis** **Chair:** *Christos Loizou,* Intercollege
18:15- 18:30	**Distributed Stopping for Average Consensus in Directed Graphs via Randomized Event-Triggered Strategies** *Nicolas E. Manitara, Department of Electrical and Computer Engineering, University of Cyprus, Christoforos N. Hadjicostis, Department of Electrical and Computer Engineering, University of Cyprus*
18:30- 18:45	**Automated Classification in Vocal/Instrumental parts of Folk Songs** *Andreas Neocleous, Nicolai Petkov and Christos N. Schizas* *Department of Computer Science, University of Cyprus, Johann Bernoulli Institute for Mathematics and Computer Science, University of Groningen, The Netherlands*
18:45- 19:00	**Image Segmentation using Environment Map Lighting** *Nikolas Ladas and Yiorgos Chrysanthou, University of Cyprus*
19:00- 19:15	**Real-Time Obstacle Avoidance for Mobile Robots via Stereoscopic Vision Using Reconfigurable Hardware** *Martinianos Papadopoulos & Theocharis Theocharides, KIOS Research Center*
19:15- 19:20	**CLOSING REMARKS**

Abstracts

SPECIAL SESSION 1: Intelligent and Cognitive Systems

Cognitive Modeling of Visual Selective Attention and Virtual Reality applications

Kleanthis Neokleous, Dept. of Computer Science, University of Cyprus, & Silversky3D Ltd
Marios Avraamides, Department of Psychology, University of Cyprus

Abstract: A fundamental aspect of the biological visual system is that of selective attention i.e., the ability to select, focus, and process only a small subset of the information that is registered by the sensory organs and ignore the rest. In this presentation an overview of cognitive modeling of visual selective attention will be presented with potential applications in computer vision. Furthermore the potentials to contribute in the cognitive systems research and the industry by correlating visual selective attention and spatial cognition concepts using virtual reality technology will be analyzed.

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Virtual reality in behavioral research and practice

Marios N. Avraamides, Experimental Psychology Lab, Department of Psychology, University of Cyprus, mariosav@ucy.ac.cy

Abstract: Although Virtual Reality (VR) technology is nowadays in the spotlight due to the rise of the gaming industry and the development of more affordable products, it has been used by scientists for years to carry out research in the social sciences and to create intervention tools for clinical purposes. Here, we will present an overview of the research potential of VR by providing examples from our own work on spatial cognition and other topics. We will also discuss the potential of using VR to fields outside the social sciences (e.g., architecture, construction).

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Automatic Emotion Recognition based on Body Movement Analysis

Zacharatos Haris & Chrysanthou Yiorgos, Computer Graphics Lab, Department of Computer Science, University of Cyprus

Abstract: Humans are emotional beings and their feelings influence the way they perform and interact with computers. One of the most expressive modalities for humans is body motion. Even though there has been an increase interest lately in the use of body motion for emotion recognition, existing methods are experimental and the topic remains largely untamed.
In this talk we will describe some of our latest work in the application of body movement analysis on the challenging task of automatic emotion recognition. In addition we will present some work in progress in motion segmentation and emotion identification which can help in real-time applications of emotion recognition.

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Facial Aging Research Using the FG-NET Aging Database: Methodologies, Benchmark Results and Future Directions

Gabriel Panis & Andreas Lanitis, Visual Media Computing Lab, Dept. of Multimedia and Graphic Arts, Cyprus University of Technology
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Abstract: The FG-NET aging database was made publicly available in 2004 in an attempt to support research activities related to facial aging. Since then a number of researchers used the database for carrying out research in various disciplines including age estimation, age-invariant face recognition and age progression. Based on the analysis of published work where the FG-NET aging database was used, conclusions related to the research carried out in relation to the impact of the dataset in shaping up the research topic of facial aging, are presented. The paper also includes a review of key articles from different thematic areas where the FG-NET aging database was used and the presentation of benchmark results reported in the literature. The ultimate aim of this article is to present concrete facts related to research activities in facial aging during the last decade, provide an indication of the main methodologies adopted and most importantly provide roadmaps for future trends, requirements and research directions in facial aging.

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Computer vision and mental health (autism, ocd, schizophrenia, anxiety). How computer vision can do Behavioral Assessement through Behavior Analysis

Nikos Papanikolopoulos

Distinguished McKnight University Professor
Comp. Science and Engineering
Univ. of Minnesota

Abstract:

Not available.

Short bio:
Nikolaos P. Papanikolopoulos (IEEE Fellow) received his Ph.D. in electrical and computer engineering from Carnegie Mellon University, Pittsburgh, PA, in 1992. Currently, he is a Distinguished McKnight University Professor in the Department of Computer Science at the University of Minnesota and Director of the Center for Distributed Robotics and SECTTRA. His research interests include computer vision, sensors for transportation applications, robotics, and control. He has authored or coauthored more than 350 journal and conference papers in the above areas (more than seventy refereed journal papers). He received the Richard P. Braun Distinguished Service Award for his transportation work in 2013.

Session 2: Biomedical Signal, Image, and Video Analysis

M-Health Video Communication Systems: Current Status and Future Directions

Z. Antoniou[1], A. Panayides[1,2], M.S. Pattichis[3], A. G. Constantinides[2], A. Spanias[4], and C. S. Pattichis[1] , [1]Dept. of Computer Science, University of Cyprus, Nicosia, Cyprus, [2]Dept. of Electrical and Electronic Engineering, Imperial College, London, UK. [3]Dept. of Elect. and Comp. Eng., [4]University of New Mexico, Albuquerque, USA, Sch. of Elec., Comp., and Energy Eng. at Arizona State University (ASU), Tempe, USA

Abstract: The adoption of mobile-health (m-health) medical video communication systems in standard clinical practice will benefit from the emergence of the new High Efficiency Video Coding (HEVC) standard and wide availability of 4G (and beyond) wireless networks. The deployment of such medical video communication systems can deliver sufficiently high resolutions and video frame rates with the low-delay and low packet loss rates requirements for matching the quality of experience of in-hospital ultrasound examinations. This study provides an overview of m-health systems of the last decade, discusses the increasing trend for diagnostically driven systems, and highlights future directions.

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The development of an automated framework that will be used for the timely and efficient assessment of different video encoding methods

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A. Spanias, Sch. of Elec., Comp., and Energy Eng. at Arizona State University (ASU), Tempe, USA
A.Panayides, Dept. of Electrical and Electronic Engineering, Imperial College, London, UK

Abstract: The objective of this study is twofold: (i) firstly, to investigate the development of an automated framework that will be used for the timely and efficient assessment of different video encoding methods using big video data sets; (ii) secondly, to investigate the use of different video coding standards for ultrasound video communications, and more importantly to assess the efficiency of the new High Efficiency Video Coding (HEVC) standard. Further to that, the use of different ultrasound video denoising methods prior to video encoding is also investigated, to demonstrate the ability of the proposed platform to accommodate the comparison of different encoding approaches.
A thorough comparison of MPEG-2, H.263, MPEG-4, H.264/AVC, and HEVC standards was performed using a data set comprised of ten atherosclerotic plaque ultrasound videos. Experimental evaluation showed that the new HEVC standard reduced bitrate demands up to 33.2% compared to the H.264/AVC standard, which extended up to 71% compared to earlier MPEG-2 standard, for comparable clinical video quality. The use of despeckle filtering prior to encoding depicted that additional significant bitrate savings can be achieved without compromising the ultrasound video's clinical capacity. More specifically, experimentation using three despeckle filters, showed that the best performing linear despeckle filter can yield bitrate gains up to 43.6% and 39.2% compared to standard HEVC and H.264/AVC encodings, respectively.

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Real-time transmission of ultrasound video over High Speed Packet Access (HSPA) wireless infrastructure using open source technologies

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A.Panayides, Dept. of Electrical and Electronic Engineering, Imperial College, London, UK

Abstract: This study reports on the use of open-source technologies for developing an eHealth medical video communication framework. The objective is to investigate the feasibility of using a low-cost open-source solution for the diagnostically robust real-time transmission of ultrasound video. To validate the efficiency of the proposed system experiments were performed over widely deployed High Speed Packet Access (HSPA) wireless infrastructure in Cyprus. The data set consisted of ten atherosclerotic plaque ultrasound videos with a spatial video resolution 560x416 at 25 frames per second, encoded at 768 kbps and 1024 kbps using the H.264/AVC standard. In addition to the original video, three despeckled filters were examined as a pre-processing step. Results showed that videos encoded at 1024 kbps attained objective quality ratings (e.g. peak-signal-to-noise-ration (PSNR)) higher that the clinically acceptable threshold of 35 dB. This was not the case for videos encoded at 768 kbps. Moreover, ultrasound videos that were subject to denoising achieved higher PSNR scores than standard H.264/AVC encodings for the same bitrate.

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Characterisation of attenuation and respiratory motion artefacts in Single Photon Emission Tomography (SPECT) Myocardial Perfusion Imaging (MPI) and their influence on diagnosis

Isabelle Chrysanthou-Baustert, Antonios Lontos, Antonis Antoniou, Yiannis Parpottas, Frederick Research Centre, Cyprus, Ourania Demetriadou, Christoforos Panayidis, Dimitris Kaolis, Stelios Christofides, Medical and Public Health Services, Ministry of Health, Cyprus
Irene Polykarpou, Lefteris Livieratos, King's College London, UK

Abstract:
Background: Attenuation and respiratory motion are major sources of artefacts in SPECT MPI and affect diagnosis. Firstly, there is the photon attenuation due to the anatomy surrounding the heart e.g. mainly the diaphragm in men and the breast in females; secondly, the motion of the heart due to respiration and thirdly, the combination of the two previous artefacts resulting in a potential mismatch of transmission (SPECT) and emission scan (CT) used for attenuation correction. A dynamic anthropomorphic phantom including a comprehensive respiratory motion assembly was used to characterise and investigate each source of artefact separately and in a combined manner.
Methods: The phantom was scanned during various amplitudes of respiratory motion as well as in static gates of the respiratory cycle. The acquisitions were repeated for an average male, a large male and a large female phantom into which a normal heart or a heart with small or large defects were introduced. The acquisitions were reconstructed with no AC (Attenuation Correction), with AC and using mismatched transmission and emission scan. The data was analysed visually, and artefact characteristics were extracted through quantitative analysis of the signal intensity in the 17 segments of the Left Ventricle (LV). Further, two experienced physicians performed diagnosis and diagnostic accuracy, specificity and sensitivity were calculated for the different types of acquisition and reconstruction.
Results: Attenuation affects the basal LV segments by lowering the signal intensity in those segments. The attenuation artefacts in the non AC images leads to an increase in False Negatives (FN) for small defects compared to AC images. Respiratory motion affects mainly anterior and inferior and to a lesser extend septal segments by reducing the measured counts in those areas and lateral segments by increasing the signal in those segments. Visually the cranio-caudal heart motion can be recognised in short axis slices and the vertical long axis slices. Motion increases the False Positives (FP) in normal hearts compared to static acquisitions. Concerning artefacts due to SPECT and CT misregistration for shallow tidal breathing, our results indicate that by registering SPECT and CT and under the assumption that the heart and the diaphragm move in synchronisation with similar amplitudes, artefacts are minimal and do not affect diagnosis. Artefacts are generated only for situations where, for the CT acquisition, the lung volume around the heart is increased without shifting the heart caudally.
Conclusions: Attenuation and motion produce characteristic artefacts in the SPECT MPI images with different consequences for diagnosis. SPECT and CT mismatch due to normal breathing can be overcome by registering the LV of both modalities.

This work is part of the project ΥΓΕΙΑ/ΔΥΓΕΙΑ/0311/27 (BIE) and is co-financed by the European Regional Development Fund and the Republic of Cyprus through the Research Promotion Foundation.

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Discriminating between wakefulness and anesthesia: a graph theoretical study

Eleni Demarchou, Nicoletta Nicolaou, and Julius Georgiou, Holistic Electronics Research Lab, Dept. of Electrical and Computer Engineering, University of Cyprus, Cyprus

Abstract: Surgical anesthesia consists of the main components of unconsciousness / amnesia, analgesia and immobility. These objectives are achieved by the administration of different drugs (anesthetics, opioids and muscle relaxants respectively). In rare events, it is possible that anesthesia is not successful, resulting in awareness during anesthesia – a frightening experience for the patient. In these cases the patient regains consciousness, but is unable to move due to the action of the muscle relaxants, which makes it impossible for the patient to alert the anesthetist. Several devices have been developed to monitor for awareness during anesthesia based on changes in the patient's electrical brain activity; however, these devices suffer from a number of reliability issues.

In this study the electroencephalogram (EEG) of 10 patients during surgery is analysed using time-delayed correlation and graph theoretical measures to identify dynamic anesthetic-induced changes in the brain network. This was achieved using: (1) time-lagged correlation to investigate changes in the linear relationships between different EEG electrodes, and (2) graph theory to investigate the changes occurring in the wider brain network due to the administration of anesthetic drugs. Time-lagged correlation also provides information regarding the time scale at which similarities in the brain activity cease to exist, which is useful for identifying the time scale at which significant changes in network dynamics occur during anesthesia. The graph theoretical measures used to study the resulting brain networks are the shortest path length, λ, and clustering, c: large λ and c indicate a network with impaired long-range connections and large local neighbourhoods (and vice versa).

The results of this study confirm that communication in the brain is disrupted during anesthesia: both λ and c increase significantly (Wilcoxon signed rank test, α=0.05) during anesthesia at short time delays, indicating a breakdown of long-range connections and the creation of more localized neighbourhoods. Communication between different brain areas is impaired and direct connections linking areas that are further away are interrupted. Simultaneously, each region develops new connections with nearby areas. These observations imply that information transfer cannot be completed successfully, indicating that the mechanism used by the brain to register a conscious event breaks down during anesthesia. The use of such techniques has wider significance in both understanding and explanation of the action of anesthetics, and the future design of more reliable anesthesia monitoring systems.

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Decoding EEG motion signals with Echo State Networks: A Brain-Computer Interface approach

Michalis Agathocleous, Chris Christodoulou, Department of Computer Science, University of Cyprus

Abstract: Brain Computer Interface (BCI) is a communication system that does not require any peripheral muscular activity but enables a subject to send commands to an electronic device only by means of brain activity. BCIs have been developed primarily as communication devices for people who cannot use their muscles because of various diseases. In many existing BCIs, ElectroEncephaloGraphy (EEG) is used to record the brain electrical activity patterns along the scalp. In this work, we have used EEG data that have been collected from real subjects. The data was related with classification of a subject's mental state according to continuous EEG signals without trial structure. The EEG signals have been pre-processed by Signal Processing Algorithms (Fast Furrier Transform, Band-Pass filtering and Wavelet Transform) to extract temporal and frequency features. The data analysis has shown that mu rhythm (8-12 Hz) of EEG signals can be used to identify chunks of data related to motion. Then an Echo State Network (ESN), which to the best of our knowledge has not previously been used for Motor Imagery (MI)-based BCIs, is used to classify the chunks of data to right and left hand motion. Our BCI system shows promising preliminary results, which demonstrate its accuracy.

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A Pre-hospital Emergency care Management System

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Abstract: Through this work we had created a pilot system that supports the management of pre-hospital emergency. The system will be installed at the ambulance response centre in order to support the procedure followed from the time that a call is received until the patient is transferred to the hospital. In order to support this procedure the system features the following:

- Support of emergency dispatch protocols
- Live monitoring of ambulance vehicles status and incident involved
- Real time data exchange of ambulance and call centre
    - Each vehicle will be equipped with a 7 inch android tablet pc through which paramedics can get information about the incident and can send information back to the control centre through 3G network
- Live monitoring of patients at incident scene and during their transport through a portable telemedicine unit
- Information available at First Aid control that can be evaluated for the need of emergency surgery operations as well.

The system is currently under pilot evaluation and it is expected that the next steps will be its evaluation in real praxis scenarios.

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Session 3: Signal & Image Processing & Analysis

Distributed Stopping for Average Consensus in Directed Graphs via Randomized Event-Triggered Strategies

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Abstract: We consider how iterative strategies for asymptotic average consensus in directed graphs (digraphs) can be adapted so that the nodes can determine, in a distributed fashion, a stopping criterion that allows them to terminate the execution of the iteration when approximate average consensus has been reached. The nodes are said to have reached approximate average consensus when each of them has a value that is close to the desirable average (in a way that we precisely define). The absence of bidirectional communication links in a digraph makes this task challenging because, for a pair of agents, only one of them may be aware of a discrepancy and may have no direct way of informing the other. The algorithm we propose can be used in practical settings to cap the number of transmissions that are required in order to reach (approximate) average consensus. We compare the number of transmissions of the proposed distributed algorithm against a centralized (non distributed) scheme that relies on an oracle to determine when to terminate the iterative algorithm once the nodes have reached approximate average consensus.

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Automated Classification in Vocal/Instrumental parts of Folk Songs

Andreas Neocleous[1,2], Nicolai Petkov[2] and Christos N. Schizas[1]
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Abstract: One artificial neural network (ANN) system is introduced, that perform automated audio annotation and segmentation of Cypriot folk songs into meaningful musical information. Low-level features such as Mel Frequency Cepstrum Coefficients, zero crossing rates, spectral spread were extracted from a training set. The low-level feature dataset was used to create ANNs in a supervised manner. This system takes as input a polyphonic song and it identifies the boundaries of the instrumental and vocal parts. For the classification of the "vocal – instrumental" a precision of 0.85 and recall of 0.83 has been achieved. From the obtained results we concluded that the timbre low-level features were able to capture the characteristics of the audio signals. Also, that the specific ANN structures were suitable for the specific classification problem and outperformed classical statistical methods.

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Image Segmentation using Environment Map Lighting

Nikolas Ladas and Yiorgos Chrysanthou, University of Cyprus

Abstract: We propose an image segmentation method that splits the image into three parts: the target object, the background and the shadows cast by the target object. The segmentation is enabled through the use of high dynamic range imaging and an environment map capture, representing the incoming illumination. Our method identifies light sources in the environment map and solves a linear system to determine the visibility of each light source for each image pixel. Depending on the visibility, each pixel is then categorized as either object, background or shadow. Identification of shadows can be achieved even in the presence of several light sources with varying intensities and color. The segmentation allows for many interesting applications such as object repositioning and relighting, or for improved accuracy in object tracking.

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Real-Time Obstacle Avoidance for Mobile Robots via Stereoscopic Vision Using Reconfigurable Hardware

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Abstract: An embedded, real-time, and low power obstacle avoidance system is a critical component towards fully autonomous robots that can be used in safety missions, space exploration, and transportation systems among others. This paper presents a holistic platform for evaluation of obstacle avoidance systems and autonomous robots, based on reconfigurable hardware. The platform integrates an obstacle avoidance algorithm that uses depth information extracted from a stereoscopic camera. The platform is optimized and implemented using a low-power FPGA-based hardware architecture, enabling its use in battery-operated environments. The platform is comprised of an ATLYS Spartan-6 FPGA board hosting all relevant algorithms, and a modified FDX Vantage 1/10 electric car platform used for navigation. The evaluation under real world conditions indicates that the platform is capable of real-time obstacle avoidance and navigation, with accuracy (~ 92%) equivalent to software implementations.

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