8th Cyprus Workshop on Signal Processing and Informatics

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

July 3, 2015 13:45-19:00 hrs

http://cwspi.cs.ucy.ac.cy

FINAL PROGRAM AND BOOK OF ABSTRACTS

Organized and Sponsored by:

University of Cyprus | Cyprus University of Technology 2004 | Frederick University | ASU Arizona State University | UNM

Technically Co-Sponsored by:

IEEE Cyprus Section | IEEE Computational Intelligence Society | IEEE EMB Cyprus Chapter | IET Collective inspiration

Table of Contents

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 8th Cyprus Workshop on Signal Processing and Informatics (CWSPI 2015).

The overall objective of CWSPI 2015 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. We would like to express our sincere thanks to Prof. Nikos Papanikolopoulos and Prof. Petros Ioannou, for willing to give the keynote talks entitled *Computer Vision for Precision Agriculture* and *Adaptive Rejection of Unknown Narrow Band Disturbances in LTI Systems,* respectively.

A total of 10 abstracts are presented into 2 different sessions. These sessions are the following: *Intelligent and Cognitive Systems,* and *Biomedical Signal, Image and Video Processing.*

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.

M. Neofytou, A. Panayides, A. Spanias, C.S. Pattichis
July 2015

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:	*M. Neofytou,* University of Cyprus, Cyprus
Co-Chair:	*A. Panayides,* University of Cyprus, Cyprus
Program Chair:	*A. Spanias,* Arizona State University, USA
Program Committee:	*M.S. Pattichis,* University of New Mexico, USA
	C. P. Loizou, Intercollege, Cyprus
	E. Kyriacou, Frederick University, Cyprus
Local Arrangements:	*C. S. Pattichis,* University of Cyprus, Cyprus
Publications:	*C. P. Loizou,* Intercollege, Cyprus
Liaison/Publicity:	*T. Kasparis,* Cyprus University of Technology, Cyprus
Webmaster:	*C. Polyviou,* University of Cyprus, Cyprus

Venue:

Department of Computer Science, University of Cyprus (New Campus),
THEE001 ROOM 148,
P.O.Box. 20537, CY-1678 Nicosia,
CYPRUS

More info:
Tel.: + 357-22-892700, Fax: + 357-22-892701, e-mail: cs@ucy.ac.cy

Webpage:

http://cwspi.cs.ucy.ac.cy
&
http://www.ehealthlab.cs.ucy.ac.cy/

or

Visit us on Facebook: cwspi cyprus

(see Facebook site for news and pictures https://www.facebook.com/cwspi.cyprus)

Technical Program

TIME	SESSIONS
13:45	**Introductions and Refreshments**
13:55	**Welcome** *Andreas Spanias*, Arizona State University, USA
14:00-15:15	**SESSION 1: Intelligent and Cognitive Systems** **Chair:** *Despina Michael,* GET Lab, Cyprus University of Technology
14:00-14:15	**On the identification of pornographic webpages using text and structure** *Theodoros Danos and Nicolas Tsapatsoulis,* Department of Communication and Internet Studies, Cyprus University of Technology
14:15-14.30	**Social pressure from agents in a virtual environment: an investigation of conformity level** Christos Kyrlitsias and Despina Michael, GET Lab, Cyprus University of Technology
14:30-14:45	**Aging Simulation in a VR Environment** Christina Zavlanou and Andreas Lanitis, Visual Media Computing Lab, Dept. of Multimedia and Graphic Arts, Cyprus University of Technology
14:45-15:00	**On the Evaluation of Age Progression Applications** Kleanthis Soteriou, Elli Kyriakou and Andreas Lanitis, Visual Media Computing Lab, Dept. of Multimedia and Graphic Arts, Cyprus University of Technology Nicolas Tsapatsoulis, Social Computing Lab, Dept. of Communication and Internet Studies, Cyprus University of Technology
15:00-15:15	**Disaster Control and Crisis Management System** S. Christou and E. Kyriacou, Department of Computer Science and Engineering, Frederick University, Cyprus R. Constantinou, Ambulance Department, Ministry of Health, Cyprus
15:15-16:00	**SESSION 2: Keynote Lecture 1:** **Computer Vision for Precision Agriculture** *Nikos Papanikolopoulos* Distinguished McKnight University Professor Computer Science and Engineering, University of Minnesota
16:00-16:30	**Coffee Break**
16:30-17:15	**SESSION 3: Keynote Lecture 2:** **Adaptive Rejection of Unknown Narrow Band Disturbances in LTI Systems** *Petros Ioannou* Electrical Engineering Systems, University of Southern California, USA
17:15-18:45	**SESSION 4: Biomedical Signal, Image, and Video Analysis** **Chair:** *Marios Neophytou*, University of Cyprus
17:15-17:30	**Non-contact recording of human cardiac and respiration rates by Magnetic Induction Tomography** Georgios Panagi and Sotos Voskarides, Department of Electrical Engineering, Computer Engineering and Informatics, Cyprus University of Technology, Limassol, Cyprus Ralf Patz, Fachbereich Informatik und Elektrotechnik, University of Applied Sciences, Kiel, Germany Stuart Watson, Salford Royal NHS Foundation Trust, Stott Lane, Salford, UK
17:30-17:45	**Estimating the Extend of Lung Involvement Using a Dual Head Stethoscope: Initial Simulations** Panos Ntoas and Costas Pitris, KIOS Research Center, Department of Electrical and Computer Engineering, University of Cyprus

17:45-18:00	**Evaluation of the Refrigeration Time and the Bacterial Load of Pork Using Raman Spectroscopy** Constantinos Timinis and Costas Pitris, KIOS Research Center, Dept. Electrical and Computer Engineering, University of Cyprus
18:00-18:15	**Development of a New Spectroscopic Metric for Scatterer Size Estimation Using Optical Coherence Tomography (OCT)** Michalis Kassinopoulos and Costas Pitris, KIOS Research Center, Department of Electrical and Computer Engineering, University of Cyprus
18:15-18:30	**A unifying framework for m-Health video communication systems using HEVC for emergency scenery videos** Z. Antoniou and C. S. Pattichis, Department of Computer Science, University of Cyprus, Nicosia A. S. Panayides and A. G. Constantinides, Department of Electrical and Electronic Engineering, Imperial College, London, UK M. S. Pattichis, Department of Electrical and Computer Engineering, University of New Mexico, Albuquerque, USA S. Stavrou, Faculty of Pure and Applied Sciences, Open University of Cyprus, Nicosia, Cyprus E. Kyriacou, Department of Computer Science and Engineering, Frederick University, Cyprus A. Spanias, School of Electrical, Computer, and Energy Engineering at Arizona State University, USA
18:30-18:45	**Analyzing of genetic data by a novel NGS platform 'ScaleSeq'** Christa Philippou, Athos Antoniades and Constantinos Pattichis, Department of Computer Science, University of Cyprus, Nicosia
18:45-19:00	**CLOSING REMARKS**

Abstracts

SESSION 1: Intelligent and Cognitive Systems

2.00-3.15hrs

2.00-2.15hrs

On the identification of pornographic webpages using text and structure

Theodoros Danos and Nicolas Tsapatsoulis, Department of Communication and Internet Studies, Cyprus University of Technology

Abstract: Identification of pornographic webpages is currently facilitated statically, with the aid of maintained directories, or dynamically through algorithms that analyze the visual content of a webpage to find large portions of skin-like colors. Given that the pornographic material distribution market is one of the bigger in the Internet the first category of approaches requires huge manual effort. The latter category faces the typical problems that prohibited the development of truly intelligent computer vision systems. They are based on low level features (skin color identification) lacking the semantics.

In this work we propose a practical system to detect pornographic webpages that is based exclusively on text content and structure information. Despite the high recall and precision values we achieve, our system can be combined with existing methods that are based on visual content to bridge the semantic gap. The approach we followed is similar to the one used for webpage classification. However, the innovation of our work is clear: We first choose the most appropriate tokens that can differentiate between pornographic and non-pornographic webpages. The selected tokens are those optimizing the *tf-df* (term frequency x document frequency) score in the given training corpus. The definition of the *tf-df* metric, which is a variation of the well known *tf-idf* metric widely used in vector space models for document classification, is also a specific contribution to the corresponding state of the art. The list of chosen tokens are freely presented to the research community to allow additional experimentation and verification of our results. The third innovative aspect of our work is the suggestion of specific structure-based features which they extend the vector space representation of each webpage used for classification. The selection of these features was based on the optimization of the ratio:

$$C(f) = \frac{\sum_{i \in S^+} W_i(f)}{\sum_{j \in S^-} W_j(f)} \quad (1)$$

where f is a specific structure-based feature (for instance the proportion of <a> tags that contain one of the previously chosen tokens, the proportion of number of images in the webpages compared to the corresponding proportion in the training corpus), $W_i(f)$ is the value of this feature in the webpage W_i, S^+ is the set of pornographic webpages in the training corpus while S^- is the set of non-pornographic webpages.

Finally, the proposed system was fully implemented using open source tools, including Python, NLTK (natural language toolkit), and the Weka wrapper and Beautiful Soup libraries for Python. The code is freely available under the Creative Commons license[1].

Corresponding Author: Theodoros Danos,Department of Communication and Internet Studies, Cyprus University of Technology, ta.danos@recomm.org

[1] http://creativecommons.org

2.15-2.30hrs

Social pressure from agents in a virtual environment: an investigation of conformity level

Christos Kyrlitsias and Despina Michael, GET Lab, Cyprus University of Technology

Abstract: Virtual Reality has been exploited in various ways in aspects related to psychology and cognitive sciences for investigating humans' behaviour. In this study, we used an immersive virtual environment to investigate the extent to which social pressure from a majority group could affect a person to conform, even if the confederates were agent avatars. The procedure that was followed is based on Asch (1951) conformity experiments. The setup includes Oculus Rift HMD for 3D immersive viewing and head tracking. The application created using Unity 3D game engine, the environment using Autodesk Maya and virtual characters using Autodesk Character Generator. Participants, embodied in a gender-matched virtual body, asked to answer a simple -12 trial vision test after they hear the replies of the confederates in each trial. In 9 out of 12 trials, agent confederates gave unanimous wrong answer. The answers of the participants as well as the time it took them to respond were recorded. Preliminary results demonstrated no distortion on participants' answers, but the time of response seems to be affected by the avatars' majority judgment. The findings of the study indicate conformity by the participants under social pressure.

Corresponding Author: Christos Kyrlitsias, GET Lab, Cyprus University of Technology, c.kyrlitsias@gmail.com

2.30-2.45hrs

Aging Simulation in a VR Environment

Christina Zavlanou, and Andreas Lanitis, Visual Media Computing Lab, Dept. of Multimedia and Graphic Arts, Cyprus University of Technology

Abstract: Aging significantly affects the human body causing important changes in the functionality and abilities of the elderly. However, since aging effects are associated with older people, it is not possible for humans belonging to younger generations to experience the effects of aging. Towards this end we propose the use of a Virtual Reality (VR) based application that allows users to experience the effects of aging. The proposed application targets two main objectives: The first objective is to allow product and software designers to experience problems faced by the elderly so that they design products friendly to older people. The second objective is to increase the appreciation and social inclusion towards the elderly. The development of this application relies on an extensive study of the literature that describes biological changes due to aging, so that several aging-related effects are simulated in a VR environment in order to allow users to virtually experience life as an older person. During an experimental evaluation users were requested to complete a simple task in the aging simulated VR-environment using an Oculus Rift, and the reactions of the users are registered using appropriate questionnaires. The results of a preliminary investigation show that users can have a better understanding and appreciation towards older people after they are exposed in a VR aging simulated environment.

Corresponding Author: Christina Zavlanou, Visual Media Computing Lab, Dept. of Multimedia and Graphic Arts, Cyprus University of Technology, christinag.zavlanou @gmail.com

2.45-3.00hrs

On the Evaluation of Age Progression Applications

Kleanthis Soteriou, Elli Kyriakou and Andreas Lanitis, Visual Media Computing Lab, Dept. of Multimedia and Graphic Arts, Cyprus University of Technology
Nicolas Tsapatsoulis, Social Computing Lab, Dept. of Communication and Internet Studies, Cyprus University of Technology

Abstract: The topic of face-aging received increased attention by the computer vision community during the recent years. As a result both a large number of dedicated age progression algorithms were reported in the literature and at the same time a plethora of commercial applications were developed. Despite the rapid development of age progression, related performance evaluation methods are still not fully developed, hence so far it was not possible to accurately compare the performance of different age progression methodologies. In this paper we describe a systematic evaluation approach that can be used for assessing the performance of age progression algorithms. The proposed method relies on the use of a dedicated dataset that shows age-separated face images captured under identical imaging conditions. The evaluation methods involve the use of dedicated machine-based performance evaluation metrics that allow the assessment of the intensity of aging effects added on a face along with an assessment of the identity preservation in age progressed images. Machine-based metrics are also complemented with the use of human-based indicators. The use of the proposed performance evaluation protocol is demonstrated in the task of comparing the performance of seven publicly available age progression commercial applications so that the most accurate age progression application is determined.

Corresponding Author: Kleanthis Soteriou, Visual Media Computing Lab, Dept. of Multimedia and Graphic Arts, Cyprus University of Technology, sotiriou.kleanthis@gmail.com

3.00-3.15hrs

Disaster Control and Crisis Management System

S. Christou and E. Kyriacou, Department of Computer Science and Engineering, Frederick University, Cyprus
R. Constantinou, Ambulance Department, Ministry of Health, Cyprus

Abstract: Through this work, we had created a system, which can support management of rescuers and health services during a major disaster event. The system can be installed in disaster area based on Ad-Hoc network approach. The system consists of a central control station, which has the control of all the rescuers, fire fighters, paramedics and ambulance vehicles working in the area. System's main characteristics are:

- Live monitoring of victims and their evaluation status. (Black, yellow, red, green), estimated age, sex. After the first evaluation, each victim is marked with a card, which has a QRcode or an NFC tag containing all the necessary emergency information.
- Recording of victims assigned to ambulances in order to be transferred to hospitals
- Live monitoring of patients at the victims clearance station through portable telemedicine units, which can help the evaluation through the transmission of subjects' vital biosignals (ECG 3-12 leads and parameters like SpO2 etc.)
- Monitoring of rescuers and fire fighters acting in the area. This includes their geo-location, and their availability (if they are free to move to the next victim or working on a case)
- Fire fighters are able to mark the hot zone boundaries through their mobile unit and indicate hazardous materials or chemicals
- Live monitoring of disaster area through video cameras installed on rescuers' helmets
- Monitoring of ambulance vehicles entering the area and their status (type, occupied or not)
- Everything is traced using Global Positioning System and presented on an area map at the control station
- All information can be transferred to a central control centre, through satellite or 3G networks if available.

The system has been designed and the development of the main parts is completed. It was initially tested in a professional exercise for major disasters with the help of the Cyprus Prehospital and Emergency Association and the Cyprus Special Fire and Rescue Unit (EMAK). Initial results and feedback from rescuers were very promising. These

indicate that the use of such a system can support better information flow, communication and control between all the teams working in a major disaster area.

Corresponding Author: Efthyvoulos Kyriacou, Department of Computer Science and Engineering, Frederick University, Cyprus, e.kyriacou@frederick.ac.cy

Session 2: Keynote Lecture 1

3.15-4.00hrs

3.15-4.00hrs

Computer Vision for Precision Agriculture

Nikos Papanikolopoulos

Distinguished McKnight University Professor
Computer Science and Engineering, University of Minnesota

Abstract:
With the continuously growing need for increasing the production of food and improving water quality, several precision agriculture systems have been developed and deployed over the past decade towards meeting the needs of modern societies. The techniques that support the surveillance and the early detection of deficiencies in the fields without directly interacting with the plants or soil belong to the research area of non-invasive Precision Agriculture (PA). These methods utilize mainly visual sensors with sensitivity to various wavelengths, therefore Computer Vision which deals with the interpretation of visual data by the machine is naturally the dominant field in this area of research. In this presentation, the most significant advancements and applications of Computer Vision in Precision Agriculture will be presented, along with the agricultural problems that the Center for Distributed Robotics at the University of Minnesota is trying to address.

Short bio: Nikolaos P. Papanikolopoulos (IEEE Fellow) received the Diploma degree in electrical and computer engineering from the National Technical University of Athens, Athens, Greece, in 1987, the M.S.E.E. in electrical engineering from Carnegie Mellon University (CMU), Pittsburgh, PA, in 1988, and the 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 (seventy five refereed journal papers).

Coffee Break

4.00-4.30hrs

Session 3: Keynote Lecture 2

4.30-5.15hrs

4.30-5.15hrs

Adaptive Rejection of Unknown Narrow Band Disturbances in LTI Systems

Petros Ioannou
Electrical Engineering Systems, University of Southern California, USA

Abstract: The suppression of unknown narrow band disturbances with time-varying characteristics has many industrial applications. The narrow band disturbances get mixed up with broadband noise of lower amplitude and usually appear at the output of the system. The objective is to use feedback to attenuate or reject the narrow band disturbances without amplifying the broadband noise. In this talk we present the design and stability analysis of an effective adaptive scheme that achieves the following: Rejects the narrow band disturbances whose characteristics can change with time without amplifying the output noise. The scheme employs an over parametrized robust adaptive filter that provides enough freedom to adaptively search for parameters that achieve both objectives namely disturbance rejection and no noise amplification. In addition a feed forward filter is used to increase the gain of the system over the frequency range of the narrow band disturbances and therefore allow the zeros of the plant to be closer to those of the internal model of the disturbance without sacrificing on performance. Simulation results based on a model of a laser beam device are used to demonstrate the results.

Short bio:

Petros A. Ioannou received the B.Sc. degree with First Class Honors from University College, London, England, in 1978 and the M.S. and Ph.D. degrees from the University of Illinois, Urbana, Illinois, in 1980 and 1982, respectively. In 1982, Dr. Ioannou joined the Department of Electrical Engineering-Systems, University of Southern California, Los Angeles, California. He is currently a Professor in the same Department and the Director of the Center of Advanced Transportation Technologies and Associate Director for Research of METRANS, a University Transportation Center. He also holds a courtesy appointment with the Department of Aerospace and Mechanical Engineering and the Department of Industrial Engineering. He was visiting Professor at the University of Newcastle, Australia and the Australian National University in Canberra during parts of Fall of 1988, the Technical University of Crete in summer of 1992 and Fall of 2001 and served as the Dean of the School of Pure and Applied Science at the University of Cyprus in 1995. As the Dean and member of the Senate he pioneered the establishment of the School of Engineering at the University of Cyprus. In 2008/2009 he was a faculty member at the Department of Electrical Engineering and Information Technologies of the Cyprus University of Technology while on sabbatical leave from the University of Southern California. His research interests are in the areas of adaptive control, neural networks, nonlinear systems, vehicle dynamics and control, intelligent transportation systems and marine transportation. Dr. Ioannou was the recipient of the Axelbi Best Paper Award by the IEEE Control System Society in 1984 and of the 1985 Presidential Young Investigator

Award. In 2009 he received the IEEE ITSS Outstanding Intelligent Transportation Systems (ITS) Application Award for his work on Adaptive Cruise Control and the 2009 IET Heaviside Medal for Achievement in Control by the Institution of Engineering and Technology (IET). In 2012 he received the IEEE ITSS Outstanding ITS Research Award. Dr. Ioannou is a Fellow of IEEE, Fellow of International Federation of Automatic Control (IFAC) and Fellow of IET, and the author/co-author of 8 books and over 300 research papers in the area of controls, vehicle dynamics, neural networks, nonlinear dynamical systems and intelligent transportation systems.

Session 4: Biomedical Signal, Image, and Video Analysis

5.15-6.45hrs

5.15-5.30hrs

Non-contact recording of human cardiac and respiration rates by Magnetic Induction Tomography

Georgios Panagi and Sotos Voskarides, Department of Electrical Engineering, Computer Engineering and Informatics, Cyprus University of Technology, Limassol, Cyprus
Ralf Patz, Fachbereich Informatik und Elektrotechnik, University of Applied Sciences, Kiel, Germany
Stuart Watson, Salford Royal NHS Foundation Trust, Stott Lane, Salford, UK

Abstract: Magnetic Induction Tomography (MIT) is a relatively new technique for imaging the passive electromagnetic properties of an object in which alternating magnetic fields are employed for application of an excitation current within a sample.

In comparison to the related technique, Electrical Impedance Tomography (EIT), MIT has the significant advantages that it can operate through air gaps or electrically insulating materials and does not require contact with the object. Proposed applications for MIT include the monitoring of cerebral haemorrhage and oedema, the non-contact recording of the human cardiac and respiration rates. Industrial applications include the monitoring of the water fraction in oil pipelines and the process monitoring of molten steel and glass production.

A fast single-channel MIT system aimed at the fully non-contact recording of human cardiac and respiration rates was designed and constructed. It comprises a single-channel coil arrangement, a signal processing and measurement unit incorporating an FPGA, and a host computer. The system operates at 10 MHz and has a maximum recording rate of 200 Hz. However for the cardiac and respiration measurements a recording rate of 20 Hz was used which is sufficient to record tachycardia. The digital post-processing of the measurements was performed using frequency (FFT) and time-frequency (STFT) analysis in MATLAB.

The MIT system was used to record concurrently the heart rate and the respiration rate of four human volunteers. Both cardiac and respiratory signals could be discriminated and rates measured at lower respiration rates with FFT and STFT. After strenuous activity by the subject however the increased respiratory rates produced a significant higher frequency chest wall motion which overlapped and masked the cardiac frequency component in the MIT signal when processed with FFT but could be discriminated when STFT was used.

Corresponding Author: Georgios Panagi, Department of Electrical Engineering, Computer Engineering and Informatics, Cyprus University of Technology, Limassol, Cyprus, george.panayi@cut.ac.cy

5.30-5.45hrs

Estimating the Extend of Lung Involvement Using a Dual Head Stethoscope: Initial Simulations

Panos Ntoas and Costas Pitris, KIOS Research Center, Department of Electrical and Computer Engineering, University of Cyprus

Abstract: Auscultation of the respiratory system with a stethoscope remains a very important part of the clinical exam. It provides a wealth of diagnostically useful information that includes normal breath sounds and adventitious or "added" sounds such as crackles, wheezes, pleural friction rubs, etc. Crackles are the clicking or crackling noises that may be made in patients with a respiratory disease during inhalation. Crackles are caused by the "popping open" of small airways and alveoli collapsed by fluid, exudate, or lack of aeration during expiration. The most common cause of crackles is pneumonia, although they are also present in a variety of other conditions. The development of computerized lung sound analysis enhances the possibility for clinical utilization of the information on crackles both in diagnosis and in follow-up of pulmonary diseases and possibly also in critical care units. Automatic crackle detection and counting methods have been developed for easy and objective differential diagnosis and assessment [1,2]. In this work, we propose that simultaneously recording crackles using two, spatially separated, stethoscopes could allow not only the detection of the sounds but also an assessment of the severity of the disease and the extent of lung involvement.

In order to assess the validity of this hypothesis, a series of simulations were performed. Initially, the sound corresponding to a single crackle was extracted from actual crackle sounds recorded and available online. The estimated shape and duration of this single crackle correspond well with those in the literature [3]. Using the individual crackle sound and a model of the distribution of the collapsed alveoli in a lung region, the crackle sounds as would be heard by two microphones, placed at a known distance apart, were simulated. This model included a random distribution of alveoli with random popping times during an inspiratory period. The cross-correlation of the simulated recordings from the two microphones was investigated as a measure of the severity of the disease. Indeed, the maximum of the cross-correlation correlates with the lung area involved. These simulation results are very encouraging and, therefore, in vivo, studies are being planned to further explore the possibility of disease severity evaluation using a dual head stethoscope.

1. Kaisla T, Sovijärvi ARA, Piirilä P, Rajala H-M, Haltsonen S, Rosqvist T. Validated method for automatic detection of lung sound crackles. Med Biol Eng Comput 1991; 29: 517–521.
2. Flietstra, B., Markuzon, N., Vyshedskiy, A., & Murphy, R. (2010). Automated analysis of crackles in patients with interstitial pulmonary fibrosis. *Pulmonary medicine*, *2011*.
3. Piirila, P., & Sovijarvi, A. R. (1995). Crackles: recording, analysis and clinical significance. *European Respiratory Journal*, *8*(12), 2139-2148.

Corresponding Author: Panos Ntoas, KIOS Research Center, Department of Electrical and Computer Engineering, University of Cyprus, ntoas.p@gmail.com

5.45-6.00hrs

Evaluation of the Refrigeration Time and the Bacterial Load of Pork Using Raman Spectroscopy

Constantinos Timinis and Costas Pitris, KIOS Research Center, Dept. Electrical and Computer Engineering, University of Cyprus

Abstract: Meat contains many useful nutrients and is considered to be an essential component of a balanced and healthy diet. Pork is one of the most popular choices worldwide. However, the high water content of meat (about 75%) combined with all the nutrients that contains, make it vulnerable to microbial contamination, which may occur at all stages of production and storage. Bacterial growth occurs even when refrigerating at 5 °C. A non-invasive and in situ tool for meat sample testing that would provide an accurate indication of the storage time of meat and its bacterial load, would be very useful for the control of meat quality as well as for the consumer safety. For that purpose, simple and quick methods that do not require any form of pretreatment of samples or laboratory preparation are required.

This research was designed to develop a more efficient and less time consuming method for evaluating pork refrigeration time and bacterial load. The proposed solution is based on Raman spectroscopy which is non-invasive and can be applied in situ. This research used 42 meat samples from 14 animals. Three Raman spectra were collected per sample, every two days, for two weeks. Then, the spectra were processed and classified in categories which corresponded to the refrigeration time (i.e., 0, 2, 4, 6, 8, 10, 12 or 14 days), using linear discriminant analysis and cross-validation.

Although Raman spectroscopy has been used in the past for the analysis of meat samples, this research has included innovative processes and algorithms that resulted in a prediction of the refrigeration time far more accurately than any reference in the literature. Contrary to other studies where the samples were simply grouped into two categories (higher or lower quality, suitable or unsuitable for human consumption, etc.), in this study, the refrigeration time was grouped per 2 days with 100% accuracy. Additionally, using the same measurements, an estimate of the bacterial load in the sample was estimated.

Corresponding Author: Costas Pitris, KIOS Research Center, Dept. Electrical and Computer Engineering, University of Cyprus, cpitris@ucy.ac.cy

6.00-6.15hrs

Development of a New Spectroscopic Metric for Scatterer Size Estimation Using Optical Coherence Tomography (OCT)

Michalis Kassinopoulos and Costas Pitris, KIOS Research Center, Department of Electrical and Computer Engineering, University of Cyprus

Abstract: In this work, we describe a new metric for spectroscopic Optical Coherence Tomography (SOCT) that is found to enhance the contrast in OCT images based on the distribution of scattering particle sizes. The basic idea behind this metric is that the degree of modulations appearing in the backscattering spectrum of a scatterer is strongly related to its diameter. Even though many other metrics have been proposed based on the same idea, none of them has achieved high accuracy when calculating the scatterer size.

In this study, we use Mie theory scattering to further investigate the relationship between the degree of modulations in the spectrum and the scatterer size in order to better understand the dependence of this relationship on the spectral range of the light source and the medium and scatterer refractive indices. Moreover, we discuss the importance of the relative size and position between a scatterer and a window in the spatial domain in order to obtain a representative backscattering profile. Finally, we demonstrate the feasibility of our approach for contrast enhancement in phantom samples of 6, 10 and 16 μm microspheres.

The results are very encouraging, suggesting that the proposed metric could be implemented in OCT spectral analysis for measuring nuclear size distribution in biological tissues. A technique providing such information would be of great clinical significant since it would allow the detection of nuclear enlargements at the earliest stages of precancerous development.

Corresponding Author: Michalis Kassinopoulos, KIOS Research Center, Department of Electrical and Computer Engineering, University of Cyprus, mkassi01@ucy.ac.cy

6.15-6.30hrs

A unifying framework for m-Health video communication systems using HEVC for emergency scenery videos

Z. Antoniou and C. S. Pattichis, Department of Computer Science, University of Cyprus, Nicosia
A. S. Panayides and A. G. Constantinides, Department of Electrical and Electronic Engineering, Imperial College, London, UK
M. S. Pattichis, Department of Electrical and Computer Engineering, University of New Mexico, Albuquerque, USA
S. Stavrou, Faculty of Pure and Applied Sciences, Open University of Cyprus, Nicosia, Cyprus
E. Kyriacou, Department of Computer Science and Engineering, Frederick University, Cyprus
A. Spanias, School of Electrical, Computer, and Energy Engineering at Arizona State University, USA

Abstract: In this paper we propose a top-down, video modality and underlying technology independent, scalable approach. The proposed framework facilitates adaptation to the best available encoding mode that satisfies underlying technology and application imposed constraints in terms of video quality, bitrate and encoding time. Experimentation involved the emerging HEVC standard and realistic modelling of 802.11x wireless service.

Corresponding Author: Z. Antoniou, Department of Computer Science, University of Cyprus, Nicosia, antoniou.zinonas@ucy.ac.cy

6.30-6.45hrs

Analyzing of genetic data by a novel NGS platform 'ScaleSeq'

Christa Philippou, Athos Antoniades and Constantinos Pattichis, Department of Computer Science, University of Cyprus, Nicosia

Abstract: Next Generation Sequencing (NGS) has unleashed a torrent of molecular level data into relevant medical research with the potential to develop novel diagnostics, as well as large genetic studies that involve sequencing all subjects' whole genome and specific tissue transcriptome, epigenome etc. This vast explosion in information created the need to develop novel analytic approaches that are scalable and can address the many computational problems associated with NGS. In this project the aim, is to build an NGS (Next Generation Sequencing) data analyses platform, deployed in a high performance platform with efficient parallelization that enables targeting through it highly complex computational problems. Currently the platform's algorithms are independent and all together can succeed the alignment. This platform has implemented on cy-terra server of Cyprus Institute (http://www.cyi.ac.cy/) and currently it's capable of performing pair read alignment and is being expanded to perform de-novo assembly. The Cyprus Institute established the first Cypriot national supercomputing center, installing and running the most powerful computer open to academia in the Eastern Mediterranean region. Cy-Tera is a hybrid machine introducing novel computational elements so far unknown to Cyprus. Its computational power is 30 Tflops.

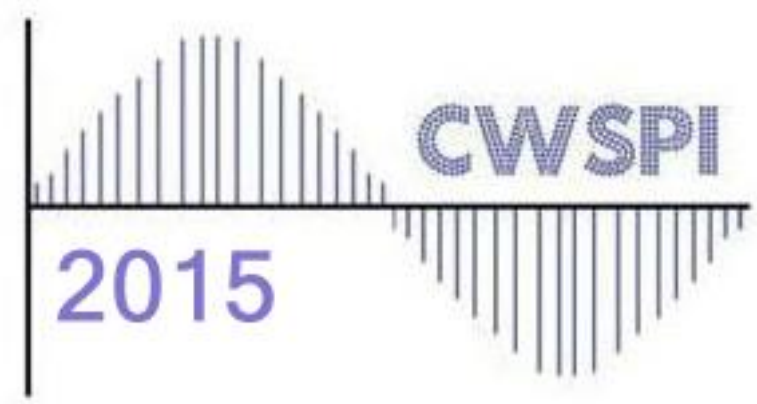
According to the experimental evaluation, this platform has 98,8% scalability (efficiency 0.98). The total memory required to encode the DNA sequence is more than 3 times less than established approaches. Further work will expand this platform into addressing key problems in genetic analyses enabling it's wider adoption.

Corresponding Author: Athos Antoniades, Department of Computer Science, University of Cyprus, Nicosia, athos.antoniades@stremble.com

8th Cyprus Workshop on Signal Processing and Informatics

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

July 3, 2015 13:45-19:00 hrs



http://cwspi.cs.ucy.ac.cy

FINAL PROGRAM AND BOOK OF ABSTRACTS

Organized and Sponsored by:

University of Cyprus | Cyprus University of Technology 2004 | Frederick University | ASU Arizona State University | UNM

Technically Co-Sponsored by:

IEEE Cyprus Section | IEEE Computational Intelligence Society | IEEE EMB Cyprus Chapter | IET Collective inspiration