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Preface

This book contains the proceedings of the 8th WSEAS International Conference on SIGNAL, SPEECH and IMAGE PROCESSING (SSIP '08) which was held in Santander, Cantabria, Spain, September 23-25, 2008. This conference aims to disseminate the latest research and applications in Nonlinear Signals and Systems, Speech analysis, Array signal processing, Biomedical processing, Fuzzy Systems, Evolutionary computation and other relevant topics and applications.

The friendliness and openness of the WSEAS conferences, adds to their ability to grow by constantly attracting young researchers. The WSEAS Conferences attract a large number of well-established and leading researchers in various areas of Science and Engineering as you can see from **http://www.wseas.org/reports**. Your feedback encourages the society to go ahead as you can see in **http://www.worldses.org/feedback.htm**

The contents of this Book are also published in the CD-ROM Proceedings of the Conference. Both will be sent to the WSEAS collaborating indices after the conference: **www.worldses.org/indexes**

In addition, papers of this book are permanently available to all the scientific community via the WSEAS E-Library.

Expanded and enhanced versions of papers published in this conference proceedings are also going to be considered for possible publication in one of the WSEAS journals that participate in the major International Scientific Indices (Elsevier, Scopus, EI, ACM, Compendex, INSPEC, CSA .... see: www.worldses.org/indexes) these papers must be of high-quality (break-through work) and a new round of a very strict review will follow. (No additional fee will be required for the publication of the extended version in a journal). WSEAS has also collaboration with several other international publishers and all these excellent papers of this volume could be further improved, could be extended and could be enhanced for possible additional evaluation in one of the editions of these international publishers.

Finally, we cordially thank all the people of WSEAS for their efforts to maintain the high scientific level of conferences, proceedings and journals.

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Plenary Lecture I

Influence of Segmentation to Efficiency of Joint Channel Coding and Cryptography

Professor Natasa Zivic
Institute for Data Communications Systems
University of Siegen
Siegen, Germany
Email: natasa.zivic@uni-siegen.de

Abstract: Newly researches show that cooperation between the elements of the receiver improves the accuracy of the received information. Such cooperation is especially important in noisy environments, as wireless, mobile and satellite communications. Examples of cooperate work of elements of receiver are:

1. iterative decoding with feedback used inside of the channel decoder for Turbo codes in order to decrease the error rate
2. the feedback information about the decoded bits from the channel decoder to the demodulator used to improve the equalization and synchronization of the demodulator
3. the feedback information from the source decoder to the channel decoder used to improve the channel decoding (so-called source channel decoding).

Joint Channel Coding and Cryptography represents the combination of cryptography and convolutional channel coding. SISO channel decoder and decryptor exchange output information with each other, enabling correction of the output results. This cooperation introduces feedback from decryptor to the SISO decoder for sending information which helps correction of results.

The algorithm of Joint Channel Coding and Cryptography is based on the use of L-values (reliability values) which are output of the SISO channel decoder and input to the decryptor. L-values show the probability of wrong decoded bits of the received information. Therefore absolute L-values are ordered per their greatness, for correction of bits with the lowest absolute L-values which have the highest probability of being wrong decoded. Joint Channel Coding and Cryptography uses feedback for improving of decoding results using the information previously corrected by the lowest absolute L-values. Efficiency of the feedback, depending on the lengths of information which have to be corrected, is the subject of this lecture.

Brief Biography of the Speaker: Dr Natasa Zivic was born on 6th of January, 1975 in Belgrade, Serbia (Yugoslavia). She graduated from the Faculty of Electrical Engineering (Electronics, Telecommunication and Automatics) of the Belgrade University in 1999. at the Telecommunication Department (Access Networks). After the Post diploma studies at the same Faculty (Telecommunications Division) she defended her Magister Thesis (Acoustics) in 2002.

From October 2004. she was scientific assistant on the University of Siegen in Germany at the Institute for Data Communications Systems as a DAAD and University of Siegen Scholarship holder. In 2007. she defended her Doctoral Thesis on the same University. The main course of her work in Siegen is Coding and Cryptography. From 2000. till 2004. she was working at the Public Enterprise of PTT ``Serbia``, Belgrade as the senior engineer. Currently she is employed as an Assistant Professor at the University of Siegen.

She published about 30 articles at international Conferences and Journals and two monographs.

Plenary Lecture II

Image Denoising: From Multiresolution Frameworks to Variational frameworks

Professor Sergio Amat
Head of the Department of Applied Mathematics and Statistics
U.P. Cartagena
SPAIN
Email: sergio.amat@upct.es

Abstract: In order to reduce the noise that perturb an image we can find two general approaches: Multiresolution frameworks and Variational frameworks.

In the linear case, both frameworks are related. But this is not the best situation in practice.

Our goal in this lecture is to review some nonlinear techniques in both framewors and their relations.

Brief Biography of the Speaker:

1. Sergio Amat Plata, Elda (Alicante) (Spain), 23-3-73.
2. MS and BS in Mathematics from Universitat de Val`encia in 1996. PhD in Mathematics from Universitat de Val`encia in 2001.
3. PhD Visiting: Paris VI 1998-1999, Marseille 1998-1999.
4. Post-doctoral and Visiting Faculty positions: EGIM, LATP IMT, Technopole de Chateau-Gombert Marseille (France) 2002-2003-2004-2005, U.Castilla La Mancha (Spain) 2003-2005-2006.
5. Head of the Department of Applied Mathematics and Statistics (U.P. Cartagena) (Spain).
6. More than 70 papers with referee process.
7. More than 50 communications in congress.
8. 10 PhD students.
9. 1 Post-Doc student.
10. He has participated in 2 regional, 3 national and 2 European projects.
11. He is member of the executive board of SEMA (Spanish Society of Applied Mathematics).
12. Head of the research group: Differential Equations and Numerical Analysis.
13. Participation in the organization of several congress.
14. Associated Editor of Journal of The Franklin Instituted.
15. Associated Editor of Applied Mathematics and Computation.
16. Associated Editor of Journal of Mathematical Sciences: Advances and Applications.
17. Associated Editor of WSEAS.
18. Referee and reviewer of several journals.
19. Coordinator of several PhD programs.
20. Coordinator of the department’s publications and conferences.
21. His research interests include:
    - Nonlinear Reconstructions.
    - Multiresolution and wavelets algorithms.
    - Iterative schemes for nonlinear equations.
    - Numerical approximation of conservation laws.

Plenary Lecture III

Enhancement and Restoration

Professor Hector Perez-Meana
National Polytechnic Institute of Mexico
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Email: hmpm@prodigy.net.mx

Abstract: Persons that suffer from diseases such as throat cancer require that their larynx and vocal cords be extracted by a surgical operation, and then require rehabilitation in order to be able to reintegrate to their individual, social, familiar and work activities. To accomplish this, different methods have been used, such as: The esophageal speech, the use of tracheoesophagical prosthetics and the Artificial Larynx Transducer (ALT), also known as "electronic larynx".

The ALT, which has the form of a handheld device, introduces an excitation in the vocal track by applying a vibration against the external walls of the neck. This excitation is then modulated by the movement of the oral cavity to produce the speech sound. This transducer is attached to the speaker's neck, and in some cases in the speaker's cheeks. The ALT is very easy using even for new patients, although the voice produced by these transducers is unnatural and with low quality, besides that it is distorted by the ALT produced background noise. The Esophageal speech is produced through the compression of the contained air in the vocal tract with the tongue. This air is swallowed and as passing through the esophageal-pharynx segment produces a vibration of the esophageal upper muscle, bringing about the speech. The generated sound is similar to a burp, the tone is commonly very low and the timbre generally harsh. In ALT as well as in esophageal speech, the voiced segments are the most affected part of speech.
Several approaches have been proposed to improve the quality and intelligibility of ALT produced, as well as esophageal speech signals. Some of them reduce the ALT produced background noise by using cepstral root subtraction or adaptive filtering. However the speech quality produced by these approaches is still poor. Another approach intended to improve the speech quality estimating the frequency band from 4 KHz to 8 KHz using the frequency band from 300Hz to 4 KHz. Although this approach may be an attractive alternative, it must be still improved. A promising approach is based on speech conversion techniques which carry out a spectral conversion using vector quantization methods. A similar approach based on a pattern recognition approach, has also been proposed, in which, firstly the voiced segments are detected and identified. Then the voiced segments are replaced by their equivalent voiced segments of normal speech while the unvoiced segments are kept without change. Finally the voiced, unvoiced and silence segments are concatenated together to produce the restored speech. These approaches perform fairly well although still present some problems because the spectral conversion reduce a continuous spectral space into a discrete code book, which may produce a distortion that still must be reduced. This speech presents a review of alaryngeal speech enhancement systems, providing also evaluation results to show the improvement in the quality and intelligibility of produced speech.

Brief Biography of the Speaker: Hector Perez-Meana received his M.S: Degree on Electrical Engineering from the Electro-Communications University of Tokyo Japan in 1986 and his Ph. D. degree in Electrical Engineering from the Tokyo Institute of Technology, Tokyo, Japan, in 1989. From March 1989 to September 1991, he was a visiting researcher at Fujitsu Laboratories Ltd, Kawasaki, Japan. From September 1991 to February 1997 he was with the Electrical Engineering Department of the Metropolitan University of Mexico City where he was a Professor. In February 1997, he joined the Graduate Studies and Research Section of The Mechanical and Electrical Engineering School, Culhuacan Campus, of the National Polytechnic Institute of Mexico, where he is now The Dean. In 1991 he received the IEICE excellent Paper Award, and in 2000 the IPN Research Award and the IPN Research Diploma. In 1998 he was Co-Chair of the ISITA'98, and in 2009 he will be the General Chair of The IEEE Midwest Symposium on Circuit and Systems (MWSCAS). Prof. Perez-Meana has published more that 100 papers and two books. He also has directed 15 PhD theses and more than 30 Master theses. He is a Senior member of the IEEE, member of The IEICE, The Mexican Researcher System and The Mexican Academy of Science. His principal research interests are adaptive systems, image processing, pattern recognition watermarking and related fields

Plenary Lecture IV

Signal Processing Education Challenge: A Speaker Verification R&D Undergraduate Team

Professor Roxana Saint-Nom
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CAERCEM Researcher
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Abstract: In order to develop the area of signal processing technology in Argentina, R+D projects have to be carried out at universities. In that way, they can train new SP doctors to start the job. But for that purpose doctorate candidates are a must, as well as proper funding for the graduate school.

How do you start the movement, when there is not such a graduate school, no candidates and the companies don't do research? How do you get the funding if you don't have the project or the people to do it? This is the challenge I faced, as head of the Electrical Engineering Department in a small University in Argentina. My talk will address the problem, and the way I could overcome it. It will describe an undergraduate team dealing with Speaker Verification (SV) research. It will explain how it is possible to insert such a subject in the EE curricula, how to encourage senior student to do R+D, how to contribute with teams in other countries, how to help build a new platform for SV and how to design a strategy to get funding and political support.

Brief Biography of the Speaker: She received her Electrical Engineering degree in 1987 from the University ITBA (Buenos Aires Institute of Technology), Argentina. She achieved a Masters degree in Speech Processing from the "Universidad Politecnica de Madrid", Spain, where she is currently finishing her Ph.D thesis on Speaker Verification.
Since 1988 she has been holding academic positions in Argentina, until she became tenured faculty in the rank of the Full Professor in 2004. Since 2007 she is the Electrical Engineering Department Chair at ITBA.

Her research area is primarily signal processing, as well as electromagnetic compatibility. In recent years she started research groups in different areas, such as speaker verification, acoustics, DSP application and EMC.

She is the author of more than 20 papers, mostly in the area of signal processing education, published in reviewed journals or presented at international conferences such as IEEE ICASSP, IEEE ISCAS, IASTED and WSEAS. She is a technical reviewer for the IEEE Transactions on Circuits and Systems and IEEE ICASSP Proceedings. She is an active senior member of the IEEE. She is the founder of the IEEE Signal Processing Society (SPS) Argentina Chapter, from which she currently Chair, she is the IEEE SPS Education Technical Committee Chair and a IEEE SPS Lensing Oversight Committee Member.

Plenary Lecture V

Multi-Channel Convolution for Room Acoustics Auralization

Professor Lamberto Tronchin
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DIENCA - CIARM,
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Abstract: The application of multi-channel convolution algorithms for room acoustics auralisation is actually considered the most suitable technique for correctly reproducing the sound characteristics of a room. The initial simple convolution from a dry signal with a mono impulse response moved to a binaural convolution and therefore to a more complex system. On the other hand, the new technology has allowed the definition of a new set of physical parameters that could be able to correctly describe the sound characteristics of the room. During this lecture, the results of a world-wide campaign of acoustic measurement of impulse responses in different special theatres and auditoria are presented. Moreover, after an overview on the most common techniques utilised for 3D auralization, an innovative procedure of measuring and reproducing spatial sound characteristics is presented. The application of this new technique in virtual 3D sound reconstruction is presented. Furthermore, the methodology is compared with other techniques of 3D sound reproduction. The possibility to enhance the spatial reproduction of sound quality in real spaces and the comprehensibility of spatial parameters is finally considered and presented in different cases.

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Plenary Lecture VI

Content Aware Image Processing

Associate Professor Raimondo Schettini

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Abstract: The great diffusion of digital cameras and the widespread use of the internet have produced a mass of digital images depicting a huge variety of subjects, generally acquired by non-professional photographers using unknown imaging systems under unknown lighting conditions. The quality of these real-world photos can be considerably improved by digital image processing .In this lecture we describe our approach for content-aware image processing and enhancement. According to our approach, the overall quality of a digital photo is improved by modular, fully automatic, image enhancement procedures driven by the image class and content. Single processing modules can be considered as autonomous elements that are suitably combined to improve the overall quality according to image and defect categories.

Brief Biography of the Speaker: Raimondo Schettini is an Associate Professor at the University of Milano-Bicocca, Italy. He is Vice–Director of the Department of Informatics, Systems and Communication, and head of Imaging and Vision Lab. He has lead several research projects and published more than 200 papers on image processing, analysis and reproduction, and on image content-based indexing and retrieval. Associated Editor of the Pattern Recognition Journal, he was Chairman of several International Conferences related to color imaging.

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