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LATEST TRENDS IN INFORMATION TECHNOLOGY

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- **Proceedings of the 1st WSEAS International Conference on Cloud Computing (CLC '12)**
- **Proceedings of the 1st WSEAS International Conference on Programming Languages and Compilers (PRLC '12)**

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Recent Advances in Computer Engineering Series | 7

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Preface

This year the 1st WSEAS International Conference on Information Technology and Computer Networks (ITCN '12), the 1st WSEAS International Conference on Cloud Computing (CLC '12) and the 1st WSEAS International Conference on Programming Languages and Compilers (PRLC '12) were held in Vienna, Austria, November 10-12, 2012. The conferences provided a platform to discuss algorithms and theory of computation, computer networking, human computer interaction, quantum computing, network reliability, programming languages, mobile computing, data mining, cloud standards, cloudsourcing, cloud reliability, cloud internetworking, design of languages and foundational calculi, software security, safety, verification etc. with participants from all over the world, both from academia and from industry.

Their success is reflected in the papers received, with participants coming from several countries, allowing a real multinational multicultural exchange of experiences and ideas.

The accepted papers of these conferences are published in this Book that will be sent to international indexes. They will be also available in the E-Library of the WSEAS. Extended versions of the best papers will be promoted to many Journals for further evaluation.

Conferences such as these can only succeed as a team effort, so the Editors want to thank the International Scientific Committee and the Reviewers for their excellent work in reviewing the papers as well as their invaluable input and advice.

The Editors

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Plenary Lecture 1

Stability Analysis and Limit Cycles of High Order Sigma-Delta Modulators

Professor Valeri Mladenov
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Abstract: Sigma-Delta modulation has become in recent years an increasingly popular choice for robust and inexpensive analog-to-digital and digital-to-analog conversion. Despite the widespread use of Sigma-Delta modulators theoretical understanding of Sigma-Delta concept is still very limited. This is a consequence of the fact that these systems are nonlinear, due to the presence of a discontinuous nonlinearity - the quantizer.
A number of researchers have contributed to the development of a theory of Sigma-Delta modulation based on the principles of nonlinear dynamics. That work, has succeeded in explaining many fundamentally nonlinear features of the modulators. In the original author's work stability (in the sense of boundness of the states) analysis approach based on decomposition of the general N-th order modulator has been developed. This decomposition is considered for all cases of poles of the transfer function of the modulator loop filter. Based on this decomposition the stability conditions of high order modulators are extracted. They are determined by the stability conditions of each of the first order modulators but shifted with respect to the origin of the quantizer function.
Limit cycles are well known phenomena that often appear in practical ÓÄ modulators. For data processing applications it is very important to predict and describe possible limit cycles. Main results concerning the limit cycles for low order Sigma-Delta modulators are discussed in many references. In his research the author uses the decomposition approach for description and validation of limit cycles in high order modulators with constant input signals. The obtained conditions for the existence and verification of limit cycles are easily to be checked and implemented.
The aim of the talk is to present the unified approach for study the stability and validation of potential limit cycles of one bit high order Sigma-Delta modulators. The approach is general because it uses the general form of a Sigma-Delta modulator. It is based on a parallel decomposition of the modulator and a direct nonlinear systems analysis. In this representation, the general N-th order modulator is transformed into a decomposition of low order, generally complex modulators, which interact only through the quantizer function. The presentation will cover several issues. First, the parallel decomposition technique for different cases of poles of the loop filter transfer function will be presented. Then the stability analysis study for first and high order modulators will be explained. Next the limit cycle analysis will be discussed and throughout the presentation several examples to show the applicability of the presented techniques will be given.

Brief Biography of the Speaker: Valeri Mladenov graduated in Electrical Engineering (with distinction) from the Higher Institute for Mechanical and Electrical Engineering, Sofia (now Technical University of Sofia), Bulgaria in1985. He received his Ph.D. from the same institution in 1993. Since 1986 he has been a Lecturer in the Department of Theory of Electrical Engineering at the Technical University of Sofia Bulgaria, teaching courses on "Circuit Theory I & II", "Electrical Engineering", "Fuzzy Control and Neural Networks" and "Discrete Structures". In 2004 he becomes a Head of the Department of Theory of Electrical Engineering. In June 2011 he becomes a Dean of the Faculty of Automation and since December 2011 he is a Vice-Rector of the Technical University of Sofia. He is a guest lecturer at the Department of Electrical Engineering, Eindhoven University of Technology, the Netherlands, where he taught a course "Nonlinear Systems and Neural Networks". He has been invited lecturer in the Technical University of Ilmenau, Germany, National Technical University of Athens, Greece and many others.
Dr. Mladenov's research interests are in the field of nonlinear circuits and systems, neural networks, artificial intelligence, applied mathematics and signal processing. He has received many international research fellowships. He has more than 170 scientific papers in professional journals and conferences. He is a co-author of ten books and manuals for students. He have received many research grants from the Technical University of Sofia, Bulgarian Ministry of Education and Science, DAAD – Germany, NWO – Netherlands, Royal Society – UK, NATO,TEMPUS

and others and also with his team he participated and now participate as a coordinator, team leader, etc. in many national and international projects (TEMPUS, DAAD, FP6, FP7).
As a member of several editorial boards Dr. Mladenov serves as a reviewer for a number of professional journals and conferences. He is a Senior Member of the Institute of Electrical and Electronics Engineering, Inc. (IEEE) http://www.ieee.org/, member of the IEEE Circuit and Systems Technical Committee on Cellular Neural Networks& Array Computing and Chair of the Bulgarian IEEE Circuit and Systems (CAS) chapter. He is also a member of the Steering Committee of the International Symposium on Theoretical Electrical Engineering (ISTET), member of the Board of Directors of the World Scientific and Engineering Academy and Society (WSEAS) http://www.wseas.org/ and editor-in-chief of the WSEAS Transactions on Circuits and Systems. He is an organizer and a chair of many International Conferences and Symposiums.

Plenary Lecture 2

On the Compression of Hyperspectral Images

Associate Professor Bruno Carpentieri
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Abstract: Hyperspectral data are usually generated by using sensors installed on airplanes, such as those used by NASA, known as the Airborne Visible \ Infrared Imaging Spectrometer (AVIRIS), or by using special satellites.
Hyperspectral images are therefore a multidimensional collection of information coming from the electromagnetic spectrum of the observed object. These sensors, through the observation of an object, are able to capture a large portion of the object's electromagnetic spectrum.
Given that any object has an unambiguous fingerprint on the electromagnetic spectrum, hyperspectral data allows the identification of different types of materials: for example, the spectral signature of oil can help mineralogists to find new oil wells.
Hyperspectral data need to be efficiently compressed to be stored and / or transmitted.
In this talk we will discuss the compression of hyperspectral images and the new recent advances in this field.

Brief Biography of the Speaker: Bruno Carpentieri received the "Laurea" degree in Computer Science from the University of Salerno, Salerno, Italy, and the M.A. and Ph.D. degrees in Computer Science from the Brandeis University, Waltham, MA, U.S.A.
Since 1991, he has been first Assistant Professor and then Associate Professor of Computer Science at the University of Salerno (Italy).
His research interests include lossless and lossy image compression, video compression and motion estimation, information hiding.
He has been, from 2002 to 2008, Associate Editor of the journal IEEE Trans. on Image Processing, he was chair and organizer of the International Conference on Data Compression, Communication and Processing 2011, co-chair of the International Conference on Compression and Complexity of Sequences, and, for many years, program committee member of the IEEE Data Compression Conference. He has been chair of the CCP2011 Conference. He has been responsible for various European Commission contracts regarding image and video compression.

Plenary Lecture 3

Application of Forensic Analysis for Intrusion Detection against DDoS Attacks in Mobile Ad Hoc Networks

Associate Professor Valentina V. Timcenko
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Abstract: This paper addresses a specific approach to resolving the problem of intrusion detection against distributed denial of service (DDoS) attacks in mobile ad hoc networks (MANET). Generally, the main function of an intrusion detection system (IDS) is to inspect the network for malicious activities, policy violations and security loopholes integrity, and to generate the appropriate reports. Network forensics concerns examining a network for anomalous traffic and identifying intrusions. It is particularly useful in decreasing of the likelihood of reoccurrence of the same intrusion activities.
In the first part of the paper, we provide a comprehensive overview of recent advances in network forensics in MANET environment. In the second part of the paper, we propose a model of IDS that uses network forensics to detect DDoS attack in MANET. The forensic analysis relies on inspecting simultaneous malicious activities of a group of attackers (zombies). Since DDoS attack traffic can appear rather alike to legitimate traffic in the sense of bit rate and packet size, the applied method should minimize the risk of misinterpreting legitimate traffic as attack traffic (false positives). Further, since DDoS zombies are actually mobile nodes, which can follow different mobile patterns and have different speeds, particular attention has been focused to individual and group mobility models.
Finally, we present a performance analysis of the proposed model that comprises the node number, node speed, attack duration and the influence of applied mobility patterns. The study has been carried out by the network simulator ns-2 and its associated tools for mobility scenario generation, network animation and trace files analysis.

Brief Biography of the Speaker: Valentina V. Timcenko received her B.Sc. (2004), M.Sc. (2010) and is currently in the process of gaining PhD degrees in Electrical Engineering from the University of Belgrade, Serbia. She joined Mihailo Pupin Institute in Belgrade in 2004, where she is currently research associate in the area of telecommunication networks. She has participated in several research projects and studies concerning NGN design and network management systems. As author or coauthor, she published more than 30 papers in national and international journals, books and conferences. Her basic scientific and professional commitment includes research, design and implementation of solutions for telecommunications and transport networks, especially in area of mobile ad hoc networks, simulation and proper software design related to operating systems Windows and Linux. She is also involved in projects related to operating systems, data protection, disc and filesystem optimization and connecting UNIX with different Operating Systems. She posses the following Cisco certificates: CCNA, and BSCI (642-901).

Plenary Lecture 4

Facial Expression Recognition of Speaker Using Vowel Judgment and Features of Thermal Face Image

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Abstract: To better integrate robots into our society, a robot should be able to interact in a friendly manner with humans. The goal of our research is to develop a robot that can perceive human feelings and mental states. For example, a robot could encourage a human who looks sad, advise a person to stop working and rest for a while when the individual looks tired, or take care of a person advanced in years. The present investigation concerns the first stage of the development of a robot that acquires the ability to detect human feeling or inner mental states visually. Although the mechanism for recognizing facial expressions of human feelings has received considerable attention in computer vision research, it currently falls far short of human capability. This is due to the decreased accuracy of facial expression recognition, which is influenced by the inevitable change of gray levels due to nuances of shade, reflection, and local darkness. To avoid this problem and to develop a robust method for facial expression recognition applicable under widely varied lighting conditions, we use an image registered by infrared rays to describe the thermal distribution of the face. The timing of recognizing facial expressions is also important for a robot because the processing can be time-consuming. We adopted an utterance as the key of expressing human feelings because humans tend to say something when expressing their feelings.
In this lecture, I introduce our method for facial expression recognition of a speaker. For facial expression recognition, we pick three images: (i) just before speaking, in speaking (ii) the first and (iii) the last vowels of an utterance. The face direction is estimated to select front-view faces as the targets of facial expression recognition using thermal image processing. A two-dimensional discrete cosine transformation is performed for transforming grayscale values on each block in focused face parts of an image into their frequency components, which are used for generating feature vectors. We use pattern recognition through our heuristic rules for facial expression recognition. In this method, the facial expressions are discriminable with good recognition accuracy when a person exhibits one of the intentional facial expressions of “angry”, “happy”, “neutral”, “sad”, and “surprise”.
We also proposed a method for efficiently updating training data, such that the training data of only the facial expressions of “happy” and “neutral” were updated after an interval such as approximately three and a half years. Using this proposed method, the facial expressions of two subjects were discriminable with good recognition accuracy for the facial expressions of “happy,” “neutral,” and “others” when they exhibited one of the intentional facial expressions of “angry,” “happy,” “neutral,” “sad,” and “surprised.” Based on our previously reported method, we proposed an on-line system for recognizing the facial expression of a speaker using front-view face judgment, vowel judgment, and thermal image processing. We expect the proposed system to be applicable for recognizing facial expressions in daily conversations.

Brief Biography of the Speaker: Yasunari Yoshitomi received his B.E., M.E. degrees and Ph.D. in Engineering from Kyoto University in 1980, 1982, and 1991, respectively. He had worked in Nippon Steel Corporation from 1982 to 1995 and had been engaged in image analysis application and development of soft magnetic materials. From 1995 to 2001, he had been in Miyazaki University as an associate professor at the Department of Computer Science and Systems Engineering. From 2001 to 2008, he had been in Kyoto Prefectural University as a professor at the Department of Environmental Informatics. Since 2008, he has been in Kyoto Prefectural University as a professor at the Environmental Information System Subdivision, Division of Environmental Sciences, Graduate School of Life and Environmental Sciences. He is a member of IEEE, IPSJ, IEICE, JSIAM, ORSJ, HIS, SSJ and IIEEJ. He received a Best Paper Award from IEEE International Workshop on Robot and Human Communication in 1998, and a Best Paper Award from IEEE International Workshop on Robot and Human Interactive Communication in 2000. He has

published 132 papers, two reviews, 10 books, and 214 patents. He is an associate editor of Artificial Intelligence Research, and an executive editorial board member of the Journal of Robotics and Artificial Intelligence. He has been listed in the 2010, 2011, and 2012 editions of Marquis Who's Who in the World. His current research interests are communication between human and computer, media information processing, authentication on digital content, stochastic programming problem, simulation on emission trading of greenhouse effect gas, and system for watching infringement of human rights in cyber space.

Plenary Lecture 5

Performance Analysis of Complex SSC/MRC Combiner in Fading Channels with Different Distributions

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Abstract: The SSC and MRC are simple and frequently used techniques for signal combining in diversity systems. The expressions for probability density function (PDF) of the Switch and Stay Combiner (SSC) output signal to noise ratio (SNR) at one time instant and the joint probability density function of the SSC combiner output signal to noise ratio at two time instants in the presence of different kind of fading are determined. Then, these expressions are used for calculation of the bit error rate (BER), the outage probability (OP), and the amount of fading (AF) for complex Switch and Stay Combining/Maximal Ratio Combining (SSC/MRC) combiner. Both of combiners, SSC and MRC, are with two branches. The system performances deciding by two samples can be determine by the joint probability density function of the SSC combiner output signal at two time instants and putting them as inputs of MRC combiner. The obtained results are presented graphically and the analysis of the parameters influence and different types of combiners is given. The improvement of using the complex SSC/MRC combiner relative to classical MRC and SSC combiners at one time instant, it was pointed out. Also, it is shown that using of this complex SSC/MRC combiner is not economical in the case of strongly correlated signals because it does not give better BER and AF than MRC combiner.

Brief Biography of the Speaker: Dr Dragana S. Krstic was born in Pirot, Serbia. She received the BSc, MSc and PhD degrees in electrical engineering from Department of Telecommunications, Faculty of Electronic Engineering, University of Nis, Serbia, in 1990, 1998 and 2006, respectively. Her field of interest includes telecommunications theory, optical communication systems, wireless communication systems, satellite communication systems etc. She works at the Faculty of Electronic Engineering in Nis since 1990. She participated in more Projects which are supported by Serbian Ministry of Science. She has written or co-authored more than 150 papers, published in Journals and at the International/National Conferences. She has also reviewed more articles in IEEE Transactions on Communications; IEEE Communications Letters; ETRI journal; C&EE Journal; Electronics and Electrical Engineering (Elektronika ir Elektrotechnika) and other journals. She is the reviewer of the papers for many conferences and the member of technical program committees and international scientific committees of several scientific conferences. As a member of some journal editorial boards Dr Krstic serves as a reviewer for a number of papers. She was awarded the title IARIA fellow.