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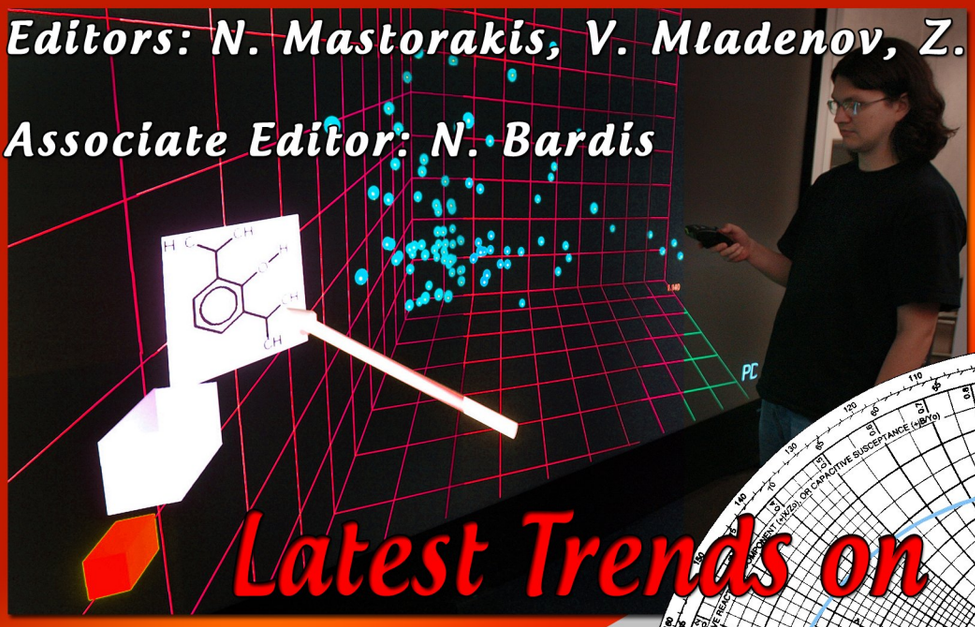

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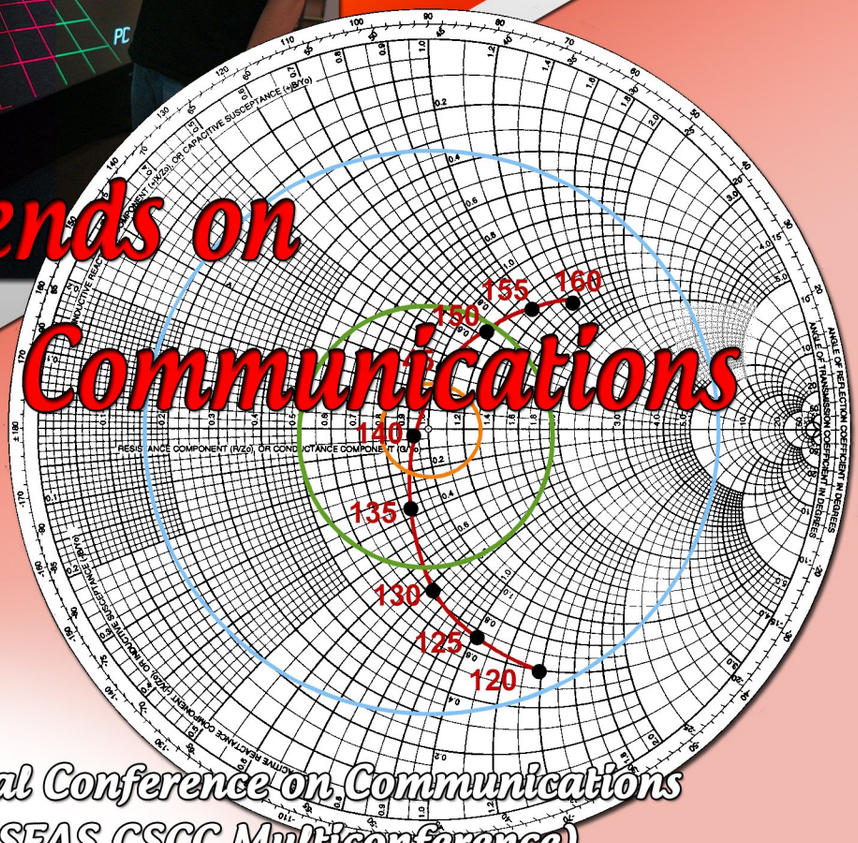

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(Part of the 14th WSEAS CSCC Multiconference)

Corfu Island, Greece, July 23-25, 2010

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Latest Trends on Communications

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Preface

This year the 14th WSEAS International Conference on COMMUNICATIONS (Part of the 14th WSEAS CSCC Multiconference) was held on Corfu Island, Greece, July 23-25, 2010. The conference remains faithful to its original idea of providing a platform to discuss microwave theory and techniques, lightwave technology, microwave and antennas measurements, microwave superconductivity, electromagnetic compatibility problems, low noise techniques, optical fiber systems, communication electronics, signal processing for wireless communication, communications switching and routing, narrow band and broad band networks, wireless and mobile computing, communication systems integration, cryptology, military communications, software for communications development and simulation, social implications of modern communications, smart interfaces, computer/communications integration etc. with participants from all over the world, both from academia and from industry.

Its 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 this conference are published in this Book that will be indexed by ISI. Please, check it: www.worldses.org/indexes as well as in the CD-ROM Proceedings. They will be also available in the E-Library of the WSEAS. The best papers will be also promoted in many Journals for further evaluation.

A Conference such as this 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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Keynote Lecture 1

Optimizing the Performance of Scientific Java Applications

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Abstract: As part of its type-safety regime, the Java semantics require precise exception at runtime when programs attempt out-of-bound array accesses. In general, this requires a dynamic bounds check each time an array element is accessed, which limits the performance of array intensive scientific applications implemented in Java. However, if it can be proven that the array index is within the bounds of the array, the check can be eliminated. We present a new algorithm based on extended Static Single Assignment (eSSA) form that builds a constraint system representing control flow qualified, linear constraints among program variables derived from program statements. Our system then derives relationships among variables, and provides a verifiable proof of its conclusions. This proof can be verified by a runtime system to minimize the analysis' performance impact. Our system simultaneously considers both control flow and data flow when analyzing the constraint system, handles general linear inequalities instead of simple difference constraints, and provides verifiable proofs for its claims. We present experimental results demonstrating that this method eliminates more bounds checks than prior approaches with minimal overhead during JIT compilation. Furthermore our algorithm increased the speed at which the Java benchmarks executed by up to 16%.

Brief Biography of the Speaker:
Kleanthis Psarris is Professor and Chair of the Department of Computer Science at the University of Texas at San Antonio. He received his B.S. degree in Mathematics from the National University of Athens, Greece in 1984. He received his M.S. degree in Computer Science in 1987, his M.Eng. degree in Electrical Engineering in 1989 and his Ph.D. degree in Computer Science in 1991, all from Stevens Institute of Technology in Hoboken, New Jersey. His research interests are in the areas of Parallel and Distributed Systems, Programming Languages and Compilers, and High Performance Computing. He has designed and implemented state of the art program analysis and compiler optimization techniques and he developed compiler tools to increase program parallelization and improve execution performance on advanced computer architectures. He has published extensively in top journals and conferences in the field and his research has been funded by the National Science Foundation and Department of Defense agencies. He is an Editor of the Parallel Computing journal. He has served on the Program Committees of several international conferences including the ACM International Conference on Supercomputing (ICS) in 1995, 2000, 2006 and 2008, the IEEE International Conference on High Performance Computing and Communications (HPCC) in 2008, 2009, and 2010, and the ACM Symposium on Applied Computing (SAC) in 2003, 2004, 2005 and 2006.

Plenary Lecture 1

Applications of Controlled Chaos and Chaotic Synchronization in Modern Secure Communication Systems

Professor Milan Stork
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Abstract: In recent years, chaotic behavior of complex nonlinear dynamical networks as a new issue has received a great deal of attention. Since 1963 the Lorenz chaotic oscillator as one of paradigms of chaos has become a focal subject in nonlinear dynamics. Some special topics such as boundedness, convergence, attractive sets, local and global synchronization including well known nonlinear observer and control of chaos have been widely studied for Lorenz type systems. Nonlinear time-varying oscillators and especially chaotic systems can play an important role in many applications including secure and reliable digital communication. This presentation deals with two important issues that are applicable to chaotic communication systems: synchronization of chaos and controlling chaos. Synchronization of chaos is a naturally occurring phenomenon where one chaotic dynamical system follows dynamical behavior of another chaotic system. This phenomenon can be used in chaotic communication system as a mechanism for information decoding whereas controlling chaos can be used to encode information into the dynamics of the system. Apart from this particular application, the phenomenon of chaotic synchronization is a popular topic of research, in general, and has attracted much attention within the scientific community.

It is not surprising that designing such systems is not as easy as designing linear time-varying systems. Throughout the development of the digital communication, many schemes have been developed to encode and decode information. What is a best scheme that will hide the information so well that it is impossible or almost impossible to intercept the information? This is a question scientist have been working for years. The study of secure communication is the area scientist developed in order to answer the above question. Particularly, secure communication using chaotic system models is a new area where people have put much effort into. The basic idea is that the digital data is somehow embedded into the chaotic signal from a chaotic system, which is in fact a special class of a nonlinear time varying system, and the chaotic signal is transmitted. At the receiver end, knowing the properties of the transmitter system, and only knowing which, we can recover the digital data. So the problems can be designed as: how to design the transmitter and receiver of such a secure communication system; how to embed digital data and transmit the chaotic signal; should the chaotic signal be analog or digital?

Although rich tools for their characterization and analysis are available, we are still in an early stage in terms of their actual design and use. It will also be demonstrated in the presentation that a new state space energy approach, which is closely related to the well known Lyapunov function method can effectively be applied for solving global synchronization and stability problems. This technique has proved to be working for the design of any order chaotic systems, which introduces more flexibility into the design of secure communication systems. Controlling chaos is another potential engineering application. A unique property of controlling chaos is the ability to cause large long-term impact on the dynamics using arbitrarily small perturbations.

In this approach, a study of: various electrical elements needed for the design of nonlinear circuits; the rules for their interconnections; the types of dynamics that will result from such circuits and the types of elements needed for various applications is made. Results, derived from this can be used to design chaotic systems for different applications.

Brief Biography of the Speaker:

Milan Stork received the M.Sc. degree in electrical engineering from the Technical University of Plzen, Czech Republic at the department of Applied electronics in 1974 and Ph.D. degree in automatic control systems at the Czech Technical University in Prague in 1985. In 1997, he became as Associate Professor at the Department of Applied Electronics and Telecommunication, faculty of electrical engineering on University of West Bohemia in Plzen, Czech Republic. He became the full professor in 2007. He is member of editorial board Czech magazine "Physician and Technology" concerning bioengineering. His research interest includes analog/digital linear and nonlinear systems, chaotic systems, control systems, signal processing and biomedical engineering, especially noninvasive tests systems.

Plenary Lecture 2

Toward Speech Communication in Highly Noisy Environments Using Bone Conduction

Professor Tetsuya Shimamura
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Abstract: The transmission of voice on bones is called bone conduction. When the voice waveforms are transmitted from the voice source (vocal cord) through the vocal tract wall and skull, they do not confront directly with noise. This is the reason why the bone-conducted speech signal is utilized to accomplish speech communications in a very noisy environment. Recently it was reported that bone-conducted speech could be effectively used for speech recognition and speaker recognition even in a negative decibel signal-to-noise ratio environment. However, normally it is known that the quality of bone-conducted speech is comparatively lower than that of normal speech being transmitted through air. This may be caused by the fact that the frequency components more than 1[kHz] deteriorate in bone-conducted speech. A straightforward method to improve the quality of bone-conducted speech is to emphasize the high frequency components. However, this has been not accepted in current communication systems. One of the reasons of this fact may be that the phenomenon of bone conduction is speaker dependent. Thus, in this plenary speech, as a speaker-dependent technique, the use of an air- and bone-conduction integrated microphone is mainly discussed. Also, it is presented that the quality of bone-conducted speech can be improved by utilizing both long-term spectra of the normal and bone-conducted speech signals. On the other hand, it is set out to design a reconstruction filter for the speaker only from the bone-conducted speech. This is a hot topic in the field of bone conducted speech. The goal of this kind of research is to accomplish a smooth speech communication in highly noisy environments.

Brief Biography of the Speaker:
Tetsuya Shimamura received the B.E., M.E., and Ph. D. degrees in electrical engineering from Keio University, Yokohama, Japan, in 1986, 1988, and 1991, respectively. In 1991, he joined Saitama University, Saitama City, Japan, where he is currently a Professor. During this, he joined Loughborough University, UK, and The Queen's University of Belfast, UK, in 1995 and 1996, respectively, as a visiting Professor. He is an author or co-author of 6 books, and member of the organizing committee of several international conferences. His interests are in digital signal processing and its applications to speech, image and communication systems.

Plenary Lecture 3

MPEG-21 Standardization Process: Organization and Rate Distortion Modeling for Network Adaptation

Professor Zoran Bojkovic
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Abstract: Standards are technical documents that define precisely the conformance required of users if interoperability is to be achieved. Many people have worked to create a coherent and valuable framework for multimedia delivery and consumption. The novelty and different directions of the MPEG-21 work have lead to new and valuable tests for long-standing MPEG process. MPEG has played a key role in developing the standards behind the explosion of multimedia-enabled consumer devices. The MPEG-1 and MPEG-2 standards are the core technologies behind digital TV, advanced audio coding and DVDs. The MPEG-4 standard has seen success in its use in IP video content, while MPEG-4, part 10 (H.264/AVC) standard is making inroads into the mobile content and broadcasting. MPEG-7 is an extensive standard for the description of multimedia content using eXtensible Markup Language (XML) metadata. Finally, in MPEG-21, the aim is to create a standard that would link together the media coding and metadata standards with access technologies, rights and protection mechanisms, adaptation technology and standardized reporting in order to produce a complete multimedia framework. Thus, MPEG-21 is a major step forward in multimedia standards. It collects together the technologies needed to create an interoperable infrastructure for protected digital media consumption and delivery.

Brief Biography of the Speaker:
Prof. Dr Zoran Bojkovic is a professor of electrical engineering at the University of Belgrade, Serbia. He is the co-author of 4 international books: "Wireless Multimedia communications" (CRC Press, 2009), "Introduction to Multimedia Communications" (Wiley, 2006), "Multimedia Communication Systems" (Prentice Hall, 2002) and "Packet Video Communications over ATM Networks" (Prentice Hall, 2000). Also he is the first author of the international monography "Advanced Topics in Digital Image Processing" (Editura Politehnica, Romania 1997). He has been the co-editor in the Proceedings of 33 International Conferences. Prof. Bojkovic is Editor-in-Chief in 2 International Journals, associated editor in 3, and member of editorial board in 5 International Journals. He has published in international peer-reviewed journals and participated in many scientific and research projects in industry, institutes and academia. He has presented and published many conference papers, has conducted seminars, special sessions, tutorials, keynote and plenary lectures on video/audio coding, standards, multimedia communications and networking, worldwide. Prof. Bojkovic is Senior Member IEEE, EURASIP and WSEAS member. Also he is Serbian Scientific Society member and full member of Yugoslav Academy of Engineering, Belgrade, Serbia.

Plenary Lecture 4

Multipath Routing over Wireless Mesh Networks for Multiple Description Video Transmission

Professor Michel Kadoch
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Departement de genie electrique
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Abstract: In the past few years, wireless mesh networks (WMNs) have drawn significant attention from academia and industry as a fast, easy, and inexpensive solution for broadband wireless access. In WMNs, it is important to support video communications in an efficient way. To address this issue, this paper studies the multipath routing for multiple description (MD) video delivery over IEEE 802.11 based WMN. Specifically, we first design a framework to transmit MD video over WMNs through multiple paths; we then investigate the technical challenges encountered. In our proposed framework, multipath routing relies on the maximally disjoint paths to achieve good traffic engineering performance. However, video applications usually have strict delay requirements, which make it difficult to find multiple qualified paths with the least joints. To overcome this problem, we develop an enhanced version of Guaranteed-Rate (GR) packet scheduling algorithm, namely virtual reserved rate GR (VRR-GR), to shorten the packet delay of video communications in multiservice network environment. Simulation study shows that our proposed approach can reduce the latency of video delivery and achieve desirable traffic engineering performance in multipath routing environment.

Brief Biography of the Speaker:
Michel Kadoch (S'67, M'77, SM'04) received the B. Eng from Sir George Williams University (Canada) in 1971, the M. Eng from Carleton (Canada) in 1974, MBA from McGill (Canada) in 1983 and the Ph.D from Concordia (Canada) in 1991. He is a full professor at Ecole de technologie superieure ETS (Canada) and the director of the Master Program in engineering. He is active in research mostly in performance analysis and network management and control in wired as well as wireless networks. He is the director of the research laboratory LAGRIT at ETS. He is also an adjunct professor at Concordia University (Canada). He is presently working on Cognitive Radio, Cross layer, and on Reliable multicast in wireless Ad hoc and WiMax networks. Professor Kadoch has published many articles and is the author of a book « Protocoles et reseaux locaux » (Edition ETS, 2004). He is serving as a reviewer for journals and conferences and for grants for NSERC as well as track TPC for ICCCAS, WiMob. He has been involved for many years at ITU-T as a special rapporteur and with the industry namely Teleglobe Canada, CAE, and Communication Canada. He has been a consultant with Harris, Bell South, BC Tel, Concert and British Telecom UK, as well as the CTO (Commonwealth Telecommunication Organization).

Plenary Lecture 5

Unique Word OFDM

Professor Mario Huemer
Chair for Embedded Systems and Signal Processing
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Abstract: OFDM (orthogonal frequency division multiplexing) is by far the most important modulation technique for broadband wireless communication systems. In OFDM signaling subsequent symbols are separated by guard intervals which are usually implemented as cyclic prefixes (CPs). In this plenary lecture we present a novel transmit signal structure and an adjusted and optimized receiver for OFDM. Instead of the conventional cyclic prefix we use a deterministic sequence, which we call unique word (UW), as guard interval. We show how unique words, which are already well investigated for single carrier systems with frequency domain equalization (SC/FDE), can also be introduced in OFDM symbols. Since unique words represent known sequences, they can advantageously be used for synchronization and channel estimation purposes. Furthermore, the proposed approach introduces correlations between subcarrier symbols, which allows to apply a highly efficient Wiener LMMSE (linear minimum mean square error) estimator at the receiver. We present simulation results in an indoor multipath environment to highlight the advantageous properties of the proposed scheme.

Brief Biography of the Speaker:
Mario Huemer was born in Wels, Austria in 1970. He received the Dipl.-Ing. degree in mechatronics and the Dr.techn. (Ph.D.) degree from the Johannes Kepler University of Linz, Austria, in 1996 and 1999, respectively. From 1997 to 2000, he was a scientific assistant at the Institute for Communications and Information Engineering at the University of Linz, Austria. From 2000 to 2002, he was with Infineon Technologies Austria, research and development center for wireless products. From 2002-2004 he was a Professor for Communications and Information Engineering at the University of Applied Sciences of Upper Austria, from 2004-2007 he was Associate Professor for Electronics Engineering at the University of Erlangen-Nuremberg, Germany. In 2007, he has moved to Klagenfurt, Austria, to overtake the Directorship of the Chair for Embedded Systems and Signal Processing at the University of Klagenfurt as a Full Professor. He has been engaged in research and development on WLAN, wireless cellular, and wireless positioning systems, and on highly integrated baseband and RF ICs for mobile devices. Within these fields he published more than 110 papers. His current research interests are focused on real time signal processing algorithms and architectures for embedded applications. Dr. Huemer is member of the IEEE Signal Processing Society, IEEE Communications Society and the IEEE Circuits and Systems Society. He is also member of the European Association for Signal Processing (EURASIP), the German Information Technology Society (ITG) in the Association for Electrical, Electronic & Information Technologies (VDE) and the Austrian Electrotechnical Association (OVE).