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RECENT ADVANCES IN CIRCUITS, SYSTEMS, SIGNAL AND TELECOMMUNICATIONS

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Preface

This year the 4th WSEAS International Conference on CIRCUITS, SYSTEMS, SIGNAL and TELECOMMUNICATIONS (CISST '10) was held at Harvard University, Cambridge, USA, January 27-29, 2010. The conference remains faithful to its original idea of providing a platform to discuss microelectronics, microcircuits, circuits and systems for control and robotics, circuits for industrial applications, circuit implementation for fuzzy systems, circuits and electronics for data conversion and s-d modulation, electronics for video systems, microstrip circuits and components, systems theory, robotics, fuzzy systems, neural networks, genetic algorithms, remote sensing, human-machine systems, cad/cam systems, geometric modeling and fractals, financial aspects in control engineering, unmanned vehicles, signal reconstruction, speech analysis, signal processing for music, image motion / sequence / video, signal processing for robotics, satellite signals processing, microwave theory and techniques, cad design for microwave systems, amplifiers, reflectors and lens antennas, applied electromagnetics, radio engineering applications in astronomy, aerospace systems, optical fiber systems, communication electronics 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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Plenary Lecture 1

Real-Time & In-Service Optical Channel Qualification and Channel Protection in Intelligent Optical Networks

Professor Stamatios Kartalopoulos
Williams Professor in Telecommunications Networking
The University of Oklahoma
USA
Email: Kartalopoulos@ou.edu

Abstract: Fiber-based optical networks transport an aggregate data rate that exceeds Tbps. The optical technology that makes this possible is known as dense wavelength division multiplexing (DWDM). Because of this humongous data rate, the performance of optical channels needs to be monitored continuously in-service and in-real time. One of the key performance metrics is the Bit Error Performance (BER), which currently is measured by using bit error detecting correcting codes (EDC) that are embedded in the signal of the information channel. However, EDCs, although indispensable for their bit error correcting ability, require many frames of information to provide a good statistical BER value for each channel. When the BER exceeds a threshold value, then the system undergoes channel equalization or channel protection, which is time consuming and costly. In this talk, we describe a statistical method based on which we estimate the performance parameters of all incoming communication channels in real-time and in-service. This method provides the estimation of BER, SNR, NF, Q, and min-max signal levels of current and previous values. In addition, we describe the realization of the method with a simple CMOS circuit, we describe the benefits of the method, compare with well-established methods and we describe its applicability to multiple channel equalization and channel protection.

Brief Biography of the Speaker:
Stamatios V. Kartalopoulos, PhD, is currently the Williams Professor in Telecommunications Networking at the University of Oklahoma. His research emphasis is on optical communication networks (FSO, long haul and FTTH), optical technology including optical metamaterials, and optical communications security including quantum cryptography and chaotic functions. Prior to this, he was with Bell Laboratories where he defined, led and managed research and development teams in the areas of DWDM networks, SONET/SDH and ATM, Cross-connects, Switching, Transmission and Access systems. He has received the President's Award and many awards of Excellence.
He holds nineteen patents in communications networks, and has published more than two hundred scientific papers, ten reference textbooks in advanced fiber optic communications and security, and has contributed several chapters to other books.
He has been an IEEE and a Lucent Technologies Distinguished Lecturer and has lectured at universities, NASA and conferences internationally. He has been keynote speaker of major international conferences, has moderated executive forums, has been a panelist of interdisciplinary panels, and has organized symposia, workshops and sessions at major international communications conferences.
Dr Kartalopoulos is an IEEE Fellow, chair and founder of the IEEE ComSoc Communications & Information Security Technical Committee, member at large of IEEE New Technologies Directions Committee, series editor of IEEE Press/Wiley, and has served editor-in-chief of IEEE Press, chair of ComSoc Emerging Technologies and of SPCE Technical Committees, Area-editor of IEEE Communications Magazine/Optical Communications, member of IEEE PSPB, and VP of IEEE Computational Intelligence Society.

Plenary Lecture 2

High Power Switching Devices: Past, Present and Future

Professor Noel Y. A. Shammas
Faculty of Computing, Engineering and Advanced Technology
Staffordshire University
UK
E-mail: N.Y.A.Shammas@staffs.ac.uk

Abstract: Switching devices are key components in any power electronic circuit or system as they control and limit the flow of power from the source to the load. Their power level requirements (current & voltage) and switching frequency are continually increasing in the power electronic industry, and this demands larger and faster switching devices.
This paper will focus on the development of high power switching devices and will present an up to date perspective of switching device technology and materials. The most important material has been and still is silicon (Si) for solid-state semiconductor devices. It dominates the world market at present, particularly in its crystalline form. However, silicon power device operation is generally limited to relatively low frequency and temperature.
Silicon Carbide, Gallium Nitride and Diamond offer the potential to overcome the frequency, temperature and power management limitations of silicon. A large number of new concepts and materials are still in the research stage. At present, Silicon Carbide is considered to have the best trade-off between material properties and commercial maturity. Multilayer Silicon Carbide (SiC) power semiconductor devices being in development are promising devices for the near future, but long term reliability, crystal degradation and forward voltage drift problems need to be solved before commercialisation.

Brief Biography of the Speaker:
Noel Shammas is currently a Professor in Microelectronics and Solid-State Power Semiconductor Devices in the faculty of Computing, Engineering and Advanced Technology, Staffordshire University. He received the M.Sc and Ph.D degrees from Salford University in 1972 and 1975 respectively. Since then he lectured and researched at different universities and industry.
Research work is primarily focused on Power Semiconductor Devices which includes mainly Power diodes, Light Emitting Diodes (LED's), Insulated Gate Bipolar Transistors and Thyristors. Other related areas of research work includes Power Module Packaging technologies (Both Conventional Press- pack and Smart pack designs) and Series/Parallel operation of high power semiconductor devices and their interaction with external circuits.
Professor Shammas has extensive experience in both experimental and theoretical research work and is recognised internationally for his significant contribution to research in the field of Power Semiconductor Devices. He has published over 120 journal and conference research papers as well as several invited Keynote Lectures, and has held several research grants from funding councils, Advantage West Midland (AWM), as well as from industry. He is a regular reviewer for many journals (including IEE Proceeding Electronic devices and systems, IEEE Transactions on power electronics, and Microelectronic Reliability) and international conferences (including the European Power Electronic conference - EPE, Microelectronic conference - MIEL, Universities Power Engineering Conference-UPEC, International Symposium Power Semiconductors-ISPS, etc…). He is a member of scientific committee for many international conferences (including MIEL, EPE, WCE, WSEAS, and Microtherm) and a steering committee member for EPE, UPEC, and ISPS international conferences. He is also a book reviewer for Prentice Hall International and McGraw Hill.

Plenary Lecture 3

Generalized Optimization for Analog Network Design

Professor Alexander Zemliak
Autonomous University of Puebla, Mexico
National Technical University of Ukraine, Kiev
Ukraine
E-mail: azemliak@yahoo.com

Abstract: An approach of the generalized optimization for analog network design was elaborated by means of the optimum control theory formulation. This methodology generalizes the design process and generates a set of different design strategies that serves as a structural basis for the minimal-time design strategy construction. The main conception of this approach is the introduction of special control functions, which, on the one hand generalize the design process and, on the other hand, they give the possibility to control the design process to achieve the optimum of the design cost function for the minimal computer time. This possibility appears because of infinite number of different design strategies that exist within the bounds of the new theory. In this case a new quality appears due to the possibility of controlling the design process by redistributing computational expense between the circuit's analysis and the procedure of parametric optimization. The problem of minimal-time network design strategy is formulated as a typical problem for some functional minimization of the control theory. The network optimization process in this case is defined as a controllable dynamic system.
An additional acceleration effect was discovered on the basis of new approach and it permits us the reducing of the computer design time additionally and serves as one of the fundamental notions for constructing the quasi-optimal-time design algorithm. This effect can be realized by means of changing of one design strategy to other with a special selection of the initial point of optimization process. Practical optimization of the different electronic networks shows that the potential computer time gain of the optimal strategy grows when the size and complexity of a network increase.
The conception of the Lyapunov function of the design process serves as one of the productive ideas to study the main properties of the time-optimal design algorithm. The Lyapunov function and its time derivative include the sufficient information to select more perspective design strategies from all of the different design strategies that exist in bounds of generalized optimization methodology. Analysis of behavior of the Lyapunov function during the optimization process shows a strong correlation between some characteristics of this function and a processor time. It means that the study of the Lyapunov function of design process helps us constructing the structure of the minimal-time network design algorithm.

Brief Biography of the Speaker:
Alexander Zemliak received the M.S. degree in electronic engineering from the Kiev Polytechnic Institute (KPI), Kiev, Ukraine, in 1972 and in mathematics from the Kiev University in 1975, and Ph.D. in electronic engineering from KPI in 1976. He is currently a Professor of Physics and Mathematics Department, Autonomous University of Puebla, and a Professor of the National Technical University of Ukraine "KPI" too. His research interests are in computer-aided RF and microwave circuit analysis, optimal design methodologies, computational electromagnetics, numerical techniques in the simulation, analysis and optimization of microwave devices. He has authored of two books, 6 chapters of books and over 250 papers in refereed journals and conference proceedings. From 1986 to 1994 he held some research grants from Ministry of Superior Education of Ukraine and industry. From 1998 to 2009 he held some grants from Mexican National Council of Science and Technology. He is a member of Ukrainian Scientific Society, National System of Investigators of Mexico, Senior Member of IEEE, member of IEICE, WSEAS and New York Academy of Sciences. He was a chairman of some international conferences in Mexico, member of technical program committee of some conferences around the world and invited lecturer of more than 10 international conferences. He obtained best paper award at National SOMI Conference, 1999 (Mexico), International conference IBERCHIP, 2002 (Mexico), International WSEAS Conference, 2009 (Turkey), International Conference IEEE EWDTS, 2009 (Russia). He is Editor-in-Chief of the WSEAS Transactions on Systems, Member of the Editorial Board of the WSEAS Transactions on Circuits and Systems, WSEAS Transactions on Electronics. He was a Reviewer of International Design Automation Conference-DAC, 2001–2003, USA; International Conference on Computing, Communication and

Control Technologies-CCCT, 2004–2008, USA; World Multi-Conference on Systemics, Cybernetics and Informatics, 2003–2009, USA.

Plenary Lecture 4

Nanotechnology in Mexico

Professor Armando Barranon
Dept. of Basic Sciences
UAM-Azcapotzalco
Mexico City
Mexico
E-mail: bca@correo.azc.uam.mx

Abstract: Mexican Research groups are dealing with theoretical and applied problems in Nanotechnology. And nanoproducts are being distributed along the country as well as nanotechnology patents are being registered and used in Mexican companies. Computational research, nanomicroscopy studies and chemical synthesis of nanosystems are being performed in order to design new advanced materials. Economics and Social Science methods have been applied to understand the social impact of Nanotechnology, collaborating with other teams around the world to develop standards for nanotechnology. Nanomedicine is developed in medical research centers to fight cancer and other diseases. A Mexican National Nanotechnology Initiative has been discussed by academic and governmental sectors since 2006 although no agreement has been reached so far. Taxation has been used to enhance governmental participation in science and technology at the capital city which could be
done also in the rest of the Mexican country, in order to attain a proper level of funding. In this Plenary Talk I will give statistical data regarding these efforts which indicate the need for a major governmental involvement in Nanotechnology.

Brief Biography of the Speaker:
Armando Barranon was born in Mexico City. B.Sc. in Mathematical Physics, Instituto Politecnico Nacional, Mexico City, 1986.
M.Sc. in Applied Statistics, The University of Texas at El Paso, 1989. Dr. in Philosophy, U. La Salle, Magna Cum Laude, Mexico City, 2004. M.Sc. Physics, Instituto Politecnico Nacional, Mexico City, 2005. Dr. in Physics of Materials, Instituto Politecnico Nacional, Mexico City, 2008.
Postdoctoral Fellow, U. Zacatecas, Mexico, 2008. Postdoctoral Fellow, U. of Texas at El Paso, 2009. Postdoctoral Fellow, CINVESTAV, 2009.
He is Full Professor at Department of Basic Sciences, Universidad Autonoma Metropolitana-Azcapotzalco, Mexico City. Research interests include Nuclear Physics, Computational Physics and Philosophy of Technology. In 2007, Dr. Barranon founded the Nanoeducation Seminar at UAM-Azcapotzalco.
Dr. Barranon is member of the Mexican National Research System, Scientific Projects Evaluator of the Mexican Council of Science and Technology, member of American Physical Society, Sociedad Mexicana de Fisica, Sociedad Mexicana de Matematicas, Sociedad Mexicana de Termodinamica, Sociedad Mexicana de Historia de la Ciencia y la Tecnologia, among others.

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