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Recent Advances in Telecommunications and Circuit Design

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Proceedings of the 17th International Conference on Circuits (part of CSCC '13)

Proceedings of the 17th International Conference on Communications (part of CSCC '13)

Rhodes Island, Greece, July 16-19, 2013

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Preface

This year the 17th International Conference on Circuits (part of CSCC '13) and the 17th International Conference on Communications (part of CSCC '13) were held in Rhodes Island, Greece, July 16-19, 2013. The conferences provided a platform to discuss network theory and applications, molecular electronics, optoelectronic devices, nonlinear circuits, circuit models, electrical and electronic measurement, circuit implementation for fuzzy systems, microwave theory and techniques, propagation, optical fiber systems, communication electronics, wireless and mobile computing, military communications 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

"The Missing" Memristor - The Fourth Circuit Element. Analysis of Circuits with Memristors

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Abstract: In 2008, the HP laboratories researchers D. B. Strukov, G.S. Snider, D.R. Stewart, R.S. Williams published a paper in Nature (D. B. Strukov, G.S. Snider, D.R. Stewart, R.S. Williams, "The missing memristor found", Nature, vol 453, pp. 80 – 83, May 2008), reporting the development of a new basic circuit element that completes the missing link between charge and flux linkage. This element was proposed by Chua in 1971 (L. O. Chua 1971, "Memristor – The Missing Circuit Element", IEEE Trans. on Circuit Theory, vol. 18, pp. 507-519, Sept. 1971) as a missing non-linear passive two-terminal electrical element relating electric charge and magnetic flux linkage. The HP memristor is based on a nanometre scale titanium-dioxide thin film, containing a doped region and an undoped region. The memristors provide new paradigms in application-specific integrated circuits and field programmable gate arrays. A significant reduction in area with an unprecedented memory capacity and device density are the potential advantages of memristors for integrated circuits. The first part of the talk is dedicated to the history and development of the Williams's memristor. The structure, the principle of action, basic parameters, the basic physical dependencies and basis of the physical processes of the titanium-dioxide memristor will be presented. The main formulae will be given as well.
The analysis that will be shown in the second part of the talk considers linear drift model of Williams's memristor. A SIMULINK model of circuits with one, two and several memristors are build with obtained formulae and Kirchhoff's voltage law. The basic results by the simulations organized in MATLAB and SIMULINK environment are given in graphical form. These results are associated with distortions of plateaus of impulses at different ratios r between resistances of "opened" and "closed" states of Williams's memristor - ROFF and RON. There are given also interpreting of results, which confirms that a memristor with high ratio r is better than a memristor with small value of r. In conclusion there are given basic deductions and perspectives for future applications of memristor circuits.

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 180 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.

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Plenary Lecture 2

On Some Aspects of Sensitivity Determination of Translinear Circuits

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Abstract: Despite of the well known advantages of the discrete-time filters during the last decade the researcher interest was attracted again to the continuous-time filters because more of the processed signals are continuous-time in their nature. One of the main topics in this increasing interest is the theory of analysis and synthesis of externally linear-internally nonlinear (ELIN) circuits – e.g. log-domain filters, square-root domain filters, sinh-domain filters, tanh-domain filters etc. The analysis and synthesis of ELIN circuits is accompanied by typical difficulties mainly due to the nonlinear characteristics of the bipolar or MOS transistors. These peculiarities complicate the determination of the main parameters that defines the practical workability of the synthesized ELIN circuits – the sensitivities of first- and second-order. Indeed in the literature they exist some investigations on the problems of ELIN-circuit sensitivity but they refer to some special structures synthesized on the base of passive prototypes, OTA-C-prototypes, active RC-prototypes, state-space derived structures etc. The paper presented is an attempt to find some common approaches to sensitivity determination in a may be greatest class of ELIN-structures – translinear circuits. Here we include the translinear structures obtained on the base of the passive prototypes by using translinear integrators and state-space equation simulation. As an interesting result we observe that the sensitivity index of passive prototypes and of the corresponding translinear decisions are very close independently of the synthesis method used. The practical meaning of this conclusion suffers that the low sensitivity passive prototypes (especially these with ladder structure) are almost quite interchangeable by their translinear equivalents with respect to the corresponding transfer functions.

Brief Biography of the Speaker: Georgi A. Nenov graduated from Technical University, Sofia, Bulgaria in 1962. He worked as an Assistant Professor in Technical University, Varna, Bulgaria (1963-1966), as a Scientific Researcher in Institute of Instrument Design in Sofia (1966-1974) and in Institute of Technical Cybernetics, Bulgarian Academy of Sciences in Sofia (1974-1980), as an Associate Professor in University "Prof. Dr Assen Zlatarov", Bourgas, Bulgaria (1980-1988) and as an Associate Professor (1988-1995) and Professor (1995) in Higher School of Transport "Todor Kableshkov, Sofia. Prof Nenov defend in 1973 a PhD dissertation on active circuit synthesis and in 1991, a Dr.Sc dissertation on analysis and synthesis of SC-networks. He is a Senior Member of IEEE and a member of Bulgarian Scientific Found. The research interests of Prof. Nenov are in the field of electrical network analysis and synthesis, network sensitivity and neural networks. He is an author and co-author of more than 120 journal and conference papers, 3 books and 1 invited book chapter.

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Plenary Lecture 3

Countermeasure Technique to Combat Greedy Behavior in Ad-hoc Wireless Networks

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Abstract: This presentation covers a countermeasure technique to combat the greedy behavior in IEEE 802.11. The countermeasure technique presented in this paper consists of three stages; first is to detect the greedy node on the MAC layer by solving Markov Chain. Second stage is to temporarily isolate the greedy node and this stage utilizes the game theory concepts and consists of coordination between the MAC and Network layers to agree on new communication frequency band applied by the PHY layer to isolate the greedy node. The third stage is to give a second chance to the greedy node to rejoin the group assuming it will behave and follow the standard so the whole system reaches an equilibrium state in the sense that deviation from this strategy has no profit for the deviator in the average outcome (long term).

Brief Biography of the Speaker: Dr Saadawi has been with the Electrical Engineering Department, The City University of New York, CityCollege, since 1980, where he currently directs the Center of Information Networking and Telecommunications (CINT) at CCNY. His current research interests are wireless networks, multimedia networks, AD-HOC networks and network security. He has published extensively in the area of telecommunications networks. He is a co-Editor of Cyber Infrastructure Protection, published by Strategic Studies Institute, 2010, lead-author of a text book on telecommunications, and the lead author of Egypt Telecommunications Infrastructure Master Plan, funded by USAID.
Dr Saadawi a former Chairman of IEEE Computer Society of New York City He has received IEEE Region 1 Award. Dr Saadawi has been a member of the Consortium Management Committee of ARL Consortium on Telecommunication (2001- 2011), and has been on US Dept of Commerce delegation to the Algerian Government addressing Rural Communications, April 2007.

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Plenary Lecture 4

Signal Processing by Generalized Receiver in DS-CDMA Wireless Communication Systems with Frequency-Selective Channels

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Abstract: The generalized receiver (GR) based on a generalized approach to signal processing (GASP) in noise is investigated in a direct-sequence code-division multiple access (DS-CDMA) wireless communication systems with frequency-selective channels. We consider four avenues: linear equalization with finite impulse response (FIR) beamforming filters; channel estimation and spatially correlation; optimal combining; and partial cancellation. We investigate the GR with simple linear equalization and FIR beamforming filters. Numerical results and simulation show that the GR with FIR beamforming filters surpasses in performance the optimum infinite impulse response beamforming filters with conventional receivers, and can closely approach the performance of GR with infinite impulse response beamforming filters. Channel estimation errors are taken into consideration so that DS-CDMA wireless communication system performance will not be degraded under practical channel estimation. GR takes an estimation error of a maximum likelihood (ML) multiple-input multiple-output (MIMO) channel estimation and GR spatially correlation into account in computation of minimum mean square error (MMSE) and log-likelihood ratio (LLR) of each coded bit. The symbol error rate (SER) performance of DS-CDMA employing GR with a quadrature sub-branch hybrid selection/maxmal ratio combining (HS/MRC) scheme for 1-D modulations in Rayleigh fading is obtained and compared with that of conventional HS/MRC receivers. Procedure of selecting a partial cancellation factor (PCF) for the first stage of a hard-decision partial parallel interference cancellation (PPIC) of the GR employed in DS-CDMA wireless communication systems is proposed. A range of optimal PCFs is derived based on the Price's theorem. Computer simulation results show superiority in bit error rate (BER) performance that is very close to that potentially achieved and surpases the BER performance of the real PCF for DS-CDMA systems discussed in literature.

Brief Biography of the Speaker: Vyacheslav Tuzlukov received the MSc and PhD degrees in radio physics from the Belorussian State University, Minsk, Belarus in 1976 and 1990, respectively. From 2000 to 2002 he was a Visiting Professor at the University of Aizu, Japan and from 2003 to 2007 served as an Invited Professor at the Ajou University, Suwon, South Korea, within the Department of Electrical and Computer Engineering. Since March 2008 to February 2009 he joined as Full Professor at the Yeungnam University, Gyeonsang, South Korea within the School of Electronic Engineering, Communication Engineering, and Computer Science. From March 2009 he has been a Full Professor of the Department of Communication and Information Technologies, School of Electronics Engineering, College of IT Engineering, Kyungpook National University, Daegu, South Korea. His research emphasis is on signal processing in radar, wireless communications, wireless sensor networks, remote sensing, sonar, satellite communications, mobile communications, and other signal processing systems. He is the author over 200 journal and conference papers, seven books in signal processing area published by Springer-Verlag and CRC Press, some of them are Signal Detection Theory (2001), Signal Processing Noise (2002), Signal and Image Processing in Navigational Systems (2005), Signal Processing in Radar Systems (2012), Editor of the forthcoming book Communication Systems: New Research (2013), and has also contributed Chapters “Underwater Acoustical Signal Processing” and “Satellite Communications Systems: Applications” to Electrical Engineering Handbook: 3rd Edition, 2005; “Generalized Approach to Signal Processing in Wireless Communications: The Main Aspects and Some Examples” to Wireless Communications and Networks: Recent Advances, InTech, 2012; “Wireless Communications: Generalized Approach to Signal Processing”, to Communication Systems: New Research: Nova Publisher, Inc., USA, 2013, and “Radar Sensor Detectors for Vehicle Safety Systems” to Autonomous Vehicles: Intelligent Transport

Systems and Automotive Technologies, Nova Publisher, Inc., USA, 2013. He participates at the major International Conferences and Symposia on signal processing as the Keynote Speaker, Plenary Lecturer, Chair of Sessions, Tutorial Instructor and organizes Special Sections. Dr. Tuzlukov was highly recommended by U.S. experts of Defense Research and Engineering (DDR&E) of the United States Department of Defense as a recognized expert in the field of humanitarian demining and minefield sensing technologies and had been awarded by Special Prize of the United States Department of Defense in 1999 Dr. Tuzlukov is distinguished as one of the leading achievers from around the world by Marquis Who's Who and his name and biography have been included in the Who's Who in the World, 2006-2012; Who's Who in World, 25th Silver Anniversary Edition, 2008, Marquis Publisher, NJ, USA; Who's Who in Science and Engineering, 2006-2012 and Who's Who in Science and Engineering, 10th Anniversary Edition, 2008-2009, Marquis Publisher, NJ, USA; 2009-2010 Princeton Premier Business Leaders and Professionals Honours Edition, Princeton Premier Publisher, NY, USA; 2009 Strathmore's Who's Who Edition, Strathmore's Who's Who Publisher, NY, USA; 2009 Presidental Who's Who Edition, Presidental Who's Who Publisher, NY, USA; Who's Who among Executives and Professionals, 2010 Edition, Marquis Publisher, NJ, USA; Who's Who in Science and Engineering, 2011-2012, Marquis Publisher, NJ, USA; 2011/2012 Strathmore's Professional Who's Who Registry among Executives, Professionals, & Entreprenuers, Strathmore's Who's Who Publisher, NY, USA; 2011/2012 Edition of Distinguished Professionals On-line, Marquis Publisher, NJ, USA; Who's Who in Asia 2012, 2nd Edition, Marquis Publisher, NJ, USA. Phone: +82-53-950-5509.

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Plenary Lecture 5

Theoretical Development, Simulation and Design of Physical Layer for Applications in Wireless Systems and Networks

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Abstract: The development of direct sequence spread spectrum systems allowed various applications including design and development of wireless systems and networks. This lecture will cover research results related to the physical layer design for wireless networks applications, in particular for wireless sensor network designs. One part of the lecture will address the development and design of multi-user systems, primarily the systems based on code division multiple access systems (CDMA). It will be assumed that the presented spread spectrum systems are based on the application of non-binary orthogonal sequences to transmit the users' information. In recent years, the non-binary sequences, primarily chaotic and random sequences, have been extensively investigated and applied in spread-spectrum systems. The chaotic sequences are generated by chaotic maps and random sequences are produced by the random number generators. In particular, the lecture will present results related to the physical layer design for wireless sensor networks, which will include theoretical modelling, simulation and practical design of the layer that is based on the application of binary and non-binary spreading sequences.Due to the semi-random or random nature of non-binarysequences,a particular problem in these systemsis how to achieve sequence synchronization. For that reason, the lecture will also present the latest findings related to the mathematical modelling, simulation and design in digital technology of efficient synchronisation techniques in these systems.

Brief Biography of the Speaker: Dr Stevan M. Berber was born in Stanisic, Serbia, former Yugoslavia. He completed his undergraduate studies in electrical engineering in Zagreb, master studies in Belgrade, and PhD studies in Auckland, New Zealand. Currently Stevan is with the Department of Electrical and Computer Engineering at Auckland University, New Zealand. He was appointed Visiting Professor at the University of Novi Sad in 2004, Visiting Scholar at the University of Sydney in 2008, visiting professor at the University of Science and Technology in Nanjing, China.His teaching interests are in communication systems, information and coding theory, discrete stochastic signal processing and wireless sensor and computer networks.His research interests are in the fields of digital communication systems and signal processing with the emphasis on applications in CDMA systems and wireless computer, communication and sensor networks. He is the author of more than 120 refereed journal and conference papers, 8 books and 3 book chapters. Hi filed three patent applications. Dr Berber is a referee for papers in leading journals and conferences in his research area. He has been leading or working on a large number of research and industry projects. Dr Berber is a senior member of IEEE, a member of New Zealand Scientists, and an accredited NAATI translator for English language.

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