Editors

Dalibor Biolek

Konstantin Volkov

Kok Mun Ng

Advances in Circuits, Systems, Automation and Mechanics

- Proceedings of the 11th WSEAS International Conference on Circuits, Systems, Electronics, Control & Signal Processing (CSECS '12)
- Proceedings of the 8th WSEAS International Conference on Applied and Theoretical Mechanics (MECHANICS '12)
- Proceedings of the 3rd International Conference on Automotive and Transportation Systems (ICAT '12)

Montreux, Switzerland, December 29-31, 2012

ISBN: 978-1-61804-146-3

Advances in Circuits, Systems, Automation and Mechanics

ADVANCES in CIRCUITS, SYSTEMS, AUTOMATION and MECHANICS

Proceedings of the 11th WSEAS International Conference on Circuits, Systems, Electronics, Control & Signal Processing (CSECS '12)

Proceedings of the 8th WSEAS International Conference on Applied and Theoretical Mechanics (MECHANICS '12)

Proceedings of the 3rd International Conference on Automotive and Transportation Systems (ICAT '12)

Montreux, Switzerland
December 29-31, 2012

Published by WSEAS Press
www.wseas.org

ISBN: 978-1-61804-146-3

ADVANCES in CIRCUITS, SYSTEMS, AUTOMATION and MECHANICS

Proceedings of the 11th WSEAS International Conference on Circuits, Systems, Electronics, Control & Signal Processing (CSECS '12)
Proceedings of the 8th WSEAS International Conference on Applied and Theoretical Mechanics (MECHANICS '12)
Proceedings of the 3rd International Conference on Automotive and Transportation Systems (ICAT '12)

Montreux, Switzerland
December 29-31, 2012

Published by WSEAS Press
www.wseas.org

All papers of the present volume were peer reviewed by no less that two independent reviewers. Acceptance was granted when both reviewers' recommendations were positive.
See also: http://www.worldses.org/review/index.html

ISBN: 978-1-61804-146-3

World Scientific and Engineering Academy and Society

North Atlantic University Union

ADVANCES in CIRCUITS, SYSTEMS, AUTOMATION and MECHANICS

Proceedings of the 11th WSEAS International Conference on Circuits, Systems, Electronics, Control & Signal Processing (CSECS '12)

Proceedings of the 8th WSEAS International Conference on Applied and Theoretical Mechanics (MECHANICS '12)

Proceedings of the 3rd International Conference on Automotive and Transportation Systems (ICAT '12)

Montreux, Switzerland
December 29-31, 2012

Chandrasekaran Subramaniam
Tiberiu Socaciu
Radha Gupta
Shahram Javadi

Table of Contents

Plenary Lecture 1

Atomic Functions: Principles and Applications

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

Abstract: Smoothing window functions have been a very important tool in many signal processing applications since the middle on 70's years, in applications in which signals under analysis must be segmented reducing at the same time the sidelobes of the spectral density of the signal under analysis. Thus in digital filter design, speech and audio coding, speech recognition and spectrum estimation have been widely used the Hamming, Hannning, Blackman and Kaiser window functions, while in image analysis, optical flow and face recognition the Gaussian functions etc. Other important set of smoothing functions, that provide a higher attenuation of sidelobes, is the Atomic functions that were firstly analyzed in detail in the book by V.L. Rvachev and V.A. Rvachev in 1971, and used in the solution of several problems reported in important books and papers. This speech presents a review of Atomic Functions (AF) which is compactly supported infinitely differentiable solution of differential equations. The main properties of AF are analyzed together with some of the most successfully applications such as: digital filter design, image filtering, radar signal processing, optical flow estimation and invariant feature extraction, etc.

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 was 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 17 PhD theses and more than 35 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 2

Determination of the First-Order Sensitivity Index of State-Space Synthesized Translinear Filters

Professor Georgi A. Nenov
Higher School of Transport "Todor Kableshkov"
Sofia, BULGARIA
E-mail: gnenov1@gmail.com

Abstract: Analysis and synthesis of translinear circuits is an actual and promising topic in the circuit theory. This can be explained by the various applications of practical importance where the translinear circuits allow to obtain low-power, low-voltage supplied and small size devices for analog signal processing. The action of the translinear devices is based on the static or dynamic translinear principle and usually uses the exponential relationship between collector current and base-emiter voltage of the bipolar transistor. A wide field where the translinear circuits find an application is the synthesis of so named log-domain filters. Despite they are internally nonlinear devices log-domain filters have a behavior of externally linear circuits with a good frequency selectivity. A variety of methods for synthesis of such kind of filters are proposed during last two decades. Some of them use suitable transformations of the signal-flow graph representations of the passive or active RC-filters, whereas others search a decision by using a modeling the set the corresponding state-space equations with translinear integrators. One exist methods with a direct replacement of elements in active RC-realizations by translinear blocks also. An interesting and original approach to the synthesis of a wide class log-domain filters was proposed by Frey where it is shown the transformation of the passive prototype state-space equation into a corresponding translinear circuit nodal equation set. An important parameter connected with the practical value of the synthesized structures is their sensitivity. Whereas the sensitivity for passive, active RC-, switched-capacitor filters is an object of a great number of investigations, this matter does not studied enough in translinear filter area. For the most of tranlinear realizations the use of DC current sources is a typical peculiarity and the change of the supplied by them currents influences the circuit characteristics. In the proposed paper a matrix approach to the determination of sensitivity index of the translinear circuits, obtained according the method in [1] is described. On the base of a passive prototype state-space equations and their transformed form some expressions for the square sum of the transfer function sensitivities with respect to the current source values is obtained. The results for the directed realization and for the realization after the equivalently transforming state-space equations are compared on the base of an example.

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 about 120 journal and conference papers, 3 books and 1 invited book chapter.

Plenary Lecture 3

Proposed Method and Program for Classification of Information Systems

Professor Amaury A. Caballero
Department of Electrical and Computer Engineering
Florida International University
USA
E-mail: caballer@fiu.edu

Abstract: The necessity of interpreting the huge quantity of received information for its use in many technological processes is of primarily importance in the modern industry. Different methods have been developed for extracting useful information from a row dataset. Neural networks and information entropy have been used to discriminate. Also the combination of rough sets and fuzzy logic for classification is a widely adopted method. Rough set theory helps in minimizing the number of attributes that influence the selection and fuzzy logic permits to discriminate when there is more than one possible solution for the same attributes and intervals. Differently from other works, the concept of information measure is used in this work, together with a fuzzy logic discrimination tool. Using these concepts, an attribute reduction is initially obtained and then, if necessary, fuzzy logic can be applied for discriminating among the possible solutions. The method results simpler than others and as accurate as the methods usually employed. Using the basic information concepts, the proposed method and a program have been developed for minimizing the number of used attributes for the discrimination of objects, under some maximum error restriction, α. In the conference, it is shown with examples that having a row database with the values obtained from different sources in different runs, it is possible:
1) To minimize and show the attributes that discriminate selected objects without any uncertainty for the accepted error α
2) To minimize and show the attributes that discriminate selected objects with uncertainty for the accepted error α
3) To show the discriminated objects without any uncertainty, and those that can be discriminated with certain uncertainty for the selected attributes and the accepted error α
4) To show the objects that cannot be discriminated with the selected attributes for the accepted error α.

Brief Biography of the Speaker: Amaury A. Caballero obtained his Bachelor Degree in Electrical Engineering from the University of Havana, Cuba, earned his Ph.D. in Technical Cybernetics from the Energy Institute of Moscow, Russia, and his Professional Engineer License from the state of Florida, USA. For more than 20 years he taught and performed research at the Higher Polytechnic Institute of Havana, where he earned the category of Full Professor and directed research in the areas of Automatic Control and Robotics. He was also a member of the Higher Scientific Council of the Cuban Academy of Sciences and was awarded medals in recognition of his work from the Cuban Ministry of Higher Education and at the Technical University of Brno, in Czech Republic, where he participated in a post-doctoral Study in robotics and developed research with the Faculty. Dr. Caballero has been invited to give speeches at the Universidad de Pamplona in Colombia, the Universidad Católica de Santa María in Peru, the Universidad Tecnologica Centroamericana in Honduras, and the Universidad Autonoma Estatal del Estado de Hidalgo in Mexico, where he also imparted a graduate course in fuzzy logic. He has published two text books and one monograph in the area of automatic control and obtained five certificates of invention in the same area. He also wrote published research reports and papers, published in scientific journals and conference proceedings. In total he has over 100 publications. Presently, he is a Senior Lecturer at Florida International University, where he teaches in the department of Electrical and Computer Engineering and has conducted in-depth research in the areas of automation applied to construction management and in fuzzy logic applications, and also works as a consultant in electrical engineering.

Plenary Lecture 4

A Methodology for Fault Tolerant ASIC Design

Dr. Zoran Stamenkovic
System Design/Wireless Broadband Communication Systems
IHP GmbH, Frankfurt (Oder)
Germany
E-mail: stamenko@ihp-microelectronics.com

Abstract: The sensitivity of application specific integrated circuits (ASICs) to the single event effects (SEE) can induce failures of the systems which are exposed to increased radiation levels in the space and on the ground. A design methodology for a full fault-tolerant ASIC that is immune to the single event upsets (SEU) in sequential logic, the single event transients (SET) in combinatorial logic and the single event latchup (SEL) in CMOS logic will be presented. The dual modular redundancy (DMR) and a SEL power-switch (SPS) are the basis of a modified ASIC design flow that incorporates the fault tolerance. Measurement results that prove the correct functionality of DMR and SPS circuits, as well as a high fault tolerance of implemented ASICs along with moderate overhead in respect of power consumption and occupied silicon area will be analyzed too.
The fault injection models for simulation and validation of the fault tolerance of redundant systems to the SEUs and SETs will be introduced. The fault models are based on the random generated SEUs in sequential logic and SETs in combinatorial logic. The analytical models for calculation of the probability of failure-free triple modular redundant (TMR) and dual modular redundant (DMR) circuits will be defined. To justify the reduced redundancy concept, the simulated and calculated probabilities of failure-free TMR and DMR circuits will be discussed and compared. The results showing trade-off between hardware overhead and circuit failure-free probability of the two concepts will be presented too.

Brief Biography of the Speaker: Dr. Zoran Stamenković is with IHP GmbH, Frankfurt (Oder), Germany. He received his Ph.D. degree in electronic engineering from the University of Niš, Serbia in 1995.
His research interests include wireless SOC design, HDL modelling, logic synthesis, chip layout, and IC yield and reliability modelling and prediction. He has leaded the EU funded project on a wireless MIMO system (MIMAX) at IHP GmbH. Currently he is in charge for the project on a vehicle wireless camera system funded by the German State of Brandenburg.
Dr. Stamenković has published a book on IC yield, six chapters in prestigious monographs, and more than 80 scientific journal and conference papers.

Plenary Lecture 5

Dispersive Extinction Theory of Cosmic Redshift

Professor Ling Jun Wang
Department of Physics, Geology and Astronomy
University of Tennessee at Chattanooga
615 McCallie Av. Chattanooga, TN 37403
USA
E-mail: lingjun-wang@utc.edu

Abstract: The most important mile stone in the development of the Big Bang cosmology is the Hubble Law, which shows a roughly linear relationship between the redshift of the spectral lines from a galaxy to the distance from it to earth. Hubble interpreted the phenomenon as a Doppler shift effect due to the recession motion of the galaxy, which inevitably led to the picture of an expanding universe created from a singularity about 15 billion years ago. The Big Bang theory has many well known fundamental problems such as the horizon problem, the geocentric nature of the theory, the extreme violation of the law of mass and energy conservation, the extreme violation of the constancy of the speed of light, and the extreme instability of the mathematical model. The Dispersive Extinction Theory (DET), which we have developed through a number of recent publications, however, interprets the cosmic redshift as the result of dispersive absorption and scattering of the star light by the intergalactic space medium during its propagation towards the earth. The theory is based on the well known phenomenon that is responsible for the star-reddening and for the sky to be blue. since the space medium absorbed and scatters the blue light more than it does the red component, the Gaussian peak of a spectral line would shift towards the red side, and therefore the redshift. No global galactic movement is needed in this theory to explain the cosmic redshift, and therefore, DET allows a stable non expanding universe, infinite in space and time. The new theory is free of all the well known problems intrinsic to the prevailing Big Bang Theory. Not only DET offers an alternative cosmology, it also contains rich physics never known to astrophysics community before: DET predicts that the cosmic redshift not only roughly linearly dependent on the distance, but is also proportional to the square of the linewidth and inversely proportional to the cube of the wavelength. This linewidth and wavelength dependence may be used to vindicate or falsify either one of DET and Big Bang cosmology against the other. DET also offers an interpretation of the abnormal redshifts of the quasars: The incredibly high redshifts of the quasars may well be due to the large linewidths typical of the quasars. It also indicats a possibility that much of the identification of the redshifts might be wrong, due to the omission of the linewidth and wavelength dependence of the redshift. It also offers an explanation of the abnormally great redshift of the quasars: It could be caused by the wide linewidths.

Brief Biography of the Speaker: Dr. Ling Jun Wang graduated from the University of Delaware, USA in 1984. He then worked as postdoctoral research associate at Wesleyan University and Oak Ridge National Laboratory. He then joined Vanderbilt University as a research associate professor. In 1990 Dr. Wang joined the faculty of University of Tennessee at Chattanooga in 1990 while cooperating with Oak Ridge National Laboratory, Argonne National Laboratory, and NASA Marshal Space Center as research associate and visiting professor. Being both theoretical and experimental physicist, his research work ranges from atomic physics, fusion physics, solid state physics, particle physics relativity and cosmology. His recent research interest is focused on the rotational behavior of Einsteinian spacetime, geocentric nature of the Big Bang theory and the Dispersive Extinction Theory of cosmic redshift, which he has developed in the recent years. He is author of about 60 papers published in peer reviewed international journals, conference proceedings, and invited book chapters. Dr. Wang was a previous Plenary Speaker of a WSES Meeting.

Plenary Lecture 6

The Vegetable Oil Fuel System for Diesel Engines (VFSD)

Professor Charalampos Arapatsakos
Department of Production and Management Engineering
Democritus University of Thrace
Xanthi, Greece
E-mail: xarapat@pme.duth.gr

Abstract: Petroleum is a non renewable but a finite resource, incapable of being reproduced in human time frames. Over the past 150 years, geologists and other scientists often have predicted that oil reserves would run dry within a few years. The rising oil demand plus the fixed supply equals to the depletion of remaining supplies and increasing economy scarcity. Furthermore, petroleum scarcity could easily destabilize world-wide relations and lead to a major war. Additionally, there is a big need for the protection of the environment. Environmentalists argue that governments must develop new energy technologies that do not rely on fossil fuels. At the present paper it will be examined an automated system that it can be adapted to any diesel engine and it could use any mixture of diesel – vegetable oils as fuel.

Brief Biography of the Speaker: Dr Charalampos Arapatsakos is a Greek citizen, who has been born in Athens. He has studied Mechanical of Engineering. He is Professor on Democritus University of Thrace in Greece. Prof C. Arapatsakos has participated in many research programs about biofuels, gas emissions and antipollution technology. His research domains are mainly on biofuels and their use in internal combustion engines, the power variation from the use of biofuels, the gas emissions and mechanical damages.