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SIMULATION, MODELLING AND OPTIMIZATION

Proceedings of the 8th WSEAS International Conference on
SIMULATION, MODELLING and OPTIMIZATION
(SMO '08)

Santander, Cantabria, Spain, September 23-25, 2008

Mathematics and Computers in Science and Engineering
A series of Reference Books and Textbooks

ISBN: 978-960-474-007-9
ISSN 1790-2769

Published by WSEAS Press
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World Scientific and Engineering Academy and Society

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Preface

This book contains the proceedings of the 8th WSEAS International Conference on SIMULATION, MODELLING and OPTIMIZATION (SMO '08) which was held in Santander, Cantabria, Spain, September 23-25, 2008. This conference aims to disseminate the latest research and applications in Simulation via Computational Linear Algebra techniques, Numerical Behaviour of Optimization Algorithms, The Art of Computer Programming of Numerical Methods, Signal Processing and other relevant topics and applications.

The friendliness and openness of the WSEAS conferences, adds to their ability to grow by constantly attracting young researchers. The WSEAS Conferences attract a large number of well-established and leading researchers in various areas of Science and Engineering as you can see from **http://www.wseas.org/reports**. Your feedback encourages the society to go ahead as you can see in **http://www.worldses.org/feedback.htm**

The contents of this Book are also published in the CD-ROM Proceedings of the Conference. Both will be sent to the WSEAS collaborating indices after the conference: **www.worldses.org/indexes**

In addition, papers of this book are permanently available to all the scientific community via the WSEAS E-Library.

Expanded and enhanced versions of papers published in this conference proceedings are also going to be considered for possible publication in one of the WSEAS journals that participate in the major International Scientific Indices (Elsevier, Scopus, EI, ACM, Compendex, INSPEC, CSA .... see: www.worldses.org/indexes) these papers must be of high-quality (break-through work) and a new round of a very strict review will follow. (No additional fee will be required for the publication of the extended version in a journal). WSEAS has also collaboration with several other international publishers and all these excellent papers of this volume could be further improved, could be extended and could be enhanced for possible additional evaluation in one of the editions of these international publishers.

Finally, we cordially thank all the people of WSEAS for their efforts to maintain the high scientific level of conferences, proceedings and journals.

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Plenary Lecture I

Fuzzy Control of Electrical Drives

Professor Constantin Volosencu
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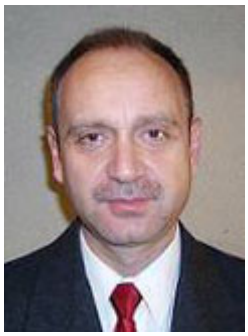
Abstract: The paper presents a short survey of some topics related to speed control of electrical drives based on fuzzy PI controllers. In the beginning the conventional control systems of the main three motors mostly used in practice: DC motors, induction motors and permanent magnet synchronous motors are taken in discussion, emphasizing the way of their PI liner controller design. The paper presents how the fuzzy PI speed controllers may be developed for all three motors. A stability analysis of the fuzzy control of DC control system, based on circle criterion is presented. Modeling and simulation Simulink diagrams with transient characteristics for different functioning regimes are presented. A comparison of the quality criteria for fuzzy control systems and linear control systems is discussed. Some ways of implementation of the fuzzy speed controllers based on interpolation and neural networks is presented.

Brief Biography of the Speaker: Prof. Constantin Volosencu graduated in 1981 the Faculty of Electrotechnics, "Traian Vuia" Polytechnic Institute of Timisoara, Romania, as an engineer in automatics and computers and he is doctor in control systems from 2000 at "Politehnica" University of Timisoara. In present he is professor at "Politehnica" University of Timisoara, Faculty of Automatics and Computers, Department of Automatics and Applied Informatics. His interest is in linear control systems, fuzzy control, neural networks, control of electrical drives, modeling, simulation, identification and sensor networks. He is author of 9 books, of more then 100 published papers, he was manager of 30 national an international research projects. Constantin Volosencu worked from 1981 to 1990 at "Electrotimis" Enterprise Timisoara, in the field of control systems for industrial machines, where he developed control equipments for a large scale of machineries, which are the objects of 27 patents.

Plenary Lecture II

Artificial Social Systems for Workflow Chart



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Abstract: We focus on the control of the performance characteristics of workflows modelled with stochastic Petri nets (SPN's). This goal is achieved using a new model for Artificial Social Systems (ASS's) behaviours, and by introducing equivalent transfer functions for SPN's.

ASS's exist in practically every multi-agent system, and play a major role in the performance and effectiveness chart of the agents. This is the reason why we introduce a suggestive model for ASS's. To model complex systems, such as flexible manufacturing ones, a class of Petri nets is adopted, and briefly introduced.

This class allows representing the flow of physical resources and control information data of the ASS's components. In the analysis of SPN we use simulations in respect to timing parameters in a generalized semi-Markov process (GSMP). By using existing results on perturbation analysis (e.g., delays in supply with raw materials, equipment failure, etc.), and by extending them to new physical interpretations we address unbiased sensitivity estimators correlated with practical solutions in order to attenuate the perturbations.

The novelty of the approach is that the construction of large Markov chains is not required. Using a structural decomposition, the construction system is divided into cells. We can simplify the structure of the SPN using the presented approach, which is useful when we deal with complex Petri nets, and we need to simplify these structures (e.g. graphs) in order to analyze them properly. For each cell a Markov model was derived and the probability was determined of at least Ni working machines in cell i, for i = 1,2,..,n and j , where j=1, ..., m, working material handling system (MHS) at time t, where Ni and j satisfy the system production capacity requirements. An example illustrates this approach. The results reported here form the basis of several enhancements, such as conducting performance studies of complex systems with multiple part types.

Brief Biography of the Speaker:

- Honor Member of the Romanian Society of Electrical & Control Engineering - Member of the Romanian Technical Experts Corp.
- Technical Expert of the Romanian Ministry of Justice.
- President of the Romanian Society of Electrical & Control Engineering, Suceava Branch.
- Academic Positions: Assoc. Professor, Dept. of Automatics and Computers, Faculty of Electrical Engineering and Computer Science, "Stefan cel Mare" University of Suceava, Romania.
- Fields of Scientific Activities: Discrete Event Systems, Complex Measurement Systems, Reliability and Diagnosis of Control Systems, Environmental Management.
- He published 6 books and over 120 scientific papers in conference proceedings and journals

Plenary Lecture III

Opposition-Based Computation

Assistant Prof. Shahryar Rahnamayan
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Abstract: Footprints of the opposition concept can be observed in many areas around us. But it has sometimes been known by different names. Opposite particles in physics, complement of an event in probability, absolute or relative complement in set theory, and theses and antitheses in dialectic just are some examples to mention. But for the first time, recently, Opposition-Based Learning (OBL) was proposed and then the opposition-based approaches have been introduced in different artificial intelligence areas. All of them have tried to enhance searching or leaning process by utilizing the opposition concept. Opposition-based evolutionary algorithms, opposition-based neural networks, and also opposition-based reinforcement learning are some efforts in this direction. The main idea behind OBL is the simultaneous consideration of a candidate and its corresponding opposite candidate in order to achieve a better approximation for the current solution. This lecture will introduce Opposition-Based Computation (OBC) in general and also its possible variant applications in soft computing techniques.

Brief Biography of the Speaker: Dr. Shahryar Rahnamayan received his B.Sc. and M.S. degrees both with honors in software engineering from Shahid Beheshti University, Iran. In 2007, he received his Ph.D. degree in the field of evolutionary computation from University of Waterloo (UW), Canada. The opposition-based differential evolution (ODE) was proposed in his PhD thesis. Since August 2007, he has been a chief research manager at OMISA Inc. (Omni-Modality Intelligent Segmentation Assistant); a company which develops innovative software for medical image segmantation. Before joining to faculty of engineering and applied science, University of Ontario Institute of Technology (UOIT), Canada, as a faculty member, he was a postdoctoral fellow at Simon Fraser University (SFU), Canada. His research includes evolutionary algorithms, image processing, and opposition-based computation. Dr. Shahryar was awarded the Ontario Graduate Scholarship (OGS), President's Graduate Scholarship (PGS), NSERC's Japan Society for the Promotion of Science (JSPS) Fellowship, NSERC's Industrial R&D Fellowship (IRDF), NSERC's Visiting Fellowship in Canadian Government Laboratories (VF), and the Canadian Institute of Health Research (CIHR) Fellowship for two times.

Plenary Lecture IV

Classification Methods for Bibliomining

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Abstract: Advances in information technology are having an important impact on library systems. Large collections of heterogeneous data, from ancient manuscripts to sounds, videos and spatial data are now available in electronic format. Digital libraries are capturing human knowledge and distributing it over the web. The increasing volume of data in today digital repositories and library data warehouses has determined a wide use of computer-based sophisticated analysis techniques. Special operation of data mining can be performed in order to answer questions of librarians and researchers in information science. In 2003, S. Nicholson and J. Stanton introduced a new term – bibliomining - for data mining library systems. Therefore bibliomining is a large umbrella incorporating all data mining methods based on mathematics, statistics, operational research, machine learning, evolutionary computing, visualization techniques, and including traditional methods of analysing groups of bibliographic references as authorship, publications, and literature, specific to bibliometrics. Librarians and researchers in information science are mining library data warehouses and other library data collections in order to discover patterns and to understand library users' behaviour, their information and services needs, but also in order to evaluate and predict the effectiveness of library services, to discover trends in queries and to identify hot topics. Classification of items based on their characteristics (features, attributes, properties) in pre-defined categories is one of the most important bibliomining tasks. Classification is defined as the ordering of items in pre-defined groups (categories) or classes, based on their similarity. The classification process consists in assigning one of k labels (or classes) to each of n items derived from a specific problem. Classification predicts categorical labels. Analysis goal is to find a classification, a model or profile for each class that optimizes a combinatorial function consisting of assignment costs, based on the individual choice of label made for each item, and separation costs - based on the pair of choices made for two related items. In machine learning classification is defined as supervised learning. Classification, as a bibliomining technique, can be used for finding hidden patterns in data by deciding to what pre-defined class to assign a record of the data set, and also in prediction, to predict group membership for data instances. This lecture describes the most important classification methods (traditional approaches as classification trees, discriminant analysis, generalized linear models, modern statistical machine learning algorithms, support vector machine, belief networks, Gaussian processes, neural network, evolutionary algorithms, swarm intelligence, boosting and ensemble) and their use in mining library data collections. Research questions regarding pre-processing operations, attribute relevance and classifiers' performance will also be discussed with emphasis on the specificity of the library items to be classified.

Brief Biography of the Speaker: Ioana Moisil received the M.Sc. in Mathematics at the University of Bucharest, in 1971, the scientific grade in Statistical, Epidemiological and Operation Research Methods Applied in Public Health and Medicine at the Universite Libre de Bruxelles, in Belgium, in 1991 and the Ph.D. in Mathematics at the Romanian Academy in 1997. Work places: the National Institute for Research & Development in Informatics - I.C.I

(1971-1986), Carol Davila Faculty of Medicine Bucharest – department of Biophysics, CCSSDM Center of the Ministry of Health. At present she is a full-time Professor and a Senior Researcher at the Department of Computer Science and Automatic Control – Faculty of Engineering at the "Lucian Blaga" University of Sibiu. She is the author/co-author of fourteen books and over 150 scientific papers. Her scientific interests include intelligent systems, healthcare telematics, web technologies, data-mining, e-learning, modelling and simulation, uncertainty management, human-computer interaction. Professor Moisil participated in several EU funded projects as project manager for the national partner (Telenurse ID ENTITY, MGT, PROPRACTITION, PRO-ACCESS), in Tempus projects and in national funded projects as research manager and software development coordinator (INFOSOC – eUNIV, AMTRANS – eCASTOR, INFOSOC - e-Scribe, INFOSOC – DANTE, e-EDU-Quality, eTransMobility, CNCSIS 2007-code 33, Studies on multivariate interpolation, polinomial classifiers and applications, CNCSIS 2007 – cod 1502, Aspects concerning the psycho-cognitive abilities of artificial intelligent agents and applications in ITC based education). Ioana Moisil is a member of EARLI (European Association for Research in Learning and Instruction), she is Romanian representative in the IMIA SIG and EFMI WG5 Nursing Informatics, honorary member of the Bohemian Medical Association J.E.Purkyne of Bio-engineering and Medical Informatics, member of the ISCB – International Society for Clinical Biostatistics – Romanian National Group, of the Romanian Association of Engineers, member of the IITM- International Institute of Tele-Medicine and of the Romanian Society of Mathematics Sciences. She is vice-president of the Romanian Medical Informatics Society; vice-president of the HIT Foundation for Health Informatics and Telematics and a member of RoCHI-ACM. Professor Moisil is taking part in several international peer-review committees and conferences scientific boards.

Plenary Lecture V

Modeling Pedestrian Dynamics in Evacuation Processes

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and

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Abstract: In the paper the mathematical model of the evacuation processes from a chosen types of rooms in buildings, based on the Langevin equations, is presented. This process is an example of a collective dynamics of a set of self driven particles. In the equations additional term - social force - describing the interactions of the pedestrian with obstacles and other pedestrians, is included. As a result of numerical simulations the trajectories of each pedestrian in the room are found and the time of evacuation is calculated as a function of the desired velocity of pedestrians, which can be treated as the measure of the level of panic. Evacuation process can have laminar or turbulent character, depending on the geometry of the room and the number of persons present in it..

Brief Biography of the Speaker:
Prof. Robert Kosinski obtained a title of professor of physics in 1999.

He works at:
- The Faculty of Physics, Warsaw University of Technology (since 1972), where he is a Head of the Physics of Complex Systems Division
- The Central Institute for Labor Protection – National Research Institute (since 1995), in Safety Engineering Department

He performed scientific investigations in some foreign universities:
- 1982 – 1985 Wuppertal University, Germany, (Humboldt scholarship)
- 1990 Institute of Theoretical Physics, Zurych University of Technology (Switzerland)
- 1992 Centre of Nonlinear Studies, University of Johannesburg (Rep. Of South Africa)

His scientific activity concerns:
- theory of magnetism,
- investigations of nonlinear dynamical systems
- theory of artificial neural network,
- application of neural network in safety engineering,
- physics of complex systems, in particular mathematical modeling and numerical simulations of complex systems of different kind.

He is an author of

- 70 publications in the most known physical journals (as Physical Review, International Journal of Modern Physics)
- the book on Artificial Neural Network
- the academic textbook on Statistical Physics and Quantum Mechanics

He is a member of a number of scientific societies (e.g. Polish Physical Society, Societas Humboldtiana Polonorum)

Plenary Lecture VI

Change Point in Time Series Data

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Abstract: In building a statistical model for time series data the primary concern is to know whether all the observations can be represented by one particular model or whether the parameters in the model change at some known or unknown time point, called the change point. Subsequently, change points are defined as the points in data where two adjacent segments of the time series are connected. However, there are real-world applications in which only the position of the change is required and not the fitting functions. A change point can occur as a change in mean; change in variance or covariance or both; change in parameter; change in the structural model; or change in the trend in the model at certain known or unknown time point. Time series change point can be classified into two main categories; those which infer in a change when the statistics exceed a control limit; and those which directly estimate the time of change. In each category, the time point is a main factor, where the construction of the statistics and estimation are based on whether the time of occurrence is not known or not. Practically in most cases the time of change is unknown. From the simulation, it can be conclude that the larger the difference of the parameter estimates before and after the given change point, the higher will be the probability of the detection of the change point, the models that do not include a regular differencing operator, tends to be slightly higher in the probability of detection than the others, similar results occur for seasonal and non-seasonal models but the detection for the change point will be slightly lower for the seasonal models, and the procedure does not perform well when the point of change is at the beginning or at the end of the series.

Brief Biography of the Speaker: Azami Zaharim worked first 13 years as a lecturer in the Universiti Teknologi MARA (University of MARA Technology - UiTM) before joining the Universiti Kebangsaan Malaysia (National University of Malaysia - UKM) in the year 2003. He is Associate Professor at the Faculty of Engineering and Built Environment UKM, and is currently Coordinator for the Unit Fundamental Engineering Studies. He obtained his BSc(Statistics and Computing) with Honours from North London University, UK in 1988 and PhD (Statistics) in 1996 from University of Newcastle Upon Tyne, UK. He specialize in statistics, public opinion, engineering education and renewable energy resources.

He has until now published over 80 research papers in Journals and conferences, conducted more than 15 public opinion consultancies and delivered 3 keynotes/invited speeches at national and international meetings. He is currently the head of Renewable Energy Resources and Social Impact Research Group under the Solar Energy Research Institute (SERI). In the year 2007, he headed the Engineering Mathematics Research Group. At the same time, he is currently active involve in outcome based education (OBE) approach at the national level and the chairman of the Engineering Education Research Group since 2005. He is also involved actively in the research for the future of engineering education in Malaysia 2006 under the Ministry of Higher Education of Malaysia.

Plenary Lecture VII

System Dynamics Models for Business Process Optimization: An Application to Supply Chain Management

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Abstract: In today's global market, managing the entire supply chain becomes a key factor for the successful business. World-class organizations now realize that non-integrated manufacturing processes, non-integrated distribution processes and poor relationships with suppliers and customers are inadequate for their success. They realize the impact of an organization's plan on the other areas of the supply chain. The impact of an organization's plan on the whole supply chain is unpredictable before its execution. That's why system dynamics models are constructed in order to prognosticate and visualize the behavior of of the system and to improve its performance.

The use of System Dynamics Modelling in Supply Chain Management has only recently re-emerged after a lengthy slack period. Current research on System Dynamics Modelling in supply chain management focuses on inventory decision and policy development, time compression, demand amplification, supply chain design, and international supply chain management.

Computer simulations are widely used to analyse supply chain dynamics. It is too complex to manage an entire inventory by mathematical analysis because more than two echelons are involved and the inventory management is usually carried out with the aid of computer simulation (Ballou, 1992).
Computer simulations can be divided into the static and dynamics models. The primary difference between them is the way in which they treat timerelated events. Static simulations do not pay enough attention to time-period interplay but the dynamic simulationsevaluate system performance across time (Bowersox, Closs, & Helferich, 1986).

Simulation permits the evaluation of operating performance prior to the execution of a plan. In the practical application of this concept, the development of the simulation model for the supply chain management has become a necessity.

There are different types of computer software for simulations like Dynamo, iThink/Stella, PowerSim, Vensim, AnyLogic, Berkely Madonna, etc. It is possible to perform good system dynamics work with all the above mentioned programs, however in our case we use Berkely MAdonna, developed by Robert Macey and George Oster of the University of California at Berkely under the sponsership of NSF and NIH.

Brief Biography of the Speaker: He earned his degree in mechanical engineering at the University of Genoa and he completed his master thesis in Genoa Mass Transportation Company developing an automatic system integrating ANN (Artificial Neural Networks) and simulation with the ERP (Enterprise Resource Planning) for supporting purchasing activities. He had consulting experience in modeling applied to environmental management for the new Bosch plant facility TDI Common Rail Technology in construction near Bari. During his service in the Navy as officer, he was involved in the development of WSS&S (Weapon System Simulation & Service) Project. He

completed is PhD in Mechanical Engineering in 2001 defending his Doctoral thesis on “Advances in Industrial Plant Management” by applying Artificial iontelligence and Distributed Simulation to several Industrial Cases. Since 1998 is active in Distributed Simulation by moving US DoD HLA (High Level Architecture) Paradigm from Military to Industrial application. In 2000 he succesfully led a research group first demonstrating practical application of HLA in not dedicated network involving a 8 International University Group. He is currently involved, as reseacher, in the DIP of Genoa University, working on advanced modeling projects for Simulation/ERP integration and DSS/maintenance planning applied to industrial case studies (Contracting & Engineering and Retail companies). He is active in developing projects involving simulation with special attention to Distributed Discrete Event and Agent Based Continuous Simulation (SwarmSimulation Agents). He is teaching Modelling & Simulation, VV&A, Distributed Simulation (HLA), Projecty management in Master Courses Worldwide and he is teaching Industrial Plants Design in University of Genoa Masters' Courses. He is member of SCS, IASTED, ACM, ANIMP, AICE, MIMOS and Liophant Simulation Club. He is Associated Professor in Mechanical Engineering and Logistics.

Special Session I

High Frequency Circuits and Systems

within the
8th WSEAS International Conference on
SIMULATION, MODELLING and OPTIMIZATION
(SMO '08)

Organized by

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Topics:

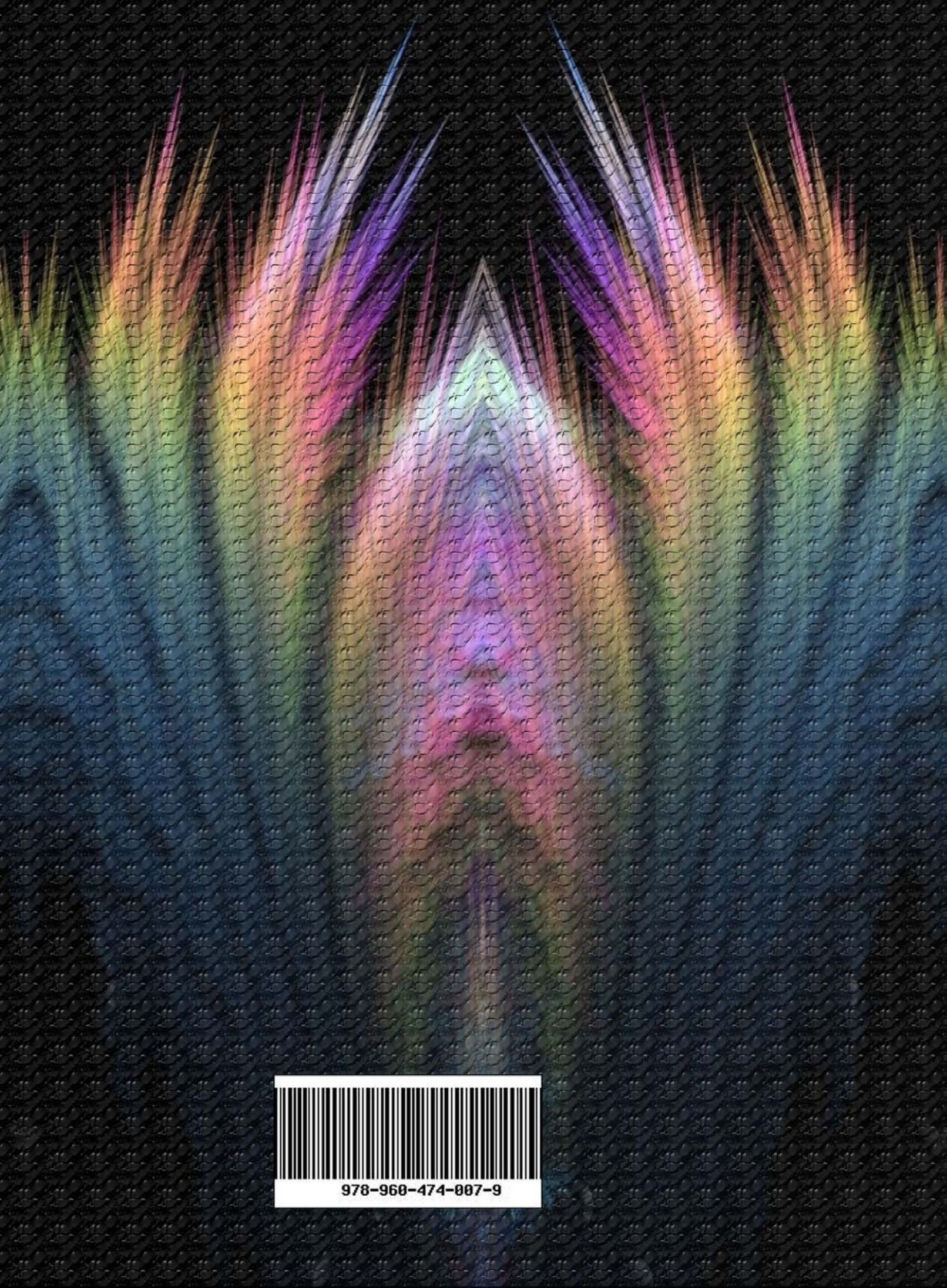
- Modelling of semiconductor technologies
- DC and large signal modelling of semiconductor power devices
- Design and modelling of microwave power amplifiers
- Linearisation
- Transmitter modelling
- Up-down converters
- Passive and waveguide 2D and 3D geometrical models

Brief Biography of the Organizers:

José M. Zamanillo was born in Madrid, Spain in 1963. He received B.Sc and Ph.D. degrees in physics from the University of Cantabria, in 1988 and 1996, respectively. Since 1988 he has been devoted to education and research at the University of Cantabria where he is a Professor in the areas of radiofrequency, microwaves and Communication Systems. He has been engaged in various European and Spanish R&D projects, mainly in the fields of microwaves, device modelling, propagation, and television. Presently, his research interests include linear and nonlinear modelling of GaAs MESFETs, HEMTs, and HBTs. Since 2004 up to January 2008, he has been the director of the summer courses of the University of Cantabria, in Laredo, Spain. Actually, he manages the "Aula de Imagen y Sonido" of the University of Cantabria.

Pablo Luis López Espí was born in Madrid, Spain in 1972. He received B.Sc from the University of Alcala and M. Sc degrees from the University of Cantabria, in 1996 and 1998, respectively. Since 1998 he has been devoted to education and research at the University of Alcala where he is a Professor in the areas of electromagnetics, microwaves and optical systems. He has been engaged in various European and Spanish R&D projects, especially in application of optical and optimization techniques to water pollution measurement.

Author Index


978-960-474-007-9