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RECENT ADVANCES in AUTOMATION & INFORMATION

Proceedings of the 10th WSEAS Int. Conf. on AUTOMATION & INFORMATION (ICAI'09)

Prague, Czech Republic, March 23-25, 2009

Recent Advances in Electrical Engineering
A Series of Reference Books and Textbooks

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Preface

This year the 10th WSEAS International Conference on AUTOMATION & INFORMATION (ICAI'09) was held in Prague, Czech Republic. The Conference remains faithful to its original idea of providing a platform to discuss theoretical and applicative aspects of circuits and systems, network theory and applications, electronics, radar systems, applied electromagnetism, human-machine systems and cybernetics, complexity theory, data structures 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

Identification of Non-Linear Systems Using Neural Networks, with Application at Fuzzy Systems

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Abstract: The paper present a short review of the ways of using artificial neural networks with continuous values for non-linear identification, with application at the fuzzy systems. Feedforward neural networks with continuous values may be seen as general approximation functions. Using adequate training methods and according Kolmogorov's theorem, we may approximate any kind of multivariable non-linear functions. Fuzzy systems, developed based on different membership functions, inference methods, rule bases and defuzzification methods are non-linear systems. The paper presents some study cases of using feedforward neural networks with hidden layer and neurons with continuous values to approximate fuzzy systems with two input and one output variables. Some quality criteria for the training of the neural networks are introduced. Based on usage of different training methods, training parameter of neural networks a comparison is presented, emphasising the quality of training.

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 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 research interest is in linear control systems, fuzzy control, neural networks, control of electrical drives, modelling, simulation, identification and sensor networks. He is author of 9 books and more then 100 scientific papers, published at international conferences and journals. He was manager of over 30 national an international research projects.
Constantin Volosencu worked from 1981 to 1990 at "Electrotimis" Enterprise Timisoara, in the field of the 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 2

Data, Information and Knowledge. Quo Vadis Informatics?

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Abstract: The paper deals with the concepts: data, information and knowledge in the background of new information technologies discusses significant relationships and investigates the conditions which can force the basic development and new possibilities of use. The importance of the dynamical information structures as well as the ability to create, propose and search through the contextual space of selected information is addressed. The concept of different types of context is introduced and the problem of uncertainty is solved for cases when multisource data are used. The rapid development caused by various types of integration techniques on the level of data, information and knowledge is discussed and practical examples from the field of geomatics are presented.

Brief Biography of the Speaker: Dana Klimesova is with the Czech University of Life Sciences Prague, Faculty of Economics and Management, Kamycka 129, 165 21 Prague, Czech Republic, and with the Institute of Information Theory and Automation ASCR, Pod vodarenskou vezi 4, 182 00 Prague 8, as associate professor. Education: Master Degree in Numerical Mathematics, Faculty of Mathematics and Physics, Charles University in Prague, 1973. Ph.D. Degree in Computer Science, Thesis: Texture Processing in Remote Sensing, Czech Academy of Sciences, Prague, 1987. Research interests: Spatial modelling, geographical information management, context mapping, GIS, image processing. Education activities: Geographical information systems and image processing, remote sensing, system engineering.

Plenary Lecture 3

Identification of Hysteretic Behavior of Materials by using Genetic Algorithms

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Abstract: The paper is devoted to identification of the hysteresis behavior of nonlinear mesoscopic materials (NM) by using genetic algorithms. A NM material is an aggregate of grains which act as rigid vibrating units, while the contacts between them - the bond system constitute a set of interfaces that control the behavior of the material. The interfaces are mesoscopic, with a typical size of 1micrometer . In this paper we propose a friction contact model for the interface between moving grains, that involve both tangential and normal relative motions. The proposed strategy is capable to predict the transition between stick, slip and separation of grains. The analysis of the hysteretic response of the NM material subjected to cyclic loading is given by the application of PUN, Preisach and Bouc-Wen models of hysteresis.

Brief Biography of the Speaker: Veturia Chiroiu (born in 1942) received the PhD degree in Mathematics from University of Bucharest in 1981. Since 1966 she is a senior scientific researcher at the Institute of Solid Mechanics of the Romanian Academy, head of Department of Deformable Media (www.imsar.ro). She received a Fulbright Fellowship to work at the Princeton University, Dept. of Aerospace and Mechanical Science (1972–1973), and has led various research projects (Copernicus, NATO) and lectured in foreign institutes and universities. She is author of numerous research articles in referee journals and international conferences, covering dynamics of deformable media, composite materials, acoustics, intelligent structures and materials, and inverse problems. She is the winner of the prize Aurel Vlaicu of the Romanian Academy in 1997. Since 2000 she is a PhD advisor in the field of mechanical engineering at the Romanian Academy. Since 2004 she is an Honorific Member of the Technical Sciences Academy of Romania (ASTR).

Plenary Lecture 4

Methodologies for Implementing IT Governance Concept and Measuring IT Business Value: Managing IT as a Business not a 'Technical' Problem

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Abstract: In the early days of implementing information systems (IS) and information technology (IT) in the business, it was often seen as a technical support function and was typically managed by finance departments. When evolving from technology providers into strategic partners, IT organizations typically follow a three-stage approach: IT infrastructure management (ITIM), IT service management (ITSM) and IT business value management (IT Governance). As the IT initiatives has become far more than a means of improving efficiency or reducing costs and increasingly account for enabler of business innovation, it still seems that it is less understood business resource. One of reason could be that often there is no systematically way of measuring IT performances and implementing IT Governance practices. IT Governance is the organizational capacity exercised by the Board, executive management and IT management to control the formulation and implementation of IT strategy and in this way ensure the fusion of business and IT. IT Governance issues are not only any more marginal or 'technical' problems and become more and more a crucial 'business problem'. As the organizations are becoming increasingly dependent upon IT in order to achieve their corporate objectives and meet their business needs, the necessity for implementing widely applicable IT best practices standards and methodologies, offering high quality IT services is evident. Therefore, in this lecture and forthcoming paper emerging issues in IT Governance will be discussed in further details and the necessity for IT Audit and Performance Measurement initiatives stressed. Contemporary issues in measuring IT Business Value will be given and actual methodologies for implementing IT Governance concept will be explained (CobiT 4.1, ITIL v3, ISO 38500, ISO 27000).

Brief Biography of the Speaker: Mario Spremic, CGEIT is currently an Associate Professor at the Faculty of Economics & Business, University of Zagreb, Croatia. He received a B.Sc. in Mathematical Sciences, M.Sc. in IT Management and Ph.D. in IT Governance from the University of Zagreb. He had published 8 books and more than 150 papers in scientific journals, books and conference proceedings mainly in area of e-business, web site evaluation and audit, IT governance, IT risk management, IS strategy and IS control and audit. He is also visiting professor at various postgraduate studies in Croatia and neighboring countries and very often a key speaker at various experts meetings and conferences. He is program director and co-founder of the 'CIO Academy', a regional executive development program in the field of IT Governance and Business / IT Alignment.
Mario is reviewer and a program committee member at wide range of international conferences (WSEAS, etc., full list available at www.efzg.hr/mspremic). He is an ISACA and IIA member and holds ISACA's CGEIT international certificate (Certificate in Governing Enterprise IT).
Mario has also been acting as a consultant for a number of companies preferably in areas of IS strategy, IT governance and risk compliance, business process change and IS control and IS audit with the experience in implementing various IT projects and conducting wide range of information system audit projects. As a qualified information system auditor and consultant he has been participating in a number of regulatory-based IS audits and advisory projects and besides scientific, gain in-depth expert knowledge of commonly used standards such as CobiT, ISO 27001, Basel II, SoX, ITIL, etc. Previously he had been working as system analyst, project manager and CIO deputy.

Plenary Lecture 5

Iterative Solution Paradigms for Uncalibrated Robot Vision Control

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Abstract: Vision is one of the most important sense in humans. Numerous attempts to mimic that powerful sense have been the main topic of extensive robotic research for decades. Demonstrated applications of vision control in which information acquired from camera(s) is used for guiding a robot system, span the broad range of human activity and include well-known theoretical, as well as practical knowledge of visual servoing themes. Visual servoing problem is, in fact, the problem of systems of nonlinear equations solving, which is a mature and well founded mathematical area with rich foundations of papers, studying the various type of problems with appropriate approaches. Uncalibrated, model free, robot visual servoing has been widely applicable in robot vision due to minimal requirements related to calibration and robot kinematic's parameters. The appropriate solutions are mostly derived from quasy-Newton approach for the nonlinear problem solving and represent various iterative approaches for acquiring an optimal solution.
However, if the robot has been controlled in the unstructured environments, the mentioned problem has been proven hard as the real system has been influenced with the noise.. Up to now, there are numerous examples which successfully use described approach for robot visual servoing. The numerical quasy-Newton methods serves as a theoretical background for problem solving, which has been proven hard as the real system has been influenced with the noise. Consequently, additional attention has to be paid which assured stability and the robustness of the proposed method. Various methods offer specific improvements which are related mostly to the specific task requirements. This lecture has a goal to present and compare the efficacy of the various iterative optimization procedures which, due to their successfulness, established itself as a paradigm for appropriate problem solving.

Brief Biography of the Speaker: Mirjana Bonkovic received the B.S., M.S., and PhD. Degrees in electrical engineering from the University of Split, Split, Croatia, in 1990, 1994, and 2000, respectively.
Since 1991, she has worked at the Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture, University of Split, where she currently serves as associate professor. She was a visiting student at Robotics Research Group, University of Oxford, U.K., in 1995, and Visiting Research Fellow at the Institute of Robotics, University of Maribor, Slovenia, in 2004. Her research interests are image processing, pattern recognition, robot vision and bio-mimetic systems. She is author of more than 30 scientific papers published at international conferences and journals.

Plenary Lecture 6

Textual Substitution Methods for Image Compression

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Abstract: Textual substitution methods, often called dictionary methods, or Lempel-Ziv methods after the important work of Lempel and Ziv, are one-dimensional compression methods that maintain a constantly changing dictionary of strings to adaptively compress a stream of characters by replacing common sub strings with indices (pointers) into a dictionary.
Lempel and Ziv proved that the proposed schemes were practical as well as asymptotically optimal for a general source model. Essentially the algorithms that stemmed from these works are collectively known as Lempel Ziv (LZ) coders and are divided in two significantly different classes: LZ1 and LZ2 type methods. These the two classes differ in the way the pointers are represented and in the type of objects to which the pointers point.
Two-dimensional (i.e. images) applications of textual substitution methods have been widely studied in the past, as for instance by Lempel and Ziv themselves and Sheinwald. Substantially those applications involve first the application of a linearization strategy to the input data, and then the encoding of the resulting mono-dimensional vector using LZ type one dimensional methods.
Storer first suggested the possibility of using dynamic dictionary methods in combination with Vector Quantization for lossless and lossy compression of bi dimensional data. The AVQ algorithm of Constantinescu and Storer and the LZ1 based algorithm of Storer and Helfgott pioneered this approach by showing that it has a number of advantages with respect to current state-of-the art algorithms such as JPEG.
In this presentation we will review the textual substitution methods for image compression, with particular attention to the AVQ class of algorithms, and present recent advances in the field.

Brief Biography of the Speaker: Bruno Carpentieri (Member, IEEE) received the “Laurea” degree in Computer Science from the University of Salerno, Salerno, Italy, and the M.A. and Ph.D. degrees in Computer Science from the Brandeis University, Waltham, MA, U.S.A..
Since 1991, he has been first Assistant Professor and then Associate Professor of Computer Science at the University of Salerno (Italy).
His research interests include lossless and lossy image compression, video compression and motion estimation, information hiding.
He has been, from 2002 to 2008, Associate editor of the journal IEEE Trans. on Image Processing, he was co-chair of the International Conference on Compression and Complexity of Sequences, and, for may years, program committee member of the IEEE Data Compression Conference.
He has been responsible for various European Commission contracts regarding image and video compression.

Plenary Lecture 7

Programming Languages as Tools for Describing and Modeling Anticipatory Systems

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Abstract: Nowadays, more and more complex systems are studied and modeled. The complexity consists not only in enormous number of system components but also of enormous number of the laws that the components should respect in their structure, behavior and interactions. Among them, the behavior of the human beings occurring in the systems is more and more considered in exact studying of the systems. The individual laws of thinking of such persons use general notions and have more or less common with the external persons who think on such systems - e.g. during designing them. Nowadays, the thinking of both the sorts of humans is transformed to computing systems. That implies that the general notions should be represented at the computing systems, among which the notions of "humans who take notions in their means". A special (but very frequent) case of human thinking is anticipation – almost any person who figures in a system and can influence it in more or less important sense, decides with view on possible future consequences of his decision for himself and for the system. The main way of that human thinking is rational imagining of the stepwise running consequences. Transforming that to computing technique, one obtains simulation. So one comes to simulation of systems that contain simulating elements. Nevertheless, anticipation can cover also the anticipation of other elements (masters, pupils, collaborators, competitors, antagonists etc.) so that the "nesting" of computer models and of knowledge representations can be iterated. The programming languages that are object-oriented, process-oriented and block-oriented are suitable both for describing such systems and notions that figure in them and the descriptions can me then used as exact inputs for computer modeling and simulation. Running computer models of local transport in production processes and in container terminal will be presented.

Brief Biography of the Speaker: Eugene Kindler was born in 1935, studied mathematics at Charles University in Prague, (Czechoslovakia) and then computer science at the Research Institute of Mathematical Machines in Prague. He is the author of the first Czechoslovak ALGOL 60 compiler and the first Czechoslovak simulation language and compiler (COSMO, Compartmental System Modeling). Charles University granted him PhDr in logic and RNDr (Rerum Naturalium Doctor) in the theory of programming, Czechoslovak Academy of Science granted him CSc (Candidate of Sciences) in mathematics and physics. During 1958-1966 he worked with the Research Institute of Mathematical Machines, then with the Institute of Biophysics of the Faculty of General Medicine of Charles University (until 1973) and then with the Faculty of Mathematics and Physics of the same University (until 2006). In parallel, he engaged as professor of applied mathematics at a new University of Ostrava (Czech Republic) and was guest professor at the universities of Italian Pisa, American Morgantown and French Clermont-Ferrand and Lorient. Since 2006 he has been pensioned, collaborating with the same Ostrava University as external specialist in various research projects, in doctoral studies and with a rather new Faculty of art.
Beside his official work in computer science, he applied exact techniques (applied in programming language analysis) to formulate the rhythmical laws of music in free rhythm and is a director and soloist of singing group Musica Poetica specialized to the chant originated during the first millennium A.D. in Europe and certain Near East Asian countries.

Plenary Lecture 8

Multimedia Delivery over Mobile Ad-Hoc Wireless Networks

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Abstract: A mobile ad-hoc wireless network is a dynamically changing network of mobile devices that communicate without the support of a fixed infrastructure. There is a direct communications among the neighboring devices, but non-neighboring devices require a robust and intelligent routing strategy to ensure reliable and efficient communications. However, in such networks there is no guaranteed end-to-end quality of service (QoS) and packets may be discarded due to bit errors. On the other hand there has been an increased demand to maintain the video quality over mobile ad-hoc networks.
In this talk we will address some of the techniques to enhance quality of services for video delivery over mobile ad-hoc wireless networks. These techniques are implemented either in the MAC layer, in unicast/multicast routing, or in the applications layers. In the first part of the talk, we will present a multipath error recovery technique for video transmission using multipath retransmission scheme. A video demo will highlight the effectiveness of the scheme. In the second part of the Talk, we will address route selection criteria that maintain the video quality under different loss rates and mobility speeds. Route selection is performed based on the expected throughput of the candidate routes. We will demonstrate the effectiveness of this technique by incorporating it into a multi-path routing protocol.

Brief Biography of the Speaker: TAREK N. SAADAWI is a Professor of Electrical Engineering, City University of New York, City College and director of the Center of Information Networking and Telecommunications (CINT). He has published extensively in the area of mobile ad-hoc wireless networks and multimedia networking, and co-authored a text book on telecommunications.
He is a former Chairman of IEEE Computer Society of New York City, received IEEE Region 1 Award, and is a co-founder of IEEE Symposium on Computers and Communications (which is in its 14th series, www.comosoc.org/iscc). Dr Saadawi and has been invited and joined US Dept of Commerce Delegation to the Government of Algeria to address rural communications. He also led a group of US experts to provide a telecommunications master plan for the Government of Egypt under US AID funding.

Plenary Lecture 9

Convergence of Data Management Technologies: Potential uses for Digital Ecosystems for Collaborative Intelligence Analysis

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Abstract: The first dimension of this presentation discusses the idea of a Digital Ecosystem. Since its first introduction in 2002, the newly emerging concept of Digital Ecosystem (DE) has received increasing attention from researchers, businesses, ICT professionals and communities around the world. The DE concept utilizes an open framework infrastructure to encourage a wide use of information in solving potential digital divide issues between collaborating entities. The DE objective is the promotion and dynamic formation of knowledge based economies that can be utilised by the various member entities of the DE.
The second dimension of this presentation looks at a number of current issues the intelligence community is facing when it comes to effectively managing, or more precisely 'sharing' Intel (or intelligence and information). Recent global incidents and the subsequent actions responding to those events, including academic research has shown that intelligence analysis processes are lacking when it comes to the providing effective, efficient and complete information on required subjects. Reviews of many Intelligence Agencies have found a common theme in that there is an unacceptable and potentially dangerous lack of collaboration for sharing data within and between intelligence communities of the world.
Hence, the third and key dimension of this talk looks at the potential for effectively implementing and utilising Digital Ecosystems for Collaborative Intelligence Analysis.

Brief Biography of the Speaker: Dr. Geoff Skinner has been an Academic with the University of Newcastle, Australia, in the Faculty of Science and Information Technology for the last four years. Current primary research projects and interests are in the areas of Collaborative Intelligence Analysis, Digital Ecosystems, and Data Security and Information Privacy specifically in Collaborative Environments. He is also the lead researcher of the C.A.S.E. research group at the University of Newcastle, in addition to being a member of Digital Ecosystem and Business Intelligence Institute at Curtin University of Technology, a member of Centre for Extended Enterprises and Business Intelligence also at Curtin University and an Associate Director of the Dampney Centre for IT Applications.
Prior to his commencement at the University of Newcastle, Dr. Skinner worked professionally in the Information Technology and Security sector for over 10 years during which time he completed a PhD in field of Data Security in Collaborative Environments. He was also the Regional IT Manager for Americas Region for a Foreign Affairs division of the Australian Government. In addition to a number of other professional positions he has gained comprehensive knowledge and hand on experience in the realms of data security and intelligence analysis which he is now being utilising in his research endeavours.

Plenary Lecture 10

Advances on Structural Optimization of Neoprene Passive Vibroisolation Devices

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Abstract: This paper presents the identification and evaluation of the operational methods to improve the isolation characteristics for neoprene passive vibroisolation devices. The area of this study is framed by the passive isolation against shocks and vibration, due to the different technological equipments, of the sensitive embedded systems. The study is based on the large sets of virtual and instrumental tests, performed on different types of vibroisolation devices, with various structural and functional configurations. All of these was developed supposing the basic compressing and torsion rubber elastic elements, their working principle, and their functional restraints. Through the comparative analysis of the acquired results, it was fixed some final structural configurations. It is also present a few theoretical and operational aspects regarding the base isolation technique, which frame the basis of using of these vibroisolation devices. The main concluding remark denotes the way to use simple neoprene elastic elements, mounted on a lever structural and spatial configuration, to obtain a high global level of dynamic isolation.

Brief Biography of the Speaker: Silviu Nastac (born in 1971) received the PhD degree in Mechanical Engineering from University "Dunarea de Jos" of Galati, Romania, in 2006. He obtained a Master degree's in Computational Mechanics in 1997 and in Mechanics of Deformable Solids in 2004, at the same University. Since 1997 he is a senior research scientist at the Research Center for Mechanics of Machines and Technological Equipments, at Engineering Faculty of Braila, University "Dunarea de Jos" of Galati, Romania. He is the winner of the prize AROTEM of Romanian Association for Construction Technologies, Equipments and Mechanization in 2006. His main research topics include the theory of mechanics, dynamics, vibrations, acoustics, modelling and simulation of dynamic phenomenon, and virtual instrumentation. His work has been published in several journals and books among which we can mention the contribution Performances Evaluation at Damaged Vibration Isolation Devices, Chapter 47 in DAAAM International Scientific Book 2008, pp.551-564, B. Katalinic (Ed.), Published by DAAAM International, Vienna, Austria, the papers On Multipoint Spectral Analysis in Dynamic Sources Behaviour Identification and Evaluation, WSEAS Transactions on Systems, Issue 10, Volume 7, October 2008, pp.996-1005, Experimental and Theoretical Analysis of the Dynamic Behaviour of the Technological Equipment Foundation, NAUN International Journal of Mechanics, Issue 4, vol.1, 2007, pp.80-88, and the book Computational Engineering with Applications, Impuls Publishing House, Bucharest, 2004. He is a member of IIAV - International Institute of Acoustics and Vibration, SRA - Romanian Society of Acoustics, and SRMTA - Romanian Society for Theoretical and Applied Mechanics.

Plenary Lecture 11

Non-linear Approaches on Dynamics of Multibody Mechanical Systems with Advanced Computing Tools

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Abstract: The study deal with non-linear approaches in dynamic behaviour analysis for multibody mechanical systems by using advanced computing and simulation tools. The main application of this work consist by dynamics estimation of some construction equipments during their technological processes, with strong various and intensive dynamic working states. The proposed methodology is capable to simulate the non-linear characteristics of interaction between machine and terrain, and involve some innovative modelling and computing tools. The analysis are based on derived MIMO technique, and provide a strong method to treat a large set both of the inputs - as an external disturbances, and of the outputs - as undesirable equipment movements. Non-linear and multibody approaches, through their realistic modelling specific methods, leads to a high efficacy on dynamic behaviour evaluation, with direct impact in optimization of design and exploitation of technological equipments.

Brief Biography of the Speaker: Carmen Debeleac (born in 1972) received the PhD degree in Mechanical Engineering from University "Dunarea de Jos" of Galati, Romania, in 2006. She obtained a Master degree in Mechanics - Dynamics of Construction Equipments, in 2002, at the same University, and a Senior Manager degree in Scientific Research Projects at "Politehnica" University - AMCSIT Center, Bucharest, Romania, in 2006. Since 1997 she is a senior research scientist at the Research Center for Mechanics of Machines and Technological Equipments, at Engineering Faculty of Braila, University "Dunarea de Jos" of Galati, Romania. Her main research topics include the theory of mechanics, dynamics of construction equipments, vibrations, modelling and simulation of dynamic phenomenon, technologies for construction equipments, research projects management. Her work has been published in several journals and books among which we can mention the contribution Vibratory Diagnosis of the Earthmoving Machines for the Additional Necessary Power Level Evaluation, on Proceedings of WSEAS International Conference AMTA'08, the papers On multipoint spectral analysis in dynamic sources behaviour identification and evaluation, WSEAS Transactions on Systems, Issue 10, Vol. 7, October 2008, Dynamic Pollutant Sources Identification Based on Multipoint Spectral Analysis, International Journal of Systems Applications, Engineering & Development, Issue 3, Volume 2, 2008, pp. 105-113, A physico-mathematical model for the dynamic state movement analysis of the frontal loader, Annual Proceedings of Institute of Solid Mechanics of Romanian Academy, 2007, and the book (with G. Axinti, N. Dragan) Analytic Mechanics with Applications, Impuls Publishing House, Bucharest, 2002. She is a member of SRMTA - Romanian Society for Theoretical and Applied Mechanics, SRA - Romanian Society of Acoustics, and AROTEM - Romanian Association for Construction Technologies, Equipments and Mechanization.

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