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New Aspects of Automatic Control, Modelling & Simulation

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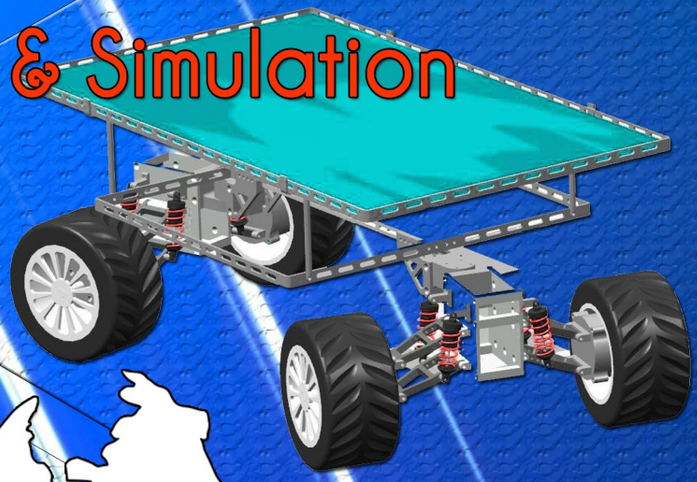
Catania, Italy, May 29-31, 2010



12th WSEAS International Conference on AUTOMATIC CONTROL, MODELLING & SIMULATION (ACMOS '10)

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A Series of Reference Books and Textbooks

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Preface

This year the 12th WSEAS International Conference on AUTOMATIC CONTROL, MODELLING & SIMULATION (ACMOS '10) was held in Catania, Italy, May 29-31, 2010. The conference remains faithful to its original idea of providing a platform to discuss circuits and electronics for control, electrical and electronic measurement, large scale systems, hybrid systems, man-machine interaction, cybernetics, optimization problems in control engineering, decision support systems, fault tolerance, virtual reality for automation, microprocessors, geometric modeling and fractals, unmanned vehicles, artificial man 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

Nested Models Implemented in Nested Theories

Professor Eugene Kindler
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Abstract: Systems developed with human influence are often facilitated by sophisticated information processing components that influence the behavior of the system itself. They can be automatic control automata and/or humans. When it is necessary exactly to model such systems (e.g. for their analysis but especially for their simulation) the desire is to have a tool for their exact describing, with a possibility to use the description in further phases of the work (namely for implementing simulation models) but also for readable communication on the concerned system with other engaged persons. Problems rise in case the described system has an information processing unit that handles an internal model of a certain system which would demand the same tool. This system can be similar to the whole system or not. Examples of the spectrum illustrating that (non-)similarity will be given.
The solution consists in building formal theories in that elements occur that are carriers of other formal theories. These "local" formal theories may use some information of the "world" in that their carriers occur, i.e. may point out from them and penetrate to the formal theory used for describing the system in that the carriers occur and that can be influenced by those carriers. In case we desire to have tools suitable applicable for implementing computer models, the formal theories can be suitable formulated in object-oriented programming languages that are also block-oriented and agent-oriented.
The characteristics of such languages that would distinguish them from "poor" programming tools will be presented, together with applications in logistics, production, graphics and environmental science.

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 2

Discrete Event Formalisms for Workflow throughput Diagnose

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Abstract: We focus on estimating the throughput of a workflow modelled with stochastic Petri nets (SPNs). We consider this discussion important, as there is a lot of confusion about the definition of the risk and the reliability of flexible manufacturing system analysis, both being risk analysts and decision makers. We propose an approach for this analysis by using a new model for artificial social systems (ASSs) behaviours, and by introducing equivalent transfer functions for SPNs.
ASSs exist in practically every multi-agent system, and play a major role in the performance and effectiveness chart of the agents. ASS allows agents to coexist in a shared environment and pursue their respective goals in the presence of other agents.
This is the reason why we introduce a suggestive model for ASSs. 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 ASSs 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:
• Honorary 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 3

How to Investigate the Decision Making Behavior of Investors in Financial Markets by means of Software Agents

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Abstract: Financial markets are an example of complex systems where relevant behavior happens to be a synthesis of independent and singular decisions taken by individual entities operating in them. Such is the case of financial markets where several investors autonomously decide what investment decision to undertake.
In our work, in particular, we focus our attention to the following research question: can a software agent simulation reproduce the behaviour of a significant financial market time serie by concentrating on many simple interactions among investors-agents.
This talk takes forward a research line we started to investigate a year ago and the most promising empirical findings are reported.

Brief Biography of the Speaker:
Prof. Filippo Neri is currently a professor in Computer Science at the Department of Computer and System Science of University of Naples "Federico II".
Prof. Filippo Neri has wide experience in the area of artificial intelligence, machine learning, and software agent simulation. He had the opportunity to work both in academic and industrial environments including Ericsson's and Unlever's R&D centers and across three countries in the European Union (Italy, Ireland and UK). He is currently setting up a spin-off company providing consulting services for information technology strategy and management while at the same time advancing his academic career.
He has studied and visited at several important academic institutions including Carnegie Mellon University, MIT, Imperial College London, University of Milano, University of Torino.
He is a Marie Curie Fellow and an ADI associate, the Italian PhD association. He is a founding member of initiatives aiming to close the gap between academia and the business application of research results.
Finally he has served in the program committees and as reviewer at several international conferences and he is author of more than 50 internationally reviewed publications.

Plenary Lecture 4

Improving Monitoring, Control and Protection of Power Grid Using Wide Area Synchro-Phasor Measurements

Professor Hamid Bentarzi
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Abstract: When disturbances occur in power grid, monitoring, control and protection systems are required to stop the grid degradation, restore it to a normal state, and hence minimize their effects. However, in wide area power grid resulting from large extension and interconnection with neighbor grids, classical systems based on local independent measurements and decisions are not able to consider the overall power grid disturbances and then they are not able to avoid the blackout. The introduction of the advanced measurement and communication technologies in these systems may provide better ways to detect rapidly these disturbances and protect the overall grid from the propagation of the fast-cascading outages. Indeed, the observability of the wide area power system dynamics becomes feasible through the use of these recent developed technologies. Using wide area real-time synchro-phasor measurement system based on Phasor Measurement Units (PMUs), different types of wide area protection, emergency control and optimization systems can be designed and implemented. In this talk we discuss new technologies that allow wide area grid to be well monitored, controlled and protected against any disturbances. At the beginning, we present the different steps which may be followed in order to develop PMU based Wide area measurement system taking into count quality of the power grid dynamics observability. After that, we discuss how to improve monitoring, control and protection integrated system for wide area power grid. We have already designed and implemented PMU based wide area synchro-phasor measurement system through the use of the new technologies as well as we have tested its performances for showing its experimental evaluation. Besides, we have developed some applications where these advanced technologies have been used. We will end up this talk by presenting our research work results related to this subject.

Brief Biography of the Speaker:
Hamid BENTARZI was born in Boumerdes, Algeria. He received both Electrical Engineering and Magister Degrees with honors from "Institut National d'Electricite et d'Electronique" (INELEC), Boumerdes, Algeria, in 1989 and 1992 respectively and Ph.D in Microelectronic systems from "Ecole Nationale Polytechnique" (ENP), Algiers, Algeria, in 2004. Till 1999, he was a lecturer at INELEC, Boumerdes, Algeria. Since 1999, he has been a faculty member at the Department of Electrical and Electronic Engineering, Faculty of Engineering, University of Boumerdes, Algeria. Since 2001, he has been head of research team working in developing microelectronic systems applied to power systems in the Signal and System Laboratory, Boumerdes, Algeria. His current research interests are in the fields of microelectronics, electrical protection systems, electric energy systems and systems reliability. He has authored and co-authored over 50 technical papers. Besides, he has been a member of organizing and technical committee of several conferences including WSEAS group.

Plenary Lecture 5

Modeling Ecological Systems

Professor Dana Simian
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Abstract: Modeling ecological systems requires tools from different field of mathematics and computer science including multivariate interpolation, classification, regression, statistical analysis, multiagent systems. A problem that has gained increasing interest in the last years is the objective selection of areas of conservative interest and the optimization of management measures for biodiversity conservation. Our aim is to present the design elements for a multi agent system which interprets the data from an ecological system and optimizes the management decisions. The areas and the species are automatic and dynamic classified, taking into account different biodiversity indices. We use Support Vector Machine for classification tasks and Support Vector Regression for predictions. For testing our model and system we use data from the Romanian Viseu catchment.

Brief Biography of the Speaker:
Dana Simian received the diploma. in engineering from the University of Sibiu, Romania, the diploma. in Mathematics - Informatics from the University Babes-Bolyai of Cluj-Napoca, Romania and the Ph.D. from Babes-Bolyai University of Cluj- Napoca, Romania. She graduated many courses in Computer Science. She is the head of the Department of Computer Science from the Faculty of Sciences, University Lucian Blaga of Sibiu, Romania. She has a great experience in algorithms and numerical methods for modelling and optimization. She published 16 books, more than 60 articles and participated in the editorial board of more than 22 scientific publications (proceedings of international conferences).
She organized 7 special sessions within WSEAS conferences, 2 international workshops and an international conference on topics related to algorithms and computational techniques in modeling, approximation and optimization. She was a member of many scientific committees of international conferences. She was plenary speakers in 6 international conferences. She is reviewer of many scientific publications. She was involved as director of many research grants. She has been included in "Who is Who in the World" in 2006-2009 and in the "IBC Foremost Engineers of the World", 2008.

Plenary Lecture 6

Method for Classification in Interval-Valued Information Systems

Professor Amaury A. Caballero
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Abstract: Due to its importance in a number of fields, the problem of classification or classes discrimination in information systems has been approached by multiple authors, and various methods to address this issue have been developed. 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. Neural networks and information entropy have also been used to discriminate. When information is diffuse and the number of obtained values for each attribute is large, such is the number of rules for any type of solution method. Due to this fact, interval-valued information systems have been proposed by several authors, in which an interval of values is defined for each attribute, moving from the minimum to the maximum obtained values in the database or using the standard deviation from the original data to define the minimum and maximum values. Differently from other works, the concept of information measure is used in this paper, together with a fuzzy logic discrimination tool. Using these concepts, an attribute reduction is initially obtained and then fuzzy logic is applied for discriminating among the possible solutions. The method results simpler than others, and as accurate as the methods usually employed.

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 did research with the Faculty. Dr. Caballero Has been invited to give speeches at the Universidad de Pamplona in Colombia, the Universidad Catolica de Santa Maria 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 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 works as a consultant in electrical engineering.

Plenary Lecture 7

Variable Structure-based Learning Algorithms for Neural Networks

Professor Francklin Rivas-Echeverria
Universidad de Los Andes
Laboratorio de Sistemas Inteligentes (LabSIULA)
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Abstract: This plenary speech covers Control schemes for nonlinear dynamical systems using Variable Structure Control (VSC)-based adaptation algorithms for Neural Networks (NN). The VSC approach has been used in diverse control applications, and is new in the NN area. Some of the features of these algorithms are: Finite time convergence to zero of the learning error, guaranteed by stability analysis, robustness with respect to input and external perturbations and easy for computer implantation.
The presentation includes identification and control applications in order to illustrate the feasibility of the approach.
The plenary speech will contemplate the following topics:
- VSC-based algorithms for a single neuron and for multilayer NN.
- Dynamical filter-weights Neuron.
- Dynamic NN VSC- based Adaptive Control of a Class of unknown Nonlinear Systems.
- On-line Identification of a direct and inverse transfer operator for dynamical systems.
- Inverse model-based Control using NN with VSC-based adaptation algorithms.
- Model Reference Adaptive Control using a VSC-based Neuron-like virtual model.
- Further works in the area of VSC-based learning algorithms applications.

Brief Biography of the Speaker:
Francklin Rivas-Echeverria Systems Engineer, MSc. in Control Engineering and Applied Science Doctor. Full professor in Control Systems Department, at Universidad de Los Andes, Venezuela. He has been invited professor in the Laboratoire d'Architecture et d'Analyse des Systemes (LAAS, Toulouse-France) and some Venezuelan and international Universities. He has also been technical advisor for “Venezuelan Oil Company” (PDVSA), “Aluminum Venezuelan Company” (VENALUM), “Steel Venezuelan Company” (SIDOR), Trolleybus System in Venezuela (TROLMERIDA). He has created and is the Director of the Intelligent Systems Laboratory and is the head of the University consulting unit (UAPIT-ULA). Over 180 publications in high level conferences and journals: the main topics of his papers are: Artificial Intelligence, Intelligent Control, Automation Systems and Industrial Applications. He has applied his results to many fields: Processes Control and Supervision, Oil production, Steel production processes, among others. Also, has developed several tools for automatic control teaching. He is coauthor of two books concerning Artificial Intelligence and Nonlinear Systems.