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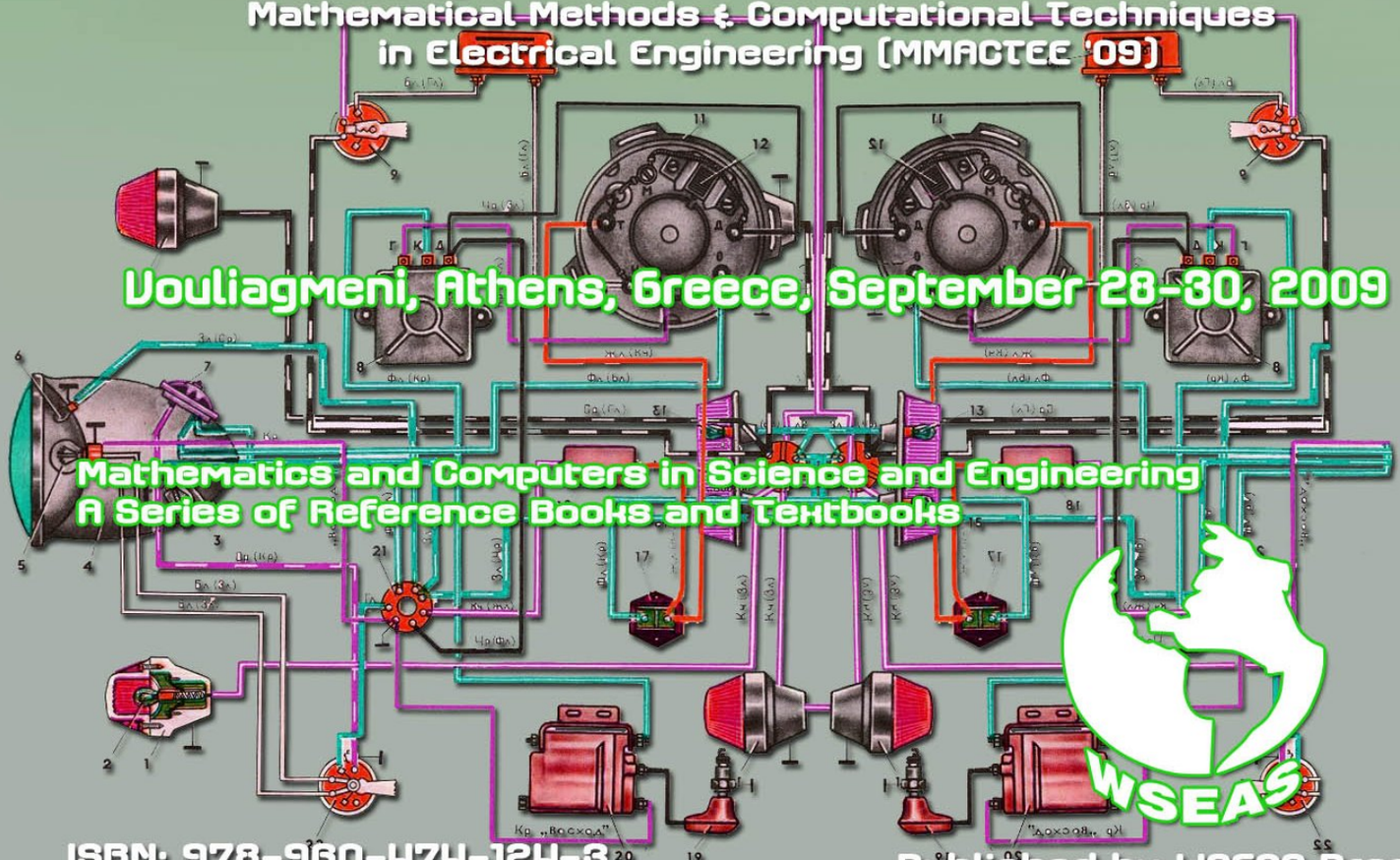
Mathematical Methods and Applied Computing

VOLUME I

- Proceedings of the Applied Computing Conference 2009 (ACC '09)
- Proceedings of the 11th International Conference on Mathematical Methods & Computational Techniques in Electrical Engineering (MMACTEE '09)

Vouliagmeni, Athens, Greece, September 28-30, 2009



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Volume I

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The Cybercom Group is a high-tech consultancy that offers global sourcing for end-to-end solutions. The Group established itself as a world-class supplier in security, portal solutions, mobile services, and embedded systems. Thanks to its extensive industry and operations experience, Cybercom can offer strategic and technological expertise to these markets: telecom, industry, media, banking and financial services, retail and the public sector.

Preface

This year the APPLIED COMPUTING CONFERENCE 2009 (ACC '09) and the 11th International Conference on MATHEMATICAL METHODS AND COMPUTATIONAL TECHNIQUES IN ELECTRICAL ENGINEERING (MMACTEE '09) were held in Vouliagmeni, Athens, Greece, September 28-30, 2009. The conferences remain faithful to their original idea of providing a platform to discuss algorithms, automata, formal languages, programming languages, software engineering, artificial intelligence, computational intelligence, real time and embedded systems, circuits, networks, electronics, microelectronics, nanoelectronics, automation, control, robotics etc. with participants from all over the world, both from academia and from industry.

Their success is reflected in the papers received, with participants coming from several countries, allowing a real multinational multicultural exchange of experiences and ideas.

The accepted papers of these conferences are published in this Book that will be 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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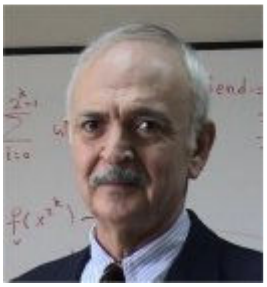
Keynote Lecture

High Dimensional Model Representation(s) as Multilinear Array Decomposition Method(s)



Professor Metin Demiralp
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Abstract: The multilinear array decomposition is an intensely investigated area today. Although it is mostly used for three index arrays some other higher dimensional applications are also encountered. There are different approaches to this end although the most preferable one is the singular value decomposition's multilinear counterpart. It aims to decompose the multilinear array under consideration to a sum over outer products composed of more than two factors. The construction is based on the suppression of the Euclidean distance between the approximant and the target array by finding optimal values for the proposed unknown entities. The decomposition attempts to additively represent the target array in terms of lower rank arrays. This type methods present quite nonlinear problems as long as the products appearing in additive representation contain more than two unknown factors. This happens when the multilinear dimensionality (the number of the indexes) is at least three. However, by keeping the number of each product's unknown factors in the representation equal to two one can use the standard linear algebraic spectral tools to determine the unknowns. The author and Emre Demiralp (author's son, PhD student in cognitive neuroscience program of the Psychology Department in University of Michigan at Ann Arbor) started to deal with the development of such decomposition methods in last two years. The purpose was and still is to find some ways which bypasses certain technical and sometimes conceptual difficulties encountered in the employment of the standing methods. Their inspiration resources were basically high dimensional model representation which was developed in last two decades and the fluctuation free matrix representation as a recently developed efficient approximation tool. Their efforts take the fruits in certain applications and now new openings seem to be appearing in the horizon. High dimensional model representation (HDMR) and its quite new extension, Enhanced Multivariance Product Representation (EMPR) developed by the author can also be used as a decomposition method if the target function is considered as a data set given on the nodes of an orthonormal hyperprismatic grid and discrete geometry is utilized. HDMR can be considered as a particular case of an additive representation over the single factor products. The terms are ordered in ascending multivariance. EMPR, on the other hand, uses products, each of which contains same number of univariate factors within a one-to-one relation to the independent variables (indexes in the discrete case). However, this increasing number of factors is balanced by keeping the number of unknowns in each product just as 1 for easy determination. The given factors have certain common properties also and we call them "supports" since one can control the approximation quality even in the very crude cases of constant or univariate level truncations. Speech focuses on certain details of these issues by referring the original findings of the author and his group.

Brief Biography of the Speaker:
Metin Demiralp was born in Turkey on 4 May 1948. His education from elementary school to university was entirely in Turkey. He got his BS, MS, and PhD from the same institution, Istanbul Technical University. He was originally chemical engineer, however, through theoretical chemistry, applied mathematics, and computational science years he was mostly working on methodology for computational sciences and he is continuing to do so. He has a group (Group for Science and Methods of Computing) in Informatics Institute of Istanbul Technical University (he is the founder of this institute). He collaborated with the Prof. Herschel A. Rabitz's group at Princeton University (NJ, USA) at summer and winter semester breaks during the period 1985–2003 after his 14 months long postdoctoral visit to the same group in 1979–1980.
Metin Demiralp has more than 70 papers in well known and prestigious scientific journals, and, more than 110 contributions to the proceedings of various international conferences. He has given many invited talks in various prestigious scientific meetings and academic institutions. He has a good scientific reputation in his country and he is the full member of Turkish Academy of Sciences since 1994. He is also a member of European Mathematical Society and the chief–editor of WSEAS Transactions on Mathematics currently. He has also two important awards of Turkish scientific establishments.

Plenary Lecture 1

Formal Testing Approach for the Conformance and Interoperability| of MANET Routing Protocols

Assistant Professor Stephane Maag
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Abstract: Conformance and interoperability testing activities are crucial to the validation of real implementation. The challenges are nowadays well known and solutions for wired environments may be provided. Nevertheless, issues still remain for ad hoc routing protocols especially to check the reliability of Wireless Mobile Ad Hoc Networks. Most of the works related to the validation of such protocols are based on simulation and emulation analysis of simulated/emulated implementations without taking into account formal specifications. Indeed, inherent constraints from these networks raise new problems and research targets. Moreover, for many reasons, it has often been shown that the results obtained from simulator studies are far from the real case studies. In this talk, first I propose to establish a state of the art of that purpose and the existing solutions. Then I will focus on the testing issues related to conformance and interoperability of MANET routing protocols. Finally a nodes' self similarity technique devoted to the protocol specification and the testing process is illustrated especially to optimize the testing coverage as well to deal with unexpected and unpredictable topologies, messages and verdicts. Interesting results are by the way provided and illustrated through experiments.

Brief Biography of the Speaker:
Dr Stephane Maag obtained his MSc in 1999 and his PhD degree in 2002 from the University of Evry. He is an Assistant Professor since 2002 at the INSTITUT TELECOM (Paris) and more precisely into the Software for Networks department and the VPS (Validation of Protocol and Services) research team. He is also involved as a researcher in the CNRS research group Samovar (UMR 5157) since 2003.
His current research activities are the testing of protocol and services from formal or semi-formal models in the MANET area. The application domains are especially the routing protocols (DSR, OLSR, etc.) testing phases, from the specification, the verification, validation and test sequences execution regarding the conformance and interoperability of the protocols.
Dr. Stephane Maag is involved in several projects such as the FP6/FP7 IST calls, Eureka projects (Σ!), ICT Asian projects and national ones. He also participates to the program committees of numerous national and international conferences. He published more than 30 papers in conference proceedings, books and journals. More details could be found on his webpage http://www-lor.int-evry.fr/~maag.

Plenary Lecture 2

Immune Network and Adaptive Control

Professor Marius-Constantin Popescu
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Abstract: This paper describes an attempt to spread further the inspiration gained from the knowledge of biological systems for engineering applications. New lessons addressed to the control of complex processes might derive from elements of the immune system comprehension. Important points inherent to the immune functions are transposed, re-interpreted and analysed in an adaptive control perspective. They are: viability, distribution, reinforcement learning, optimization, adaptability and memory. Several resemblances will be pointed out with the Q_learning method as well as with classifiers system principles.

Brief Biography of the Speaker:
Marius-Constantin Popescu is currently an Associate Professor in Automatics and Computers, in the Faculty of Electromechanical, Environmental Engineering and Industrial Informatics, University of Craiova, Romania. He is graduate from the Faculty of Automatics-Computers and Informatics-Mathematics in Craiova, he received the Ph.D degree from University of Craiova. In Publishing House he is author of fifteen books in automatics, computers and mathematics area. Research work is focused on improved solutions for computer networks on basis of new telecommunication equipment and automatics systems. He has extensive experience in both experimental and theoretical research work, certified by over 90 journal and conference research papers and 16 research projects from industry. He is invited keynote lecture for automatics engineering courses organized by Faculty of Engineering from University of Targu Jiu. Due to WSEAS recognition as huge scientific Forum he participated in five WSEAS International Conferences, presenting papers and chairing sessions. He participated in the WSEAS International Conference on MATHEMATICAL and COMPUTATIONAL METHODS in SCIENCE and other sections, held in Venice, Tenerife, Heraklion, Bucharest and Cambridge. He is very proud of her 12 papers published in the WSEAS Conferences Books and 5 papers published in WSEAS TRANSACTIONS on SYSTEMS AND CONTROL.

Plenary Lecture 3

Monte Carlo Cellular Automaton Simulation in Biomedical Science: Cancer Research and Min Protein Dynamics

Professor Yongwimon Lenbury
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Abstract: It has become well known that simulation can be used to investigate complex biomedical systems in situations where traditional methodologies are difficult or too costly to employ. Once the model, constructed to represent important aspects of the system under evaluation, has been validated, it may be used to investigate the effects of differences in the system inputs, changes in initial conditions, or its environment, and alterations in the system structure. Many recent advances in technology, such as the Next Generation Internet, high bandwidth communication, object oriented software, distributed and parallel processing, and visualizing techniques, have greatly enhanced the power and expressiveness of simulation. We give two examples where Monte Carlo cellular automaton simulation is applied to study cancer growth and Min protein dynamics.

Plenary Lecture 4

Visualization and Interaction of the Virtual Human Organs for the Pre-operative Planning

Professor Lucio Tommaso De Paolis
Co-author: Giovanni Aloisio
Department of Innovation Engineering
Salento University, Lecce, Italy
SPACI Consortium, Italy
E-mail: lucio.depaolis@unile.it

Abstract: The visualization of 3D models of the patient's body emerges as a priority in surgery both in pre-operative planning and during surgical procedures and the introduction of new modalities of interaction with the 3D models of the human organs could also be required.
In this paper is present a virtual interface and a low cost multi-touch screen. Both systems are able to interpret in real-time the user's finger movements and can be used in the pre-operative planning for the navigation and manipulation of 3D models of the human body built from real patient's CT images.
The developed virtual interface, based on the use of an optical tracking system, is the first prototype of a system designed to avoid contact with the computer so that the surgeon will be able to visualize models of the patient' organs more effectively.
In particular, the surgeon will be able to rotate, to translate and to zoom in on the 3D models simply by moving his finger in the free space; in addition, it is possible to choose to visualize all of the organs or only some of them.
In the system have been utilized the NDI Polaris Vicra as optical tracker and two open-source and multi-platform programs for the construction of the graphic environment (OpenSceneGraph toolkit) and for the building of the 3D models (3D Slicer package).
A 3D model of the abdominal area has been reconstructed from CT images using segmentation and classification algorithms.
All of the interactions with the models happen in real-time using the virtual interface which appears as a touch-screen suspended in the free space and situated in a location chosen by the user at the starting up of the application. The finger movements are detected by means of the optical tracker and are used to simulate the touch with some buttons present in the developed virtual interface.
The doctor, using this system, is able to rotate, to translate and to zoom in on the 3D models of the patient's organs simply by moving his finger in free space and he can select the visualization of all of the organs or only some of them.
The optical tracker has already been used in computer aided systems and, for this reason, it is easy to integrate the described virtual interface with these systems.
The introduction of other functionalities of interaction with the models is in progress, after further investigation and consideration of surgeons' requirements.
The developed multi-touch screen provides a user interface customized for doctor requirements. It is possible to use one or more fingers in order to interact with the complete 3D models of the human body or with some parts of these; in addition it is provided the possibility to visualize the CT slice sets used to build the virtual models.
The interaction results very simple and evident for the user and the system can be a helpful tool for the diagnosis and the surgical operation planning.

Brief Biography of the Speaker:
Lucio Tommaso De Paolis is an Assistant Professor of Information Processing Systems at the Department of Innovation Engineering of the Salento University (Italy).
He received a Degree in Electronic Engineering from the University of Pisa (Italy) and since 1994, first at the Scuola Superiore S.Anna of Pisa and then at the University of Salento, his research interest has concerned the study of the interactions in the virtual environments and the physical modelling of the objects for applications of the Virtual Reality and the Augmented Reality in medicine and surgery.
He is a member of the Society for Medical Innovation and Technology (SMIT), member of the SPACI Consortium (Southern Partnership for Advanced Computational Infrastructure) and member of the Italian Movement of Modelling and Simulation (MIMOS).
He teaches Computer Science at the Faculty of Sciences of the Salento University.

Plenary Lecture 5

Potential Method in the Performance Evaluation of a Network Node

Assistant Professor Andrzej Chydzinski
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Abstract: The advantages of packet-switching networking over circuit switching made the packet-switching technology very successful (e.g. Internet). However, the cost of packet switching is that in each network node, packets are queued, resulting in delay and packet losses during buffer overflow periods. The queues in network nodes used to be modeled by a classic FIFO queue with Poisson arrivals. Since the beginning of 90's we have known that traffic in packet-switching networks is strongly autocorrelated and therefore we have to use much more advanced models for it. Markovian models like MMPP, MAP and BMAP were adopted for this purpose with good results. On the other hand, when modeling a queue in a network node, it is important that the finite size of the buffer is assumed, as finite buffer is responsible for packet losses.
The subject of this lecture is the performance analysis of a finite-buffer queue fed by Markovian arrival process. The lecture is particularly focused on a relatively new method of analysis of such queues - so called "potential method". At first, the method uses the Laplace transform technique in order to reduce a large system of integral equations to a system of linear equations. Then, with the help of a recurrent sequence called "potential", the large system is solved and the results are obtained in an explicit form. The method has some important advantages. It enables finding almost all queueing characteristics of interest. It gives results in a closed, easy to use form and this is a unique property among methods of analysis of finite-buffer queues. Moreover, both steady-state and transient performance characteristics can be obtained by means of the method.

Brief Biography of the Speaker:
Andrzej Chydzinski received his MSc (in applied mathematics), PhD (in computer science) and Habilitation (in computer science) degrees from the Silesian University of Technology, Gliwice, Poland, in 1997, 2002 and 2008, respectively. He is currently an Assistant Professor in the Institute of Computer Sciences of this university. His academic and professional interests include modeling and simulation of computer networks, active queue management in Internet routers, queueing theory and discrete-event network simulators. Dr. Chydzinski authored and co-authored more than fifty journal and conference papers and two books. His work is well recognized - Thomson Scientific reports that his publications were cited about 100 times (excluding self-citations) in ISI indexed journals. He was also awarded for his work by a major Polish magazine and was given (with R. Winiarczyk) the best paper award in modeling and simulation during the IEEE Symposium on Computers and Communications in 2006. He has been involved in several scientific projects, in some of them as a project leader.

Plenary Lecture 6

Simulation of Power Plants and Energy Conversion Systems

Professor Reinhard Leithner
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Abstract: Since the 60ies and 70ies also power industry started to use computers for special calculations e.g. thermodynamic calculations of the main components of power plant cycles like steam generators, turbines, heat exchangers, etc. The interest to assess complete cycles was low because usually power plants were not delivered by one single company but the components were designed and manufactured by different companies. So each company used its own simulation program and developed it separately. Sometimes therefore funny mistakes occurred, when the components did not fit properly.
Increasing computer capacity and velocity led to increasing computing applications reducing also engineering labour. Today several commercial programs are available on the market. But they still have different foci due to their different origin and task. E.g. on the combustion and flue gas side CFD-programs like FLUENT, CFX, etc. are used, for the water steam cycle EBSILON, KRAWAL, APROS, etc., for flue gas cleaning, etc. ASPEN, FACTSAGE, etc.
At the Institute of Heat and Fuel Technologies a CFD-program FLOREAN and a cycle calculation program ENBIPRO was developed and is still further developed. The latter one is an object orientated program, which enables the user to design a thermodynamic cycle, i.e. to get information on the geometry of a component, etc., what is quite new because usually the design of the components is the input. But ENBIPRO is also capable of stationary part load calculations for a given geometry and in addition also dynamic simulations including control systems can be performed. Finally, with given geometry it can also be used for validation of measurements especially also for acceptance tests.
In the presentation a lot of examples of furnace calculations including pollutant's emissions and slagging and fouling as well as a variety of cycle calculations, e.g. Coal Fired Rankine Cycle Power Plant, Gas Fired Combined Cycle Power Plant and in addition the following cycles will be shown: Calciumoxide – Calciumcarbonate Cycle (CaO – CaCO3) for CO2 separation from flue gases without losses in efficiency, Solar Thermal Power Plant, SOFC Solide Oxide Fuel Cell System, an Alstom Gas Turbine (GT-26), ORC Organic Rankine Cycles for the Use of Geothermal Energy, RDF (Refuse Derived Fuel) Power Plants and Compressed Air Energy Storage Combined Cycle Power Plants with Heat Storage.
In combination with CAD the so-called "Virtual Power Plant" i.e. a power plant only existing in the computer as a full model, with full virtual functionality and including virtual accessibility becomes gradually reality.

Brief Biography of the Speaker:
Prof. Dr. techn. R. Leithner (born in 1945 in Scharding, Austria) is head of the IWBT (Institute of Heat and Fuel Technologies) of Technical University Braunschweig, Germany. He has graduated as Dipl.-Ing. (Mechanical Engineering) from the Technical University in Vienna in 1970 with a diploma thesis about measurement and simulation of a heat exchanger.
From 1971 till 1983 he was working in different positions with Energie- und Verfahrenstechnik GmbH (now Alstom Power Boiler GmbH), Stuttgart, one of the leading steam generator manufacturers in Germany. During his work at EVT he wrote a doctoral thesis on the mass flow from an equally heated tube at constant pressure and was graduated as Dr. techn. from the Technical University in Vienna in 1976. His last position in this company was head of the "main department for steam generator design, development and commissioning" including stress analyses and control systems; also procuration was granted him.
In 1983 he was appointed professor and director of the IWBT - TU BS. During all these positions he was always involved in power plant simulations and design.

Plenary Lecture 7

Electronic Health Record from an Australian Perspective

Mr. Eugene Lutton
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Abstract: This lecture will outline the Australian experience with implementing an Electronic Health Record (EHR). Since the early 1990's the Australian Government has been investing resources into a comprehensive electronic health record. These projects have been undertaken at a pilot level, while a full scale implementation has not occurred. On a global stage, patients require efficient and timely responses from health care professionals. Response time relies upon the interaction of a complex set of objects, which require an ability to interact and exchange data and information. Currently in Australia, a patient can visit a general practitioner or a health care facility, and undergo multiple tests performed by various internal and external providers. These providers can include a radiologist, pathology collection, mental health intervention and auxiliary services such as home care. The number of providers involved in this process is such that the complete medical history of a patient is not held in one central location, and will most likely be recorded upon a mixture of electronic and paper based formats. This disjointed system has meant that analysis of patient history not been a simple task. Constructing a history based upon this jigsaw puzzle has not resulted in an end product which is interchangeable between different health providers nor is it easily accessed or transportable for the patient.

Brief Biography of the Speaker:
Academic Studies:
Undergraduate and post graduate studies in information technology at The University of Newcastle.
Academic Teaching:
Delivering courses at Australian and Singaporean campuses of The University of Newcastle. These courses are for students (undergraduate and postgraduate) who are completing an information technology stream as part of their degree.
Research Interests:
The rationale and deployment of Radio Frequency Identification Technologies.
Member of the CASE research group.
The relationship between social, economic and technology impacts on society.

Plenary Lecture 8

Decision Precising Technologies in Decision Making Systems

Professor Gia Sirbiladze
Department of Computer Science
Faculty of Exact & Natural Sciences
Iv. Javakhishvili Tbilisi State University
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Abstract: To ensure the effectiveness of decision-support computer systems it is essential to solve such problems as identification, filtration, precision etc. of information streams, as well as modeling and simulation of decision-making problems which are based on them. When working with information streams of expert knowledge, as a complex systems, in parallel with classical approaches of their modeling, the most important matter is to assume fuzziness. All these is connected to the complicity of study of incomplete, abnormal and extreme processes in nature and society, which are caused by lack or shortage of objective information and when expert data streams are essential for constructing credible decisions. Such problems include solutions of business problems in extreme environments, analysis of management and investment risks, problems of conflictology, sociology, medical diagnosis, etc. With the growth of complexity of information our ability to make credible decision about process development reduces to some level, below which some characteristics such as accuracy and certainty become mutually conflicting. Our research is concerned with quantitative-fundamental analysis of this uncertainty and its use for precision of informational processes and decision modeling. Consequently one of main objects of our attention is the analysis of structures of expert data and measures of its uncertainty. The most important of such analysis methods are the theory of the body of evidence.

The precision of decisions first of all means improvement of representation of decision making factors by Dempster-Shafer data structures. Of course, there are many methods for knowledge representations and decision making, which use the Dempster-Shafer structures. The novelty of our research in this direction is the technology for precision of the structure of body of evidence, which we call the temporalization of body of evidence. Temporalization means the construction of inclusion relation on the bodies of evidence. This approach is completely novel in study of expert knowledge representations and structuring. It will cause many heurstic methods of decision- making based on the expert knowledge representation to be modified. All above listed means the following: 1. representation of data which is an input of considered methods using Dempster-Shafer structures, so called pessimistic-optimistic representations. This will better exhibit the knowledge and intellectual activities of an expert. 2. the possibilities of representing of expert information streams in triangular or trapezioform fuzzy numbers will be considered. 3. the cases where focal elements in Dempster-Shafer structure are represented by fuzzy sets, and focal probabilities are represented by triangular or trapezioform fuzzy numbers will be considered separately, 4. in methods' decision-making criteria represented in knowledge base of decision support technologies of inaccuracy and uncertainty aggregations will be used such as: Choquet integral, Sugeno integral, Dempster upper and lower expected values, positive and negative discriminations, OWA operators, etc. 5. in selected methods these aggregations will give us new criteria supporting more precise decision. Thus existing heuristic methods will obtain fundamental basis, final purpose of which will be to model more precise decision in the cases of expert knowledge streams input. 6. The decision support system will obtain higher credibility, which can be measured in new modified methods using the informational measures, such as confusion and chaos constructed on more precise decisions, inaccuracy and non-specificity measures etc.

Finally the process of precising decisions will be demonstrated based on Discrimination method which is one of the popular methods of decision making using fuzzy set theory.

Brief Biography of the Speaker:
Dr. Gia Sirbiladze is a full professor at the Department of Computer Science of Faculty of Exact & Natural Sciences of Iv. Javakhishvili Tbilisi State University, Georgia. He received his Ph.D. degree in 1991 from the Computational Mathematics Institute of the Georgian Academy of Science. He received his D. Sci. degree from the same institute in 2005. His scientific interests include areas such as Intelligent Fuzzy Technologies and General Systems, Fuzzy Technologies in Decision-making Support Systems, Fuzzy Extremal Dynamic Systems - Control, Filtration and Identification, Fuzzy Discrete Optimization Problems and Modeling Decisions.

Plenary Lecture 9

Iterative Numerical Methods for Simulation of Coupled Engineering Problems

Associate Professor Ion Carstea
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Abstract: Any electromagnetic device is the house of two or more physical fields that interact by a number of parameters as the material properties, the field sources etc. In other words we have not separate problems for engineers from different science branches although for economic reasons in terms of computer resources, each physical field is considered as though it was separate field and generates a problem which is solved independently. The subsystems and numerical solutions are finally coupled together in such way that interactions are satisfied with an "acceptable" degree of accuracy. This is a natural approach for the analysis of large or complex structures but the accuracy of the analysis is not good.
The technique of dividing a large physical system into a system of components is very old and is still used extensively although the reasons of this approach are not valid nowadays. We have an increased computing power with advanced computer architectures so that it is an antisocial fact to ignore this real computing power.
In our lecture we intend to review the state-of-the-art of iterative methods for solving large sparse systems such as arising in coupled engineering problems. The solution of practical problems of mathematical physics ultimately relies on solving a system of partial derivative equations and this is only achieved by iterative numerical methods. Iterative solution methods proceed by adding successive corrections to some arbitrary initial approximation, but unfortunately these methods are very sensitive to specific features of the system to be solved. A procedure call preconditioning is possible but is not always used.
We limit our presentation to a large class of systems defined by elliptic-parabolic mathematical models that represents the basis of the electromagnetic-thermal problems. The numerical models are obtained by the finite differences and finite element methods. The motivation is simple: for parabolic problems we use an explicit scheme for temporal discretization, and for elliptic problem we use the finite element method. As target example we use an electromagnetic-thermal coupled problem from electrical engineering.
In the algorithmic skeletons for this class of problems we are guided by the implementation of the algorithms on the parallel computers with emphasis on parallel computers (MIMD architectures).

Brief Biography of the Speaker:
The speaker is an Assoc. Professor at the Computer Engineering and Communications Department, Faculty of Automatics, Computers and Electronics, University of Craiova, Romania.
He has a BSc and MSc in Automatics from the University of Craiova, Romania. He has a Ph.D. in Automatics from the University of Ploiesti, Romania. Also, he has a BSc and MSc in Mathematics from the Natural Sciences Faculty, University of Craiova, Romania.
He was director of the research projects supported by international grants at University of Houston (USA)- 6 months (Fulbright Grant), at the University of Coimbra, Portugal – 9 months (NATO grant), at the Polytechnics of Milano, Italy- 4 months (a CNR-NATO grant). In 2004 he was invited at the Mathematics Department, University of Trento, Italy, for 2 months.
Ion Carstea published 10 books in the area of programming languages advanced computers and CAD of the electromagnetic devices. He is the co-author of the book FINITE ELEMENTS in WSEAS Press, 2007.
He is the author of more than 160 papers in revues, scientific journals and international conference proceedings. He is a reviewer for several WSEAS International Conferences and was a member in many international scientific committees. In the year 2007, he was a Plenary speaker and chair at the WSEAS Conferences from Arcachon (France) and Venice (Italy). In 2008 he was Plenary speaker to two WSEAS Conferences from Bucharest (June 2008, November 2008).
His research interests include parallel algorithms for numerical simulation of the distributed-parameter systems, software products for coupled and inverse problems in engineering, domain decomposition method in the context of the finite element method.

Plenary Lecture 10

Campus Web based Information System for Monitoring Quality of Life: A Case Study Applied to the University of Minho

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Abstract: Universities have been recognised as an active agent in the society development and evolution. One of the marks of this acknowledgement was the Magna Charta Universitatum. This document sustains that their role is to promote cultural, scientific and technical development of new generations, as well as the whole society, providing permanent training. It also says that such education should teach and train future generations to respect the great harmonies of their natural environment and of life itself. Joining that relevance to campi extension and to the university community dimension, the quality of life in campi became a critical feature for the management and sustainable development of that type of urban areas.
In addition, there is a consensus about the fact that Portuguese Universities are leaving a period of continuous building growth, incoming in a cycle of stabilization and consolidation. The demand tends to be satisfied. So, a new process shall emerge where the physical expansion will be substituted by a quality and sustainable process where the equity will become more relevant. Also, the quality of teaching and research activities in Universities are somehow related to the quality of the spaces where they take place, either when considering the buildings' facilities, or when taking into account the campus area. Some authors have concluded that the students' perception of their overall academic experience and the campus environment is related to academic accomplishment. Furthermore, keeping and increasing the quality of life in public spaces is also recognised as a critical aspect concerning the urban sustainable development perspective.
When analysing characteristics, form, dimension and organisation of university campi, it can be concluded that they can be seen as urban spaces. This fact is often enhanced by their location: in urban areas or even merged in the city. In this context, a model for the evaluation of the quality of life based on concepts for urban spaces is presented. Its main purpose is to provide conceptual bases for the implementation of a decision support system that evaluates the campus quality of life and its sustainable development. The process integrates the users' perception and provides the ability to assess the impact of future interventions on the campus quality of life using scenarios. Those scenarios can be created by a tool included in the system and enabled to measure, through indicators, changes in campus. The evaluation of the quality of life variation that would result from the scenario execution will serve as a decision support tool for campus management when studying several possibilities.
The case study explores and shows the web based information system for monitoring the quality of life of the Gualtar Campus of the University of Minho, located in Braga, Portugal. Basically, the model aims at determining a global index of the Quality of Life in the Campus (QIC) variation, comparing different moments in time. The system embodies two main functions related to its sustainable development process: (i) to inform the community, allowing any user to know which are the considered indicators and their actual values, and how the QIC has evolved; (ii) to serve as a decision support tool, mainly in facilities planning and management, thus allowing to compare the impact of several scenarios on several quality of life dimensions, through an evaluation that integrates the users' perception.

Brief Biography of the Speaker:
Rui Ramos is an assistant professor of Civil Engineering Department, Engineering School, University of Minho, Portugal. His area of expertise is Urban and Regional Planning and he is a PhD Researcher at Territory, Environment and Construction Centre from University of Minho. In 1993, at University of Minho, he started his regular work as a lecturer and researcher. Since then he published as author or co-author over 40 scientific papers in reviewed journals or presented at international conferences. Moreover, since 2000, he had the opportunity to be an invited Professor at the Department of Transportation of the School of Engineering of Sao Carlos, University of Sao Paulo, Brazil.

Plenary Lecture 11

The Operating Risk Assessment for Dependable Systems

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Abstract: The lecture proposes an axiomatic characterization of the measure risk in a systemic vision and framework for quantifying variability of exposure and risk in dependable systems via probabilistic approach by means of Monte Carlo method.
Identifying the hierarchy of risks associated with hazardous activities provides a basis for analytic, deliberative decision-making in the business process, where stakeholders have to select a variant of several possible on the basis of multiple (sometimes contradictory) criteria. Due to the random, collateral factors, the risk is present in any sociotechnical system. The risk regarded as a potential danger is a result of action which has the probability to not fulfill the proposed function of the system.
In a systemic interpretation, the risk is characterized by a set of uncertain events consisting of independent input and dependent output elements variables of the system components. Independent events are sources of disturbance for the dynamic system, acting as generators of uncertainty. Using virtual-reality tools, the simulation that validates the effectiveness of the model can assist human operators in different phases of system.

Brief Biography of the Speaker:
Gabriela Tont is an Associate Professor at the Department of Electrical Engineering, Measurements and Electric Power Use, Faculty of Electrical Engineering and Information Technology, University of Oradea. She has earned her Ph.D from the Technical University Cluj Napoca, Faculty of Electrical Engineering. Her research areas relate to applied statistics in the complex systems, currently focusing on the aspects of error analysis and optimal control of safety critical systems. She has published 7 books in the field of reliability of systems and quality management. Gabriela Tont is the author of more than 110 papers in revues, scientific journals and international conference proceedings in those areas. She is participant and reviewer for several WSEAS International Conferences.

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