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RECENT ADVANCES IN COMPUTERS

Proceedings of the 13th WSEAS International Conference on COMPUTERS

13th WSEAS CSCC Multiconference
Rodos (Rhodes) Island, Greece, July 23-25, 2009

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Preface

This year the 13th WSEAS International Conference on COMPUTERS was held in Rodos, Greece, in July 23-25, 2009. The Conference remains faithful to its original idea of providing a platform to discuss artificial intelligence, computer networking, computer science education, hardware and architecture, multimedia, operating, networked and storage systems, wireless sensor networks, programming languages, hardware engineering, tele-medicine and medical informatics, tele-healthcare, algorithms and multiplexity 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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Keynote Lecture 1

Embedded Systems Design – Scientific Challenges and Work Directions

Professor Joseph Sifakis
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Abstract: The development of a satisfactory Embedded Systems Design Science provides a timely challenge and opportunity for reinvigorating Computer Science. Embedded systems are components integrating software and hardware jointly and specifically designed to provide given functionalities, which are often critical. They are used in many applications areas including transport, consumer electronics and electrical appliances, energy distribution, manufacturing systems, etc. Embedded systems design requires techniques taking into account extra-functional requirements regarding optimal use of resources such as time, memory and energy while ensuring autonomy, reactivity and robustness. Jointly taking into account these requirements raises a grand scientific and technical challenge: extending Computer Science with paradigms and methods from Control Theory and Electrical Engineering. Computer Science is based on discrete computation models not encompassing physical time and resources which are by their nature very different from analytic models used by other engineering disciplines.
We summarize some current trends in embedded systems design and point out some of their characteristics, such as the chasm between analytical and computational models, and the gap between safety critical and best-effort engineering practices. We call for a coherent scientific foundation for embedded systems design, and we discuss a few key demands on such a foundation: the need for encompassing several manifestations of heterogeneity, and the need for design paradigms ensuring constructivity and adaptivity.
We discuss main aspects of this challenge and associated research directions for different areas such as modeling, programming, compilers, operating systems and networks.

Brief Biography of the Speaker: Joseph Sifakis is a CNRS researcher and the founder of Verimag laboratory (http://www-verimag.imag.fr/), in Grenoble, France. He holds the INRIA-Schneider endowed industrial chair since September 1st 2008. He studied Electrical Engineering at the Technical University of Athens and Computer Science at the University of Grenoble. Verimag is a leading research laboratory in the area of critical embedded systems. It developed the underlying theory and technology for the SCADE tool, used by Airbus for the design and validation of its critical real-time systems, and is becoming a de facto standard for aeronautics. Verimag has a lasting and strategic collaboration with ST Microelectronics, France Telecom R&D, and Airbus, through which numerous results on validation and testing have been transferred. Joseph Sifakis is recognized for his pioneering work on both theoretical and practical aspects of Concurrent Systems Specification and Verification. He contributed to emergence of the area of model-checking, currently the most widely-used method for the verification of industrial applications. His current research activities include component-based design, modeling, and analysis of real-time systems with focus on correct-by-construction techniques (http://www-verimag.imag.fr/~sifakis/). Joseph Sifakis has broad experience with industry, notably though joint projects with partners such as Astrium, the European Space Agency, France Telecom, ST Microelectronics and he has also been active for many years in consulting. Joseph Sifakis is the Scientific Coordinator of the European Network of Excellence ARTIST2 on Embedded Systems Design. (http://www.artist-embedded.org/). This network gathers 35 of the best European teams in the area, and aims to produce innovative results for cost-effective design of dependable embedded systems. It will also promote innovative methods safe and secure systems, notably through cooperation with key European industrial partners such as Thales, Airbus, Ericsson, Philips, and ST Microelectronics. Joseph Sifakis is the director of the CARNOT Institute "Intelligent Software and Systems" in Grenoble (http://www.carnot-lsi.com/). Joseph Sifakis is a member of the editorial board of several journals, co-founder of the International Conference on Computer Aided Verification (CAV) and a member of the Steering Committee of the EMSOFT (Embedded Software) conference. He is a member of Academia Europea (http://www.acadeuro.org/) and a member of the French National Academy of Engineering (http://www.academie-technologies.fr/).
Joseph Sifakis has received with Ed Clarke and Allen Emerson for their contribution to Model Checking, the Turing Award for 2007 (http://awards.acm.org/homepage.cfm?srt=all&awd=140). He is also the recipient of the CNRS Silver Medal in 2001.

Keynote Lecture 2

Quantum Cryptography and Chaos Functions: The Ultimate for Network Security

Professor Stamatios Kartalopoulos
Williams Professor in Telecommunications Networking
The University of Oklahoma
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Abstract: As the sophistication of intruders' increases, so does the incidents of information integrity breaches and network attacks. In response, very complex cryptographic processes have started being employed, such as chaos theory and quantum theory, in an effort to create the "holy grail" of cryptographic systems and network security.
Quantum theory defines the non-classical qubit, which is the superposition of quantum states having no classical analog. In addition, it is based on the "no cloning" or "no copying" theorem and on Heisenberg's uncertainty. Both, the qubit and the no-cloning theorem, along with the quanto-mechanical properties of photons, have been applied to a new breed of cryptography and secure optical communication networks known as quantum cryptography and quantum networks, respectively.
Chaos is based on the particular behavior of certain non-linear functions, which for a minute change of parameters produce a very large and unstable output, known as the "chaotic regime". However, this chaos is reproducible, which also makes it attractive to secure communications.
In this talk we explain quantum cryptographic protocols as well as chaos and chaotic processes with simple examples. We then describe how chaos functions are used in quantum cryptography in order to increase efficiency and speed of the quantum key establishment.

Brief Biography of the Speaker: Stamatios V. Kartalopoulos, PhD, is currently the Williams Professor in Telecommunications Networking at the University of Oklahoma. His research emphasis is on optical communication networks (FSO, long haul and FTTH), optical technology including optical metamaterials, and optical communications security including quantum cryptography and key distribution. Prior to this, he was with Bell Laboratories where he defined, led and managed research and development teams in the areas of DWDM networks, SONET/SDH and ATM, Cross-connects, Switching, Transmission and Access systems. He has received the President's Award and many awards of Excellence.
He holds nineteen patents in communications networks, and has published more than hundred fifty scientific papers, nine reference textbooks important in advanced fiber optic communications and security, and has also contributed several chapters to other books.
He has been an IEEE and a Lucent Technologies Distinguished Lecturer and has lectured at international Universities, at NASA and conferences. He has been keynote speaker of major international conferences, has moderated executive forums, has been a panelist of interdisciplinary panels, and has organized symposia, workshops and sessions at major international communications conferences.
Dr Kartalopoulos is an IEEE Fellow, chair and founder of the IEEE ComSoc Communications & Information Security Technical Committee, member at large of IEEE New Technologies Directions Committee, and has served editor-in-chief of IEEE Press, chair of ComSoc Emerging Technologies and of SPCE Technical Committees, Area-editor of IEEE Communications Magazine/Optical Communications, member of IEEE PSPB, and VP of IEEE Computational Intelligence Society.

Keynote Lecture 3

Content-Adaptive Efficient Resource Allocation for Packet-Based Video Transmission

Professor Aggelos K. Katsaggelos
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Abstract: Supporting video communication over lossy channels such as wireless networks and the Internet is a challenging task due to the stringent quality of service (QoS) required by video applications and the many channel impairments. Two important QoS characteristics for video are the degree of signal distortion and the transmission delay. Another important consideration is the cost associated with transmission, for example, the energy consumption in the wireless channel case and the cost for differentiated services in the Internet (with DiffServ) case.
In this presentation we consider the joint adaptation of the source coding parameters, such as the quantization step-size and prediction mode, along with the physical layer resources, such as the transmission rate and power. Our goal is to provide acceptable QoS while taking into account system constraints such as the energy utilization. We discuss a general framework that allows a number of "resource/distortion" optimal formulations for balancing the requirements of different applications. We conclude the presentation with some of the grand opportunities and challenges in designing and developing video communication systems.

Brief Biography of the Speaker: Aggelos K. Katsaggelos received the Diploma degree in electrical and mechanical engineering from the Aristotelian University of Thessaloniki, Greece, in 1979 and the M.S. and Ph.D. degrees both in electrical engineering from the Georgia Institute of Technology, in 1981 and 1985, respectively. In 1985 he joined the Department of Electrical Engineering and Computer Science at Northwestern University, where he is currently professor. He is also the Director of the Motorola Center for Seamless Communications and a member of the Academic Affiliate Staff, Department of Medicine, at Evanston Hospital.
Dr. Katsaggelos is a member of the Publication Board of the IEEE Proceedings, the IEEE Technical Committees on Visual Signal Processing and Communications, and Multimedia Signal Processing, the Editorial Board of Academic Press, Marcel Dekker: Signal Processing Series, Applied Signal Processing, and Computer Journal. He has served as editor-in-chief of the IEEE Signal Processing Magazine (1997-2002), a member of the Publication Boards of the IEEE Signal Processing Society, the IEEE TAB Magazine Committee, an Associate editor for the IEEE Transactions on Signal Processing (1990-1992), an area editor for the journal Graphical Models and Image Processing (1992-1995), a member of the Steering Committees of the IEEE Transactions on Image Processing (1992-1997) and the IEEE Transactions on Medical Imaging (1990-1999), a member of the IEEE Technical Committee on Image and Multi-Dimensional Signal Processing (1992-1998), and a member of the Board of Governors of the IEEE Signal Processing Society (1999-2001). He is the editor of Digital Image Restoration (Springer-Verlag 1991), coauthor of Rate-Distortion Based Video Compression (Kluwer 1997), co-editor of Recovery Techniques for Image and Video Compression and Transmission, (Kluwer 1998), and co-author of Super-Resolution for Images and Video, (Morgan and Claypool, 2007), and co-author of Joint Source-Channel Video Transmission (Morgan and Claypool 2007). He was the holder of the Ameritech Chair of Information Technology (1997-2003), and he is the co-inventor of twelve international patents, a Fellow of the IEEE (1998) and SPIE (2009), and the recipient of the IEEE Third Millennium Medal (2000), the IEEE Signal Processing Society Meritorious Service Award (2001), an IEEE Signal Processing Society Best Paper Award (2001), an IEEE ICME Best Paper Award (2006), and an IEEE ICIP Paper Award (2007). He was a Distinguished Lecturer of the IEEE Signal Processing Society for 2007-2008.

Keynote Lecture 4

Computer Aided-Visual Perception : Challenges and Perspectives

Professor Nikos Paragios
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France
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Abstract: Computer aided human perception aims at developing intelligent algorithms towards understanding visual cues coming from images, video, or other means of gathering visual information. Such a process often consists of three stages, initially the problem of perception is parameterized through a mathematical model where the estimation of its parameters will lead to visual understanding. Then, the model is associated with the available observations through the definition of an objective function and last, this function is optimized using computational methods. The main challenges that one has to address in this context is the curses of dimensionality, non-linearity, non-convexity and modularity. In simple words, even the simplest possible perception problem could involve too many parameters where the association between the data and them is not straightforward and is done through non-convex functions. In this talk, we will present a generic mathematical framework that exploits recent advances in discrete optimization to address computational visual perception. Numerous image processing, computer-aided diagnosis and computer vision applications will be considered to demonstrate the potentials of this method.

Brief Biography of the Speaker: Nikos Paragios (http://vision.mas.ecp.fr) obtained his B.Sc. (highest honors, valedictorian) and M.Sc. (highest honors) in Computer Science from the University of Crete (Greece) [1994,1996] , his Ph.D. in electrical and computer engineering from I.N.R.I.A. [2000] and his D.Sc. (Habilitation a Diriger de Recherches) from the University of Nice/Sophia Antipolis (France) [2005)]. He is professor of applied mathematics at the Ecole Centrale de Paris - one of most exclusive engineering schools "Grande Ecoles" - leading the Medical Imaging and Computer Vision Group. He is also affiliated with INRIA Saclay Ile-de-France, the French Research Institute in Informatics and Control heading the GALEN group. Prior to that he was professor/(2004-2005) at the Ecole Nationale de Ponts et Chaussees, affiliated with Siemens Corporate Research (Princeton, NJ, 1999-2004) as a project manager, senior research scientist and research scientist. In 2002 he was an adjunct professor at Rutgers University and in 2004 at New York University. N. Paragios was a visiting professor at Yale University in 2007.
Professor Paragios has co-edited four books, published more than hundred papers (DBLP server) in the most prestigious journals and conferences of medical imaging and computer vision, gave more that hundred invited lectures, and has twelve US issued patents and more than twenty pending. His work has approx 3,500 citations in googlescholar and approx 2,000 in scopus, and and his H-number according to scholar is 28 and 24 according to scopus. He is a Senior member of IEEE, associate editor for the IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI), area editor for the Computer Vision and Image Understanding Journal (CVIU) and member of the Editorial Board of the International Journal of Computer Vision (IJCV), the Medical Image Analysis Journal (MedIA) and the Journal of Mathematical Imaging and Vision (JMIV). Professor Paragios is one of the program chairs of the 11th European Conference in Computer Vision (ECCV'10, Heraklion, Crete). In 2008 N. Paragios was the laureate of one of Greece's highest honor for young academics and scientists of nationality or descent (world-wide), the Bodossaki Foundation Prize in the field of applied sciences. In 2006, he was named one of the top 35 innovators in science and technology under the age of 35 from the MIT's Technology Review magazine. He and his collaborators were the recipients of numerous scientific rewards, like for example the Francois Erbsmann prize for the IPMI'07 conference. His research interests are in the areas of computer vision, medical image analysis and human-computer interaction.

Keynote Lecture 5

Control and Estimation Theory: Current Trends, New Challenges, & Directions for the Future

Professor Lena Valavani
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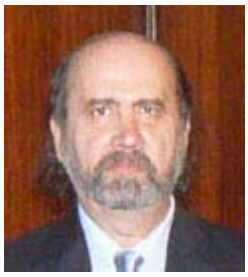
Abstract: Despite the tremendous strides witnessed in the Control and Estimation of lumped parameter systems , whether linear or nonlinear, the issue of stability and performance robustness under simultaneous structured and unstructured uncertainty still remains largely unresolved. When fault tolerance, autonomy and reactivity are added to the requirements, this presents an additional challenge. 'Closed form' solutions are in most cases not possible and computational methods (optimization based, search, etc.) do not provide the necessary guarantees.
The challenges become even greater in the case of distributed systems and networks, such as large industrial/manufacturing plants, environmental applications (CO2 sequestration), communications networks, traffic networks (aeronautical, highway), space networks (satellite constellations), biomedical applications(CNS studies) which, by their nature, require control and estimation in a distributed setting. Requirements and specifications can also be widely variable between safety critical and socially/economically significant systems.
It becomes increasingly evident that control, communications and computation need to be synergistically combined through a 'universal formalism' and novel paradigms that combine logical operations (symbolic reasoning and decision making) with analytical constructs (mathematical algorithms)and continuous quantities(throughput, subsystem interconnections), in order to handle heterogeneity, asynchronicity , real time functionality, properties that typically characterize distributed systems/networks.
We focus on some representative examples to elucidate key issues that arise in modeling, algorithm design, computation, in order to ensure robustness , fault tolerance, autonomy and even reactivity of distributed systems/networks, that point to the need for total synergy of Control, Communications , and Computation/Computer Science- to meet today's and future challenges.

Brief Biography of the Speaker: Lena Valavani holds her B.S. in Physics, from Barnard College, Columbia University, and the M.S., M.Phil. and Ph.D degrees in Engineering and Applied Science from Yale University. After postdoctoral positions at Yale and MIT's Laboratory for Information and Decision Systems, she joined the Department of Aeronautics and Astronautics, MIT, where she was Boeing Associate Professor. She also served as Chief Scientist, Systems Engineering, U.S. D U.S. Department of Transportation for four years. She is currently president of Hellenic Space Systems , S .A.
Dr. Valavani served as Associate Editor of IEEE Transactions of Automatic Control, Automatica , AIAA Journal of Guidance, Navigation and Control, and the International Journal on Robust and Nonlinear Control. She was elected to the Board of Directors, AIAA, N.E., and served as General Secretary. She also was for a long time a member of the steering committee of the International Physicians for the Prevention of Nuclear War, GBPSR, (1985 Nobel Peace Prize).
Her research interests are in modeling for, and the analysis and synthesis of control systems, estimation and identification, with emphasis on robustness to structured and unstructured uncertainty, fault tolerance and reconfiguration, currently in distributed systems and networks . Her research in the U.S. was supported by NASA, NSF, AFOSR,ONR ,and by private industry , resulting in innovative designs of prototype systems currently in operation in the U.S; in Europe by ESA and EC. She has supervised 27 Ph.D and 29 M.S theses at MIT , and 22 M.S. theses at NTUA and UoA.
Dr. Valavani was consultant to Lincoln Laboratory, C.S.Draper Laboratory , and Bell Helicopter while in the U.S. She received the Best Research Paper Award (1991) from the International Gas Turbine Institute and holds three U.S. Patents in the area of controlling unsteady aerodynamic processes in compressors. She is an Associate Fellow of AIAA.

Plenary Lecture 1

Concurrent Neural Classifiers for Pattern Recognition with Applications in Biometrics, Satellite Imagery, and Autonomous Navigation



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Abstract: We present the model of Concurrent Neural Classifiers (CNC) representing a collection of small neural networks, which use a global winner-takes-all strategy. Each neural module is trained to correctly classify the patterns of one class only and the number of modules equals the number "M" of classes. One considers the case of choosing the SOM (Self-Organized-Map) as a neural module. The CNC training technique is a supervised one, but for any individual net, the SOM specific unsupervised training algorithm is used. We built "M" training pattern sets and each neural module is trained with the pattern set characterized by the corresponding class label.
Several presented CNC applications are dedicated to biometrics; first one has as target the recognition of color facial images and second belongs to iris recognition. One also considers a CNC application corresponding to the case of decision fusion by implementation of a multimodal biometric model.
Second series of applications focuse on the CNC model for pattern recognition in multispectral satellite imagery. The implemented neural classifiers are evaluated using some LANDSAT ETM+ images composed by a set of multispectral pixels, each pixel corresponding to one of several categories (vegetation, buildings, water, and so on).
Third kind of considered CNC applications correspond to visual identification of road direction of an autonomous vehicle. We present the experimental results obtained by computer simulation . We have also performed, trained and tested a real time neural path follower based on CNC model, implemented on a mobile robot (car toy).

Brief Biography of the Speaker: Dr. Victor-Emil Neagoe is a Professor of the Department of Electronics, Telecommunications, and Information Technology at the Polytechnic University of Bucharest, Romania.
He teaches the following courses : Pattern Recognition and Artificial Intelligence; Digital Signal Processing; Computational Intelligence ; Detection and Estimation for Information Processing. He co-ordinates 12 Ph.D. candidates.
His research interest corresponds to the fields of pattern recognition, computational intelligence, biometric technology , satellite image analysis and sampling theory.
Prof. Neagoe is author of more than 110 published papers.
His has internationally recognized results concerning concurrent self-organized maps, face recognition, optimum color conversion, syntactical self-organized maps, nonuniform sampling theorems, inversion of the Van der Monde matrix, predictive ordering and linear approximation for image data compression, Legendre descriptors for classification of polygonal closed curves.
He has been included in Who's Who in the World and Europe 500 and he has been nominated by the American Biographical Institute for American Medal of Honor and for World Medal of Honor.
He has been a Member IEEE since 1978 and a Senior Member IEEE since 1984.

Plenary Lecture 2

On the Generalized Network Design Problems

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Abstract: Classical combinatorial optimization problems can be generalized in a natural way by considering a related problem relative to a given partition of the nodes of the graph into node sets. In the literature one finds generalized problems such as the generalized minimum spanning tree problem, the generalized travelling salesman problem, the generalized Steiner tree problem, the generalized (subset) assignment problem, etc. These generalized problems typically belong to the class of NP-complete problems, are harder than the classical ones and nowadays are intensively studied due to the interesting properties and applications in the real world.
We will focus on the generalized minimum spanning tree problem and the generalized travelling salesman problem. Several aspects will be considered: exact algorithms, heuristics and metaheuristics algorithms, integer programming formulations, LP-relaxations, polyhedral analysis and approximability, etc.
We will present some of my recent work and results in this area and we will discuss some of the key questions posed by the research in this field.

Brief Biography of the Speaker: Petrica Pop graduated the Faculty of Mathematics and Computer Science, Babes-Bolyai University of Cluj-Napoca, Romania in 1995. He received his PhD in mathematics (with the specialization in Operations Research, Combinatorial Optimization) from the Twente University, the Netherlands in 2002. Nowadays, he is Associate Professor and Chair Head of Informatics and Applied Mathematics Chair, North University of Baia Mare. He visited numerous universities with frequent and/or longer stays in Delft, Twente (the Netherlands), Hamilton (Canada), Vienna, Linz (Austria), Paris (France), Rome, Bari (Italy), Patras (Greece), Valencia (Spain), Zurich (Switzerland), etc.
His main research area are combinatorial optimization and its applications, complexity theory, mathematical modeling, heuristic and metaheuristic algorithms, approximation algorithms.
He has published over 45 research papers and has lectured at over 15 universities. He is member of the editorial boards of Carpathian Journal of Mathematics and Creative Mathematics and Informatics and he was involved in the program/organizing committees for many recognized conferences and workshops.

Plenary Lecture 3

Computational Methods and Analytical Study for Detecting the Attractors of a Particular Type of k-Order, Nonlinear, Exchange Rate Models

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Abstract: In this paper we present some qualitative and quantitative results for a particular type of exchange rate evolution models, described by k-order nonlinear, discrete and determinist dynamical systems, where k is greater than or equal to 2. These results concern the existence of attractors: the fixed point, its stability and its attraction domain, period-p cycles (where p is greater than or equal to 2), limit cycles and chaotic attractors.
With analytical tools we detect:
- the existence and the unicity of the fixed point, its stability and, for certain parameters values, its attraction domain;
- the values of parameters for which these systems have period 2-cycles and the form of these orbits;
- the relation between the cycles of period p, corresponding to systems of different k-orders.
Given the nonlinear nature of these systems, the chaotic dynamics is their most complex type of behavior. We cannot detect this type of behavior using only analytical tools. For this reason, in order to detect the dynamics of the system, we will use numerical simulations.
In our numerical simulations, we will consider the following cases:
- firstly, we present numerical studies for a particular case of the second order system – here we present chaotic attractors and sequences of period-doubling bifurcations.
- for the same values of parameters as in the case of the second order system, we make the numerical study for the third order system – here, we can observe a similarity between the images of chaotic attractors for each aforementioned order of the systems.
Our study focuses on attractors. It is known that the Lyapunov exponents are a tool used to establish the type of behavior in nonlinear dynamics. We have also calculated their values. In this paper, we present an implementation method used in order to calculate the Lyapunov exponents. We present the implementation for the system of the second order. This implementation method can be used for any nonlinear, determinist, discrete system and for any order of the system. The algorithm implementation is made using VBA (Visual Basic for Applications) program in Excel, and the images of the figures in this paper are made using Mathematica. This method presents a way in which we can obtain a very large number of observations with the computer, in a very short time, which is conclusive for the obtained results.
In our computational study we also are concentrated on some objectives: to determine the behavior type for certain cases; to obtain images for attractors; to calculate the Lyapunov exponents and finally, to obtain animation. In order to obtain animation we can use different applications. We present such an animation obtained in Flash.

Brief Biography of the Speaker: Mirela-Catrinel Voicu was born in Romania, in 1972. In 1995, she graduated from the Faculty of Mathematics and Computer Sciences, West University of Timisoara. She received the MSc degree in Applied Mathematics, Informatics in Economy and Computer Sciences from the West University of Timisoara. She followed a training course for PhD thesis at the National Institute for Statistics and Economic Studies, Paris, France. She received her PhD in 2001 from the University of Timisoara, Romania (with the “Cum laude” distinction) and from the University of Paris 13, France (with the “Tres honorable avec felicitations“ distinction). Currently she is Professor of the Department of Economic Informatics, within the Faculty of Economics and Business Administration, West University of Timisoara, Romania, where, since 1995, she has held several academic positions. Her activity includes Programming and Internet Programming, Informatics in Economy, Databases, OOP, Data structures. Through the collaboration program between the Faculty of Economics and Business Administration and the Faculty of Mathematics and Informatics of the West University, she has held classes with international participation, in postgraduate education, in the section of “Mathematic Modeling in economics and applied sciences” – Exchange Rate Evolution Models – subject introduced within the program due to the original contributions in she’s PhD. During

the collaboration between the Faculty of Economics and Business Administration, West University of Timisoara and CUOA – Italy, she has taught in postgraduate university, “The Management of Business and Public Administration”, the subject, Internet. She has 65 papers in conference proceedings or refereed journals (from these papers, 15 have been presented or published abroad). She has published 7 books (1 book in France and 6 books in Romania). She is a reviewer and a member in international program committee of various WSEAS conferences from abroad, member in the teams of 9 research projects (one of which is international) and project manager for one research project. Since 2002, she is a member of INFOREC (Romanian Association for Economic Informatics Training Promotion) and since 2005 is a member of WSEAS (World Scientific And Engineering Academy And Society).

Plenary Lecture 4

The Fuzzy Cognitive Maps: History, Applications and Challengers

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Abstract: In this plenary we present recent extensions to the Fuzzy Cognitive Maps (FCM) to improve their performances (learning procedures, FCM hierarchical model, dynamical FCM, etc.). Additionally, we present several applications in different domains (social systems, control systems, multiagent systems, etc.). This technique is the fusion of the advances of the Fuzzy Logic and Cognitive Maps theories. FCMs were proposed by Kosko to represent the causal relationship between concepts and analyze inference patterns [10, 11, 12, 13]. FCMs represent knowledge in a symbolic manner and relate states, processes, policies, events, values and inputs in an analogous manner. Once constructed, an FCM allows performing a qualitative simulation of the system and experiment with the model. FCMs have gradually emerged as a powerful modelling and simulation technique applicable to numerous research and application fields: administrative sciences, game theory, information analysis, popular political developments, electrical circuits analysis, cooperative man–machines, distributed group-decision support, etc.

Some application examples are presented at the following. [6, 19, 21, 22] investigate the implementation of the FCM in control problems. Particularly, FCMs have been used to model and support a plant control system, to construct a system for failure modes and effect analysis, to model the supervisor of a control system or of manufacturing systems. FCMs have been used in multiagents system to represent different types of knowledge in a group of agents, to support the building of group consensus, like ontological framework to share knowledge [9, 15, 20]. FCM has been used to structure virtual worlds that change with time [7, 11]. FCM links causal events, actors, goals, and trends in a fuzzy feedback dynamical system. It can guide actors in a virtual world as the actors move through a web of cause and effect and react to events and to other actors.

To improve the performance of FCM, several works have been proposed. For example, three core issues are discussed and respective solutions are proposed in [14]: the first one concerns the case of multi-stimulus situations (parallel stimulation of many FCM concepts), the second one focuses on the design of a learning algorithm (using evolution strategies), and finally the generic real-world phenomena of conditional effects and synergies are properly modelled to support the inference mechanism of FCMs. Carvalho et al. propose a Rule Based Fuzzy Cognitive Map (RBFCM), as an evolution of Fuzzy Causal Maps (FCM) that allow a more complete representation of cognition, since relations other than monotonic causality are made possible [3, 4].

The purpose [2] is to describe a FCM based on the random neural network model called the Random Fuzzy Cognitive Map (RFCM). This model is based on the probability of activation of the neurons/concepts in the network. The model carries out inferences via numerical calculation instead of symbolic deduction. In [1] is described an Adaptive Random Fuzzy Cognitive Map (ARFCM). The ARFCM changes its fuzzy causal web as causal patterns change and as experts update their causal knowledge. They show how the ARFCM can reveal implications of models composed of dynamic processes. [5, 6] have proposed a dynamical FCM (DFCM) to implement Causal Relations like adjustment functions. The adjustment functions can be based on fuzzy rules or mathematical equations of the modelled system.

In general, the task of creating FCMs is made by experts in a certain domain, but is very promising the automatic creation of FCMs form raw data. In [23] Vazquez presents a new algorithm (the Balanced Differential Algorithm) to learn FCMs from data. To enable the gradual learning of symbolic representations, a backpropagation learning procedure has been developed for FCM [16]. In [17, 18] have been proposed FCM hierarchical models and unsupervised learning techniques for tuning FCMs.

Several tools based on FCMs have been developed for different problems. The FCModeler tool displays the known and uncertain biological information in a metabolic network using interactive graph visualization [8]. The system also models pathway interactions and the effects of assumptions using a FCM-based modelling tool. We have proposed a tool to implement DFCM in [5].

Brief Biography of the Speaker: Professor Jose Aguilar received the B. S. degree in System Engineering in 1987 from the Universidad de los Andes-Merida-Venezuela, the M. Sc. degree in Computer Sciences in 1991 from the Universite Paul Sabatier-Toulouse-France, and the Ph. D degree in Computer Sciences in 1995 from the Universite Rene Descartes-Paris-France. He was a Postdoctoral Research Fellow in the Department of Computer Sciences at the University of Houston (1999-2000). He is a Titular Professor in the Department of Computer Science at the Universidad de los Andes (ULA), researcher of the Center of Studies in Microelectronics and Distributed Systems (CEMISID). Currently, he is head of the Free Technology Research Center (CENDITEL). He was head of the Science and Technology Bureau of the Merida State, Venezuela, during 6 years (2001-2007), coordinator of CEMISID from 2001 to 2007, and belonged to the committee that created the High Performance Computing Center of the ULA (CeCalCULA) in 1995.

He has published more than 200 papers in journals, books and proceedings of international conferences in the field of parallel and distributed systems (performance evaluation, task/data/transaction assignment and scheduling, fault tolerance, middleware design, etc.), computational intelligence (artificial neural networks, evolutionary computation, fuzzy logic, swarm intelligence, multiagente systems, etc.) applied to combinatorial optimization, pattern recognition, control systems (identification and supervision systems, distributed and intelligent control, industrial automation, etc.), among others. He has published 5 books in the domain of computational sciences, and science and technology management. He has been Chairman of Symposia, Workshops, etc.; editor of proceedings and books, and member of more than 30 Program Committees for different International Conference and scientific juries. He has more than 50 conferences in different international or national congress. In addition, he has participated in training courses both nationally and internationally. He has received several awards and some of his papers have received special awards. The last 6 years has been one of the two best researchers of his university (The University has more than 1000 researchers). Dr. Aguilar has been a visiting research/professor in different universities and laboratories (Universite Pierre et Marie Curie-Paris-France, Universite de Versailles Paris-France, Universite Rene Descarte-Paris-France, Laboratorie d'Automatique et Analyses de Systemes-Toulouse-France, University of Houston-USA, Universidad de la Coruna-Spain, Universidad Complutense de Madrid-Spain, Institute National de Recherche en Informatique Niza-France). He has been the coordinator or inviting research in more than 20 research or industrial projects supported by the Venezuelan Scientific Office, the French Scientific Office, the Scientific Office of the Universidad de los Andes, INTEVEP (Venezuelan Institute of research in oil), the European Economic Community, among others. In these projects, he has written more than 40 technical reports. Aguilar has been a consultant for PDVSA (the Venezuelan Oil Company), SIDOR (the Venezuelan Iron and Steel Industry), Venezuelan government departments, etc. Aguilar has supervised more than 25 M.S. and Doctoral students in their thesis and dissertation work. He is currently supervising 5 Ph.D. dissertations and 2 M.S. thesis.

Plenary Lecture 5

Variable Step Adaptive Algorithms in Controlling Industrial Distorted Loads

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Abstract: The numbers of the industrial nonlinear distorting loads that pollute the electric power supply network from electromagnetic viewpoint has increased and increase permanently. Their connection to the electric network produces significant current distortions and, taking into account that their total power is not negligible against the supply network's power, are producing also voltage distortions, which decrease the electric power's quality. In this paper we propose an adaptive control method of the electrical installation of an Electric arc furnace. Based on the experimental results will be proposed an adaptive control system of the process. The algorithm used is known as the LMS algorithm (Least Mean Square) or the stochastic gradient's algorithm, being, due to its simplicity, the most used algorithm implemented in the current systems. It was used standard and variable step size LMS algorithm. The efficiency of the proposed algorithms is verified using simulations based on modeling the electric arc. For modelling the electric arc the authors are using a model which parameters like of a real electric arc. For simulation it was use the PSCAD-EMTDC program (Power Systems CAD - a program dedicated to power systems).

Brief Biography of the Speaker: Manuela Panoiu was born in 1965, graduate the Computer Science Faculty, Polytechnic University of Timisoara in 1989. She receives his PhD degree in Electrical Engineering in 2001 and is currently Assistant Professor at the Electrical Engineering and Industrial Informatics Department of Engineering Faculty of Hunedoara, Polytechnic University of Timisoara, Romania. His research interests focus on advanced computer programming, modelling and simulating systems, and artificial intelligence.
She has until now published over 80 research papers in Journals and conferences and participate to 8 research projects.

Plenary Lecture 6

Using of Shift Registers in Cryptosystems

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Abstract: All over the world in today's global activities the continuous development of information technology has an important impact.
There are a lot of applications using shift registers in cryptography, coding theory and wireless system communication.
A Linear Feedback Shift Register is always the kernel of any digital system based on pseudorandom bits sequences.
Some important aspects are developed for working in Galois Fields using irreducible polynomials.
Such kind of methods are used more and more often in cryptosystems, convolutional codes, error correcting and detecting codes.
For example, the Advanced Encryption System (Rijndael) is based on using a grade 8 Irreducible Polynomials in a Galois Field.
Sometimes it's necessary to choose between different scheme of shift registers generators of pseudorandom sequences. A comparison of functioning for such scheme is useful for a better understanding. For this goal there is the possibility to simulate the functioning with some programs or to experiment with a hardware model.
Both of these methods demonstrated that the Linear Feedback Shift Register and Multiple Input- Output Shift Register have the same function.
Based on the mathematical grounds, there are relations for calculating each of the weights of an irreducible polynomials.
Other aspects presented are focused on the convolutional codes.
The two complementary parts of a cryptosystem for coding and decoding offer a great variety of possibilities in choosing alternatives from cryptographic algorithms, as Rijndael, Reed-Solomon and other algorithms based on convolutional codes, as Viterbi.
Other aspects analised are in the frame of using Shift Registers in detecting and correcting communication errors.

Brief Biography of the Speaker: Mirella Amelia Mioc graduated in 1981 the Faculty of Electrotehnics, Computer Science, of the „Traian Vuia" Polytehnic Institute of Timisoara;
Presently she is Assistant Professor in the Department of Computer Science from „Politehnica" University of Timisoara.
The main field of interest consists of analizing the use of shift registers in cryptography and coding theory, the subject of her PhD.
Her scientific activity concerns:
-Number theory;
-Numerical Methods for mathematics;
-Information Theory;
-Programming languages: Pascal, C, C++, Lisp, ML, Java;
-Fundamental concepts of programming languages;
-Study of using shift registers in cryptography and coding theory.
She is the author of:
-3 books about programming languages Pascal and C;
-4 guiding laboratories -numerical methods and programming languages ;
-25 scientific papers published in conference proceedings and journals in country and abroad.
She performed scientific activities in some foreign univesities:
-Technische Universitat Berlin, Germany

-Technical University of Budapest, Hungary;
-Universite Libre de Bruxelles, Belgium;
-Universite de Liege, Belgium;
-Universite Pierre et Marie Curie (VI) of Paris, France.
She participated in several EU founded projects in TEMPUS, LEONARDO and ERASMUS and also took part in some grants and agreements in research.

Plenary Lecture 7

Spectral Element Solution of Klein-Gordon Equation on Infinite Channel with High-Order Boundary Treatment

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Abstract:

A spectral element (SE) method is proposed for the solution of the linearized Euler equations. The infinite domain is truncated via an artificial boundary $\mathcal{B}$, (see Figure 1) and a high-order Non-Reflecting Boundary Condition (NRBC) is developed and applied on $\mathcal{B}$. The new NRBC does not involve any high derivatives, but its order of accuracy is as high as one desires. It involves some parameters which are chosen automatically as a pre-process. A C^0 semi-discrete FE formulation incorporating this NRBC is constructed for the problem in the finite domain bounded by $\mathcal{B}$. A numerical example concerning the propagation of a pressure pulse is used to demonstrate the performance of the new method.

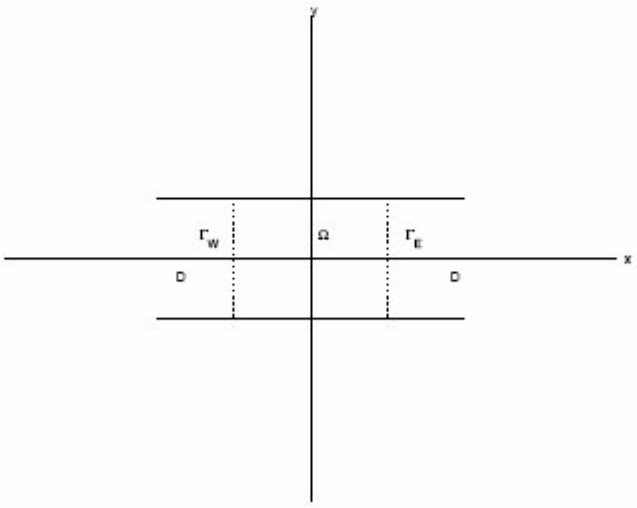

Figure 1: An infinite channel domain Ω truncated by artificial boundaries Γ_W and Γ_E

Brief Biography of the Speaker: Beny Neta received his B.Sc. in 1967 from Tel-Aviv University, Israel and his Ph.D. in Applied Mathematics in 1977 from Carnegie-Mellon University, Pittsburgh, Pennsylvania. In 1984 he was awarded a National Research Council Senior research Associate. Since 1985 he has been a professor with the Department of Applied Mathematics at the Naval Postgraduate School in Monterey, California. He was an advisor for the National Research Council until 2008. He has published more than 75 journal papers and several edited books. Current research focuses on high order non reflecting boundary conditions. He is a member of the New York Academy of Sciences and associate fellow of the American Institute of Aeronautics and astronautics (AIAA).

Plenary Lecture 8

Reconfigurable Chip Multiprocessors Targeting Performance and Energy Consumption

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Abstract: Heterogeneous chip multiprocessors form powerful computing platforms. For high-performance or real-time applications, their design should also rely on acceptable energy budgets. The inclusion of reconfigurable hardware can enhance these platforms even further. This talk first presents a very versatile family of reconfigurable chip multiprocessors that can support the run-time reconfiguration of resources in efforts to match target applications for better performance and/or lower energy consumption. This talk then introduces another family of reconfigurable chip multiprocessors where the hardware can be customized to speed up the execution of time-consuming application kernels. Hardware reconfiguration can then facilitate various customized kernels as execution proceeds. This approach greatly reduces the space and energy requirements, attributes that appeal to high-performance embedded designs. The kernel execution should be prudently scheduled considering the reconfiguration overheads. Suitable task scheduling and resource reconfiguration policies are presented for these families of chip multiprocessors and benchmarks are enlisted as well to showcase their success.

Brief Biography of the Speaker: Dr. Sotirios G. Ziavras received the Diploma in Electrical Engineering from the National Technical University of Athens, Greece, the M.Sc. in Computer Engineering from Ohio University, and the Ph.D. in Computer Science from George Washington University (GWU). He was a Distinguished Graduate Teaching Assistant and Research Assistant at GWU, and also received the Richard Merwin Ph.D. Fellowship. He was with the Center for Automation Research at the University of Maryland, College Park, from 1988 to 1989, focusing on supercomputing. He was a visiting Professor at George Mason University in Spring 1990. He joined in Fall 1990 the ECE Department at NJIT as an Assistant Professor. He is currently a Professor as well as the Director of the Computer Architecture and Parallel Processing Laboratory (CAPPL). He served as the Associate Chair for Graduate Studies for four years.
He received the National Science Foundation (NSF) Research Initiation Award in 1991. In 1996 he lead an NSF/DARPA/NASA-funded New Millennium Computing Point Design project for Petaflops computing. He has received research grants in excess of $2.5M. He has served as an Associate Editor of the Pattern Recognition journal and serves regularly as a member of Conference Program Committees. He is the author of about 140 scientific papers. He is listed, among others, in Who's Who in Science and Engineering, Who's Who in America, Who's Who in the World, and Who's Who in the East. His main research interests are reconfigurable and high-performance computing, computer architecture and embedded systems.

Plenary Lecture 9

The Use of Artificial Neural Networks to Predict the Parametrers of Drinking Water in the Distribution System of Hyderabad City (Pakistan)

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Abstract: The eminence of drinking water of Hyderabad city of Pakistan has remained convoluted. Out of 90 samples taken; the mean values of free chlorine ranges from 0.00 - 0.1340, total chlorine 0.00 to 1.34 mg/l; and pH 6.9 to 7.74. EC & TDS varies from 864-927µS/cm, 83-411 mg/l. Turbidity 27.8 to 30 NTU. The ranges of iron, sulfates, Ca, Mg, and total alkalinity are 0.02 to 1.3, 48-77, 0.04-0.52, 0.16-3.86 and 1.09-16.49 mg/l respectively. All samples are positive microbiologically. Gradient Descent Back-propagation algorithm has been trained and tested for validation of the model to predict pH and Chlorine. The Mean Square Error (MSE) for pH & Chlorine is 0.008380, 0.05310. Input and output weights are generated. The performance of the presented model is very fast. Elapsed training time is only 4.875000 seconds. The results indicated that the trained model has patronizing predictive feat for predicting both Chlorine and pH of Hyderabad city. Overall objective is to develop public awareness about the contamination of drinking water and the use of Artificial Intelligence predictive modeling in order to monitor its quality. In my speech, I will demonstrate the application and importance of Artificial Neural Networks being used for monitoring the quality of drinking water in the distribution system.

Brief Biography of the Speaker: Prof. Niaz A. Memon is an Assistant Professor in the department of civil/Enviroenmental Engineering at Quaid-e-Awam University of Engineering Science & Technology, Nawabshah, PAKISTAN. He joined there in 1987. He graduated in Civil Engineering and then Masters and PhD in Environmnetal Engineering & management. His expertise is the application of Artificial Neural Networks and Drinking water quality monitoring. Niaz has many international publications on his credit in this area, as author or co-author. He has reviewed many of the manuscripts. Last year in 12th CSCC conference on Computers, in Crete, Greece, his paper was decalred as one of the best papers of the conference and the extended version was published in the "WSEAS TRANSACTIONS ON ENVIROENMENT AND DEVELOPMENT" volume 4, issue 8 , August 2008. He developed many ANN models for predicting the critical parameters of the drinking water, keeping in view that the safe drinking water is HEALTH and the sanitaion is the "DIGINITY".

Plenary Lecture 10

Classification in Interval-Valued Information Systems

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Abstract: The use of information theory, rough sets and fuzzy logic helps in extracting important facts from an information system and to discriminate among the different objects, classes or decisions. The minimization of attributes or key facts that influence any selection is the first step when dealing with raw data, where the important information is hidden making the selection complicated. When information is diffuse and the number of obtained values for each attribute is large, so is the number of rules in the discrimination process. Due to this fact, an interval of values is defined for each attribute, moving from the minimum to the maximum obtained values in the database. This is what is defined as interval-valued information systems. Differently from other works, the concept of information measure is used here, together with a fuzzy logic discrimination tool. Using these concepts, initially the key facts are identified (attribute reduction) and then fuzzy logic is applied for discriminating among the possible solutions. The method results simpler than others, and gives accuracy not less than the usually employed methods.

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 the Professional Engineer License from the state of Florida, USA. He taught and did researches for more than 20 years at the Higher Polytechnic Institute of Havana, where he obtained 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 received medals recognizing his work from the Cuban Ministry of Higher Education and the Technical University of Brno, in Czech Republic, where participated in a post-doctoral Study in robotics and in research with the Faculty of this University. 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 books in the area of automatic control and obtained five certificates of invention in the same area. He also wrote published research reports, journals papers and proceedings in scientific conferences. In total he has over 100 publications. Presently, he works as a consultant in electrical engineering and is a lecturer and advisor 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.

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