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# NEW ASPECTS OF COMPUTERS

**Recent Advances in Computer Engineering  
A Series of Reference Books and Textbooks**



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**Heraklion, Crete Island, Greece, July 22-25, 2008**



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## Preface

This book contains the proceedings of the 12th WSEAS International Conference on COMPUTERS which was held in Heraklion, Greece, July 23-25, 2008. This conference aims to disseminate the latest research and applications in Programming Languages, High Performance Languages, Operating Systems, Hardware Engineering, Supercomputing, Parallel Computing Systems Architectures, Software Evaluation Standards, Distributed Multimedia, Digital Speech Processing, Statistical Methods for Signal Processing, Tele-automatic control, E-commerce, Tele-medicine and medical informatics, Tele-healthcare, Computational linguistics, Computer networks, Interconnection Networks, Optical Interconnection Networks, Broadband Networks, Mobile Networks, Network Applications, Distributed Real Time Systems, Distributed Data Base, Computational Biophysics and other relevant topics and applications.

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

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## CEREMONY for Prof. SIFAKIS

Opening by the Deputy Minister of National Defence of GREECE  
Ioannis Plakiotakis  
(Biochemical Engineer, M.Sc and Economics, M.Sc.)



<http://www.plakiotakis.gr>

Born in 1968 in Sitia, in the prefecture of Lasithi on the island of Crete. Plakiotakis studied chemical engineering at the University of Wales and obtained a Master's degree in biochemical engineering at London University with an MBA from the City University Business School of London. He worked at Eurocontrol, an inter-country Organisation that regulates Air Circulation and the flight safety in Europe. He is a member of the New Democracy Party since 1987. He was an active member of New Democracy's Student Movement (DAP) and in 1999 became Vice-president of the Local Committee of N.D. in Sitia (Crete). From 1998 to 2002 he acted as Municipal Advisor in Sitia. On January 2001 he was appointed as a permanent member of the Committee of Tourism by the President of the Hellenic Republic. He is a member of the Association of graduates of Biochemical Engineering at the University of London, as well as at the City University Business School.

### **Parliamentary- Governmental Activity:**

- Member of Parliament's Special Permanent Committee of Protection of the Environment.
- New Democracy's Assistant Supervisor of Tourism and member of the Parliamentary Delegates of Production and Trade, Protection of Environment and Orthodoxy.
- He was elected MP of Lasithi with the N.D. in 2004 and in 2007.
- On 19 October 2007 he was appointed Deputy Minister of Defense.

## KEYNOTE SPEAKER – TURING AWARD 2007

### Embedded Systems – Scientific Challenges and Work Directions



**Prof. Joseph Sifakis**  
**Turing Award 2007,**

**<http://www.acm.org/press-room/news-releases/turing-award-07/>**  
**1 hour Keynote Lecture (CONFERENCE ROOM 1),**  
**Wednesday, July 23, 16:00-17:00**

#### **Nobel of Computing:**

**<http://www.cmu.edu/homepage/practical/2008/winter/nobel-of-computing.shtml>**

**Also: <http://www-verimag.imag.fr/~sifakis/>**

**Abstract:** Embedded systems are components integrating software and hardware that are jointly and specifically designed to provide given functionalities, which are often critical. They are used in a very wide array of application areas - including transport, consumer electronics / electrical appliances, energy distribution, manufacturing systems, etc. Designing embedded systems 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, which are by their nature are very different from the analytic models used in other engineering disciplines, because they do not encompass physical time and resources. We discuss the main aspects of this

challenge and their associated research directions for different areas such as modelling, programming, compilers, operating systems and networks.

**Biography:** Joseph Sifakis is CNRS researcher and the Founder of Verimag laboratory (<http://www-verimag.imag.fr/>), in Grenoble, France. 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 through 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 Thalès, Airbus, Ericsson, Philips, and ST Microelectronics.

Joseph Sifakis is the chair of "Chamber B" (Public Research Organisations) of ARTEMISIA, which is the Industrial Association within the ARTEMIS European Technology Platform on Embedded Systems (<http://www.cordis.lu/ist/artemis/>).

Joseph Sifakis is the director of the CARNOT Institute "Intelligent Software and Systems" in Grenoble. 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.

Joseph Sifakis has received with Ed Clark 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 I

### Distributed Estimation Using Wireless Sensor Networks



**Professor Georgios B. Giannakis**  
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USA

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**Abstract:** Envisioned applications of wireless sensor networks (WSNs) include surveillance, monitoring and tracking tasks. These motivate well decentralized estimation and smoothing of deterministic and (non)stationary random signals using (possibly correlated) observations collected across distributed sensors. In this talk we present state-of-the-art algorithms for consensus-based distributed estimation using ad hoc WSNs where sensors communicate over single-hop noisy links. The novel framework reformulates basic estimation criteria such as least-squares, maximum-likelihood, maximum a posteriori, and linear mean-square error, as decomposable, constrained, convex optimization problems that are amenable to distributed solutions. The resultant distributed estimators are provably convergent to their centralized counterparts and robust to communication noise. Besides stationary, the framework encompasses adaptive filtering and smoothing of non-stationary signals through distributed LMS and Kalman filtering.

**Brief Biography of the Speaker:** G. B. Giannakis received his B.Sc. in 1981 from the Ntl. Tech. Univ. of Athens, Greece and his M.Sc. and Ph.D. in Electrical Engineering in 1983 and 1986 from the Univ. of Southern California. Since 1999 he has been a professor with the Department of Electrical and Computer Engineering at the University of Minnesota, where he now holds an Endowed ADC Chair in Wireless Telecommunications. His general interests span the areas of communications, networking, signal processing, estimation and detection theory -- subjects on which he has published more than 270 journal papers, 450 conference papers, two research monographs and two edited books. Current research focuses on wireless networks, complex-field and space-time coding, ultra-wideband and cognitive radios, cross-layer designs and wireless sensor networks. He is the (co-) recipient of six best paper awards from the IEEE Signal Processing (SP) and Communications Societies (1992, 1998, 2000, 2001, 2003, 2004) and also received the SP Society's Technical Achievement Award in 2000 as well as the EURASIP Technical Achievement Award in 2005. He is an IEEE Fellow since 1997, a Distinguished Lecturer for 2007-08, and has served the IEEE in various editorial and organizational posts

## Keynote Lecture II

### Tyflos : A Wearable System-Prototype for Assisting Visually Impaired



**Dr. Nikolaos G. Bourbakis**

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**Abstract:** *Human eyes receive more than 75% of the total information accessible to the human senses.* “There are approximately 45 million blind individuals world-wide according to the World Health Report. Vision loss can be very traumatic, leading to frustration and depression. According to the American Foundation for the Blind (AFB), the rate of unemployment among legally blind individuals of working age residing in the United States (58%) is much greater than that of individuals with no functional limitations (18%). Employment opportunities and independence are scarce for visually impaired individuals. This is unfortunate in view of the fact that ingenious devices [IEEE Spectrum] and information technology (IT) strategies can be developed to help people overcome these barriers and to pursue educational opportunities that will allow them to become productive members of society.” In this talk technological efforts are presented that have the same goal assisting and increasing the visual impaired people’s independence in their working and living environment, and reducing their social neglect. In particular, the research effort (called Tyflos) is presented here that is an IT- based wearable system-prototype. It consists of a pair of dark glasses on which two tiny vision cameras, an ear speaker and a microphone are attached. The cameras are connected with a portable computer that carries intelligent software programs. The cameras, under the user’s command, capture images from the surrounding and convert them via software programs into audio or vibrations. The current versions of Tyflos is used as 1) a reader by reading books or the blind user via audio conversion and 2) a navigation by converting 3D images into vibrations for navigation.

**Brief Biography of the Speaker:** Nikolaos G. BOURBAKIS (IEEE Fellow) received his PhD in computer engineering and informatics in 1983. He currently is the Associate Dean for Engineering Research, a Distinguished Professor of Informatics and the Director of the ATR Center at WSU. He has directed several research projects (Applied AI, Image Processing & Machine Vision, Visual Autonomous Navigation, Information Security, Bio-Informatics, Biomedical Engineering) funded by government and industry, and he has published near 300 papers in International refereed Journals, Conference proceedings and book-chapters. Previous working places: SUNY, IBM, UP, GMU. He is actively involved as an Associate Editor in several IEEE and International Journals and General Chair in numerous International IEEE Conferences. He is the EIC of the Artificial Intelligence Tools Int. Journal (WSP) and the new upcoming Bioinformatics Engineering Journal. He is an IEEE Computer Society Distinguished Speaker, and NSF University Research Programs Evaluator, an IEEE Computer Society Golden Core Member. He has received several high prestigious awards, some of them are: IBM Author recognition Award 1991, IEEE Computer Society Outstanding Contribution Award 1992, IEEE Outstanding Paper Award ATC 1994, IEEE Computer Society Technical Research Achievement Award 1998, IEEE I&S Outstanding Leadership Award 1998, IEEE ICTAI 10 years Research Contribution Award 1999, IEEE BIBE Leadership Award 2003, ASC Recognition Award 2005.

### Keynote Lecture III

## Algorithms for Rendering Depth of Field Effects for Synthetic Image Generation and Computational Photography



**Dr. Brian A. Barsky**

Professor of Computer Science

Affiliate Professor of Optometry and Vision Science

Member of Joint Graduate Group in Bioengineering, UCSF/UCB

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**Abstract:** Depth of field refers to the swath through a 3D scene that is imaged in acceptable focus through an optics system, such as a camera lens. It is a vitally important component of real photographs, and is useful as a tool for drawing the viewer's eye to the important part of the image. Depth of field is equally important for computer-generated images. This talk will provide an explanation of the phenomenon of depth of field and a survey of a variety of techniques to render depth of field effects in computer graphics, with particular attention devoted to the trade-offs between image quality and algorithm efficiency. Algorithms to render highly accurate depth of field effects, such as distributed ray tracing or the accumulation buffer, are sampling methods that use large numbers of samples, with high computational cost. Sampling is inherently slow because it effectively requires rendering the scene many times, which multiplies the render time by a potentially large factor. Faster algorithms are based on a post processing approach, which operates in image space. Post process methods operate on 2D images along with depth information, rather than working with a full 3D object representation as the sampling methods do. Consequently, post process methods struggle to accurately simulate the underlying optical process, and tend to suffer from artifacts or avoid those artifacts at a large cost. The talk will include an analysis of the nature of these artifacts.

**Brief Biography of the Speaker:** Brian A. Barsky is Professor of Computer Science and Affiliate Professor of Optometry and Vision Science at the University of California at Berkeley. He is a member of the Joint Graduate Group in Bioengineering, an interdisciplinary and inter-campus program, between UC Berkeley and UC San Francisco. He was a Directeur de Recherches at the Laboratoire d'Informatique Fondamentale de Lille (LIFL) of l'Université des Sciences et Technologies de Lille (USTL). He has been a Visiting Professor of Computer Science at The Hong Kong University of Science and Technology in Hong Kong, at the University of Otago in Dunedin, New Zealand, in the Modélisation Géométrique et Infographie Interactive group at l'Institut de Recherche en Informatique de Nantes and l'Ecole Centrale de Nantes, in Nantes, and at the University of Toronto in Toronto. Prof. Barsky was a Distinguished Visitor at the School of Computing at the National University of Singapore in Singapore, an Attaché de Recherche Invité at the Laboratoire Image of l'Ecole Nationale Supérieure des Télécommunications in Paris, and a visiting researcher with the Computer Aided Design and Manufacturing Group at the Sentralinsittutt for Industriell Forskning (Central Institute for Industrial Research) in Oslo. He attended McGill University in Montréal, where he received a D.C.S. in engineering and a B.Sc. in mathematics and computer science. He studied computer graphics and computer science at Cornell University in Ithaca, where he earned an M.S. degree. His Ph.D. degree is in computer science from the University of Utah in Salt Lake City. He is a Fellow of the American Academy of Optometry (F.A.A.O.). He is a co-author of the book *An Introduction to Splines for Use in Computer Graphics and Geometric Modeling*, co-editor of the book *Making Them Move: Mechanics, Control, and Animation of Articulated Figures*, and author of the book *Computer Graphics and*

Geometric Modeling Using Beta-splines. He has published 120 technical articles in this field and has been a speaker at many international meetings. Dr. Barsky was a recipient of an IBM Faculty Development Award and a National Science Foundation Presidential Young Investigator Award. He is an area editor for the journal Graphical Models. He is the Computer Graphics Editor of the Synthesis digital library of engineering and computer science, published by Morgan & Claypool Publishers, and the Series Editor for Computer Science for Course Technology, part of Cengage Learning. He was the editor of the Computer Graphics and Geometric Modeling series of Morgan Kaufmann Publishers, Inc. from December 1988 to September 2004. He was the Technical Program Committee Chair for the Association for Computing Machinery / SIGGRAPH '85 conference. His research interests include computer aided geometric design and modeling, interactive three-dimensional computer graphics, visualization in scientific computing, computer aided cornea modeling and visualization, medical imaging, and virtual environments for surgical simulation. He has been working in spline curve/surface representation and their applications in computer graphics and geometric modeling for many years. He is applying his knowledge of curve/surface representations as well as his computer graphics experience to improving videokeratography and corneal topographic mapping, forming a mathematical model of the cornea, and providing computer visualization of patients' corneas to clinicians. This has applications in the design and fabrication of contact lenses, and in laser vision correction surgery. His current research, called Vision-Realistic Rendering is developing new three-dimensional rendering techniques for the computer generation of synthetic images that will simulate the vision of specific individuals based on their actual patient data using measurements from a instrument a Shack-Hartmann wavefront aberrometry device. This research forms the OPTICAL (OPTics and Topography Involving Cornea and Lens) project.



## Plenary Lecture I

### Computational Intelligence Solutions for Biometrics



**Professor Victor-Emil Neagoe**

Depart. of Electronics, Telecommunications and Information Technology,  
Polytechnic University of Bucharest,  
Splaiul Independentei 313, Bucharest, Romania

**Abstract:** The word **biometrics** is a combination of the Greek words **bio** and **metric**. When combined, it means “life measurement.” Biometrics concerns the study of automated methods for identifying an individual by measuring one or more physical or behavioral features of him. Certain physical human features or behaviors are characteristics that are specific and can be uniquely associated to one person. Common physiological biometric traits include: fingerprints, hand geometry, retina, iris, DNA and facial images. Whereas, common behavioral biometric traits include: handwriting, voice print, gait, and keystroke rhythms. Nowadays biometrics is rapidly evolving; it becomes more and more attractive and effective in critical applications, such as to create safe personal IDs, to control the access to personal information or physical areas, to recognize terrorists or criminals, to study the movements of people, and to monitor the human behavior. Several governments are now using or will soon be using biometric technology. The U.S. INSPASS immigration card and the Hong Kong ID card, for example, both store biometric features for authentication. Computational intelligence (CI) is a fastmoving research field with approaches primarily based on neural networks, machine learning, fuzzy logic, genetic algorithms and evolutionary computing. Computational intelligence (CI) technologies are robust, can be successfully applied to complex problems, are efficiently adaptive, and usually have a parallel computational architecture. For those reasons they have been proved to be effective and efficient in biometric feature extraction and biometric matching tasks, sometimes used in combination with traditional methods. In this lecture we survey two kinds of major applications of CI in biometric technologies: CI-based feature extraction and CI-based biometric matching. We also present the original contribution of the author regarding some CI solutions for facial image recognition and iris identification.

**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 II**  
**Post Modern Ubiquitous Information Society**  
**- Bridging the gap between human and computer -**



**Professor Norio Shiratori**

Research Institute of Electrical Communication (RIEC)  
Tohoku University, Japan

**Abstract:** Famous Russian economist, Nicolai Kondratiev envisioned a long term (50 to 60 years) economic cycles of boom followed by depression, known as "Kondratiev waves", or grand supercycles. These cycles are closely related to the innovation of new technologies and its wide spread applications. The last boom was in 1960s with the invention of semiconductors and subsequently the introduction of computer. According to Kondratiev time-cycle, new technology and the consequent next economic peak would appear around year 2025. By that time, with the advancement of computer and communication technologies we can perceive a transformation from the present Information society to a new society, that we named as Symbiosis society. We have already witnessed that, invention of new technologies has made a huge impact on our life style and the society itself. Though it may provide various advantages and convenience, at the same time many social problems have also arisen. For some particular group of people, this technological development may not be as helpful as the rest. As they will be unable to take the full advantage of the benefits of information and facilities available. Actually it may pose anxiety and inconvenience to various layers of the society in different ways. To overcome these problems and to close the expected gap between human and computer a new information and communication paradigm is proposed, named as Symbiotic Computing. To overcome the above mentioned shortcomings and the subsequent problems, at the same time strengthening the power of advance ubiquitous computing environment, a new paradigm, called Symbiotic Computing is created. Based on this novel idea of Symbiotic Computing, Symbiosis Society can be realized, where human and ubiquitous information environment can coexist providing necessary cooperation to each other and close the gap between these two entities. We construct a symbiotic computing model and an architecture of symbiotic space for achieving the concept of symbiotic computing. Basic technologies for realizing the model and architecture are also developed. Moreover, we evaluated our proposal through developing a few applications and performing trial experiments in prototype system.

**Brief Biography of the Speaker:** Norio Shiratori is currently a Professor at Research Institute of Electrical Communication (RIEC), Tohoku University, Japan. Before moving to RIEC in 1993, he was the Professor of Information Engineering at Tohoku University from 1990 to 1993. Prior to that, he served as an Associate Professor and Research Associate at RIEC, Tohoku University, after receiving his Doctoral degree from Tohoku University in 1977. He was also served as the vice Director of RIEC, Tohoku University, vice President of IPSJ (Information Processing Society of Japan) and IFIP representative of Japan. He is a fellow of IEEE, IPSJ and IEICE. Professor Shiratori also contributes through serving as various capacities, such as: General Chair of the 9th IEEE ICOIN-9(1994), 1997 IFIP Joint International conference FORTE/PSTV'97, and 12th IEEE ICOIN-12 (1997); Program Chair of ICPADS'96 and ICPP-99 (1999). Dr. Shiratori was one of the leaders in Japan Gigabit Network (JGN) national project as is leading two other projects: SCOPE - funded by Ministry of Internal Affairs and Communications and JSPS sponsored "Mirai-kaitaku" project. In 2006, the proposed idea of his research group on Mobile IPv6MIB was approved and standardized by IETF. He has been engaged in research related to symbiotic computing paradigms between human and information technology and distributed processing systems and flexible intelligent networks. He has proposed a new concept of Flexible Computing and still working in this direction. His recent research interest is in Ubiquitous and Symbiosis computing. He has published more than 15 books and over 400 referred paper in computer science. He was the recipient of IPSJ Memorial Prize Wining paper award in 1985, Telecommunication Advancement Foundation Incorporation award in 1991, best paper award of ICOIN-9 in 1994, IPSJ best paper award in 1997, and many others, including the most recent Outstanding Paper Award of UIC-07 in 2007.

### Plenary Lecture III

#### Symbolic computing in engineering simulations and education



**Professor Marcin Kaminski**

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**Abstract:** Symbolic computations nowadays still extend the area of potential applications in a variety of the fundamental and applied sciences and, especially, in different branches of the modern engineering. Now, using such computer systems as MAPLE, MATHEMATICA, MATLAB or MATHCAD for instance, it is possible to solve the complex systems of partial differential, make precise visualizations of the observed dynamical systems or to perform some statistic or stochastic simulations of the non-deterministic systems. The quality of those computer environments in terms of interoperability with the other programs (like the Finite or Boundary Element as well as Finite Difference Methods source codes), computer time cost, visualization tools and the number of ready-to-use available applications still dramatically increases. Relatively simple differentiation methods, both symbolic and numerical, frequently lead the users to apply symbolic computations programs to sensitivity and optimization studies, whereas a wide range of statistical tools enables uncertainty inclusion and estimation in various unstable systems computations finished with the reliability prognoses. At the same time symbolic computer systems are very valuable educational tools for mathematicians, physicians and the engineers because the students after primary demonstration of some problem solution may easily follow the teacher, whereas the powerful visualization may help to understand the methods not only by numbers and symbols but also using the graphs and animations. Therefore, the main aim of the lecture is to make a review of the recent advances in designing, capabilities, implementation, various machines and operating systems performance as well as the applications for the symbolic computer programs using, as the example, the system MAPLE. The recent research applications in composite materials modeling and stochastic analysis will be shown together with the case studies used in the civil and mechanical engineering practice and some examples used in undergraduate, graduate and doctoral courses. Some new ideas concerning the symbolic computations packages and their general ideas will be also discussed.

**Brief Biography of the Speaker:** Marcin Kaminski, born in Torun, Poland, 17.02.1969. M.Sc. in Civil Engineering (1994) at the Technical University of Lodz, Poland, Ph.D. in Civil Engineering (1997) at the Technical University of Lodz, Poland, postdoctoral study at Rice University, Houston, TX, USA, 1999-2000, D.Sc. in Civil Engineering (mechanics of materials and structures) at the University of Technology Wrocław, Poland; university professor since 2007. Author of more than 140 papers in international conference proceedings and scientific journals, a monograph 'Computational Mechanics of Composite Materials' printed by Springer London-New York, 2005. Recipient of the prizes of the Foundation of Polish Science in 1996 and 1999, John Argyris Award in computational mechanics in 2001 and J.T. Oden Faculty Fellowship at ICES, UT, Austin in 2004. A member of many international scientific associations - IACM, IASS, GAMM, SIAM & USACM.

## Plenary Lecture IV Intelligent Techniques for Medical e-Learning Systems



**Professor Abdel-Badeeh M. Salem**

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Web site: <http://net.shams.edu.eg/27.htm>

**Abstract:** Medical Intelligent e-Learning Systems (MILSs) are concerned with the construction of intelligent software that performs diagnosis and make therapy recommendations. Unlike other medical applications abased on other programming methods such as purely statistical methods, MILSs are based on symbolic models of disease and their relationship to patient factors. Many types of MILSs are in existence today and are applies to different medical tasks, e.g. generation alerts and remainders, diagnosis assistant, therapy critiquing and education . This talk presents some of the intelligent technologies used in developing intelligent medical learning systems at Ain Shams University, Cairo, are discussed as well.

**Brief Biography of the Speaker:** Prof. Dr. Abdel-Badeh M Salem He is a professor of Computer Science and Vice Dean of Faculty of Computer and Information Sciences at Ain Shams University, Cairo-Egypt, from 1996 to present. He was a professor of Computer Science at Faculty of Science, Ain Shams University from 1989 to 1996. He was a Director of Scientific Computing Center at Ain Shams University (1984-1990). His research includes intelligent computing, expert systems, medical informatics, and intelligent e-learning technologies. He has published around 170 papers in refereed journals and conference proceedings in these areas. He has been involved in more than 120 conferences and workshops as an Int. Program Committee and Session Chair. He is author and co-author of 15 Books in English and Arabic Languages. He was one of the founders of the following events, First Egyptian Workshop on Expert Systems 1987, Int. Cairo Conference on Artificial Intelligence Applications in 1992 and Int. Conf. on Intelligent Computing and Information Systems 2002, and one of the main sustainers of annual Int. Romanian Internet Learning Workshop Project (RILW), 1997. In addition he was Secretary of Egyptian Computer Society (1984-1990), Member of National Committee in Informatics – Academy of Scientific Research and Technology (1992-200), Member of Egyptian Committee in the Inter-Governmental Informatics Program, IIP-UNISCO, Paris (1988-1990) and Coordinator of the Annual International Conference for Statistics, Scientific Computing, and Social and Demographic Research (1983-1990). In addition he was a partner of a MEDCAMPUS Projects on Methodologies and Technologies for Distance Education in Mediterranean (1993-1995). He is a Member of the Editorial Board of the follwing Journals: Int. Journal of Computing and Information Sciences(IJCIS), Canada; Egyptian Computer Science Journal, EC Newsletter, Education in Computing and Computers in Education, Italy; Scientific Journal of Studia Universitatis Babes-Bolyai, Series Informatica, Cluj – Napoca, Romania; International Journal of intelligent computing in medical sciences and image processing (IC-MED), Japan; Egyptian Journal for Specialized Studies, Faculty of Specific Education,Ain Shams University,Egypt; Int. Journal of Intelligent Computing & Information Science”,IJICIS, Egypt; Enformatika Transactions on Engineering, Computing and Technology, World Enformatika Society, Turkey; and Int. Journal of Soft Computing Approaches (IJSCA), Eurojournals. He is a Membership of Int. Scientific Societies: American Association of Artificial Intelligence (AAAI), USA; British Computer Society, Expert Systems Specialist Group (SGES), Int. Neural Network Society (INNS), USA; Association for the Advancement of Computing Education (AACE), USA; Int. Society for Computers and their Applications ((ISCA), NC, USA, Dec. 95); Int. Society for Telemedicine & eHealth ISfTeH., Switzerland; Member of Int. Federation for Information Processing (IFIP) Technical Committee WG 12.5, Knowledge-Oriented Development of Applications, Austria (2000 till now), Member of Int. Association for Science and Technology for Development (IASTED), TC on AI and Expert Systems, Int. Association for Science and Technology for Development, Canada, (2000 till now).

## Plenary Lecture V Super-Object-Oriented Programming and Simulation



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**Abstract:** One applies simulation namely in studying complex systems and for that purpose special programming techniques were developed, among which the object-oriented programming (OOP) passed the domain of simulation over and became a universal technique of programming and of representation of concepts. A man-made system  $S$  designed in a modern way often uses a computer  $C$  for controlling its operation and – in case the controlling is complex – it uses also simulation and/or OOP. If such a man-made system  $S$  is simulated during its design phase,  $C$  should be reflected in the used simulation model  $M$ , together with its operation, namely with the (simulation) model  $m$  and/or the represented concepts used by it; this statement can be exactly proved. So the “internal” model  $m$  should be “nested” in the “external” model  $M$  and often the system  $r$  of concepts represented for the purpose of  $m$  should be “nested” into the system  $R$  of concepts represented for the purpose of  $M$ . The psychology demands the authors of the models to introduce the same names of concepts, of functions and of elements for both the models  $M$  and  $m$ , although they essentially differ by their own relation to the simulated reality; for example, they have their own (mutually different) time flows; moreover, a danger of a fatal error called transplantation exists, consisting in assigning a name qualified in one of the models to an element belonging to the other one. There is a technique called super-object-oriented programming (SOOP) that allows secure and decipherable producing of such “nesting” models. It consists in enlarging the OOP by “life rules”, i.e. algorithms according the instances of the concepts should behave, and local classes, that enable an instance  $E$  of a class to carry classes “nested” in it. In  $M$ ,  $E$  can simply model a modeling/simulating computer (or even a formalized human “manager” existing inside the system reflected by  $M$ , who time to time anticipates possible future consequences of his own decisions). Surprisingly, SOOP was discovered already 41 years ago together with the OOP. The principles of solving obstacles in the nesting simulation models will be presented. The author led some works oriented to simulation of the sea harbors (especially container terminals), of the production halls equipped with auto-routed vehicles, and of the hospital sections, and in the Czech Republic and France such techniques were followed, namely in developing special “quasi-parallel” methods of optimizing and of nested simulation models of public transport, of circular conveyors and of systems of demographic development. Their details will be presented in special papers of their authors.

**Brief Biography of the Speaker:** Eugene Kindler was born in 1935, studied mathematics at Charles University in Prague, (Czechoslovakia) and then computer science at the Research Institute of Mathematical Machines in Prague. He is the author of the first Czechoslovak ALGOL 60 compiler and the first Czechoslovak simulation language and compiler (COSMO, Compartmental System Modeling). Charles University granted him PhDr in logic and RNDr (Rerum Naturalium Doctor) in the theory of programming, Czechoslovak Academy of Science granted him CSc (Candidate of Sciences) in mathematics and physics. During 1958-1966 he worked with the Research Institute of Mathematical Machines, then with the Institute of Biophysics of the Faculty of General Medicine of Charles University (until 1973) and then with the Faculty of Mathematics and Physics of the same University (until 2006). In parallel, he worked with a new University of Ostrava. Since 2006 he has been pensioned, collaborating with the same Ostrava University as external specialist in various research projects and in doctoral studies. During 1967-1973 he was responsible for special projects on information processing in radiation security and during 1973-1989 he was head of teams oriented to the fundamental research of modeling techniques. During 1995-2000 he represented Czech Republic activities at two COPERNICUS projects sponsored by the European Commission and oriented to sea harbor modernizing with use of modern information technology. Beside many shorter professional stays at foreign institutions, he worked as visiting professor with the University of Pisa (Italy, one year around 1969) and with West Virginia University (Morgantown, USA, one year around 1993), as invited professor and then as holder of French government professor scholarship with Blaise Pascal University (Clermont-Ferrand, 9 moths, around 1995 and 1998) and with the University of South Brittany (Lorient, France, 3 times one months in 2002-2004), and as a hosting lecturer with Humboldt University (Berlin, 3 months in 1983). His main professional interest is object-oriented simulation of discrete event systems, namely of those using their own private models for anticipating their future states. His private hobby is the chant originated during the first millennium A.D. in Europe and certain Near East Asian countries.



## Plenary Lecture VI Heterogeneous Reconfigurable Chip Multiprocessors for Embedded Systems



**Professor Sotirios G. Ziavras**

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**Abstract:** Chip multiprocessing has recently become a common practice in processor design. With ever increasing concerns for energy consumption, performance-energy trade-offs are often necessary, especially in the design of real-time embedded systems. Multiprocessor heterogeneity is a successful design paradigm for high performance and energy conservation with embedded systems. Performance and energy analyses will be presented for an in-house developed FPGA\*- based mixed-mode heterogeneous chip multiprocessor, where the SIMD (Single-Instruction, Multiple-Data) and MIMD (Multiple-Instruction, Multiple-Data) parallel computing modes can be realized simultaneously or distinctly. The presented performance-energy trade-off techniques are based on the observation that SIMD and MIMD tasks involve substantially different amounts of computation and communication with different execution time and energy behaviors. Experimental results on Xilinx FPGAs demonstrate the effectiveness of the proposed approach. To conserve space and power as well as to incorporate dynamic adaptability in embedded systems, it is important to utilize hardware components as best as possible. The hardware customization of application kernels reduces the execution time and potentially the power consumption. Reconfiguring the same hardware to facilitate various customized kernels as execution proceeds greatly reduces the space requirements. When the kernel execution is carefully scheduled considering also the reconfiguration overheads, the obtained performance gain can offset such overheads. A policy and experiments will be presented of customizing and reconfiguring multiprocessor hardware for embedded benchmark kernels implemented on FPGAs. The results reveal substantial performance improvement and resource conservation. \* FPGA: Field-Programmable Gate Array

**Brief Biography of the Speaker:** Dr. Sotirios G. Ziavras received the Diploma in Electrical Engineering from the National Technical University of Athens, Greece, in 1984, the M.Sc. in Computer Engineering from Ohio University in 1985, and the Ph.D. in Computer Science from George Washington University (GWU) in 1990. 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 Electrical and Computer Engineering Department at NJIT as an Assistant Professor. He is currently a Professor at NJIT, with joint appointments in the Electrical and Computer Engineering, and Computer Science Departments. He also serves as the Associate Chair for Graduate Studies in ECE. 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 computing, high-performance computing (architectures and applications), computer architecture and embedded systems.

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