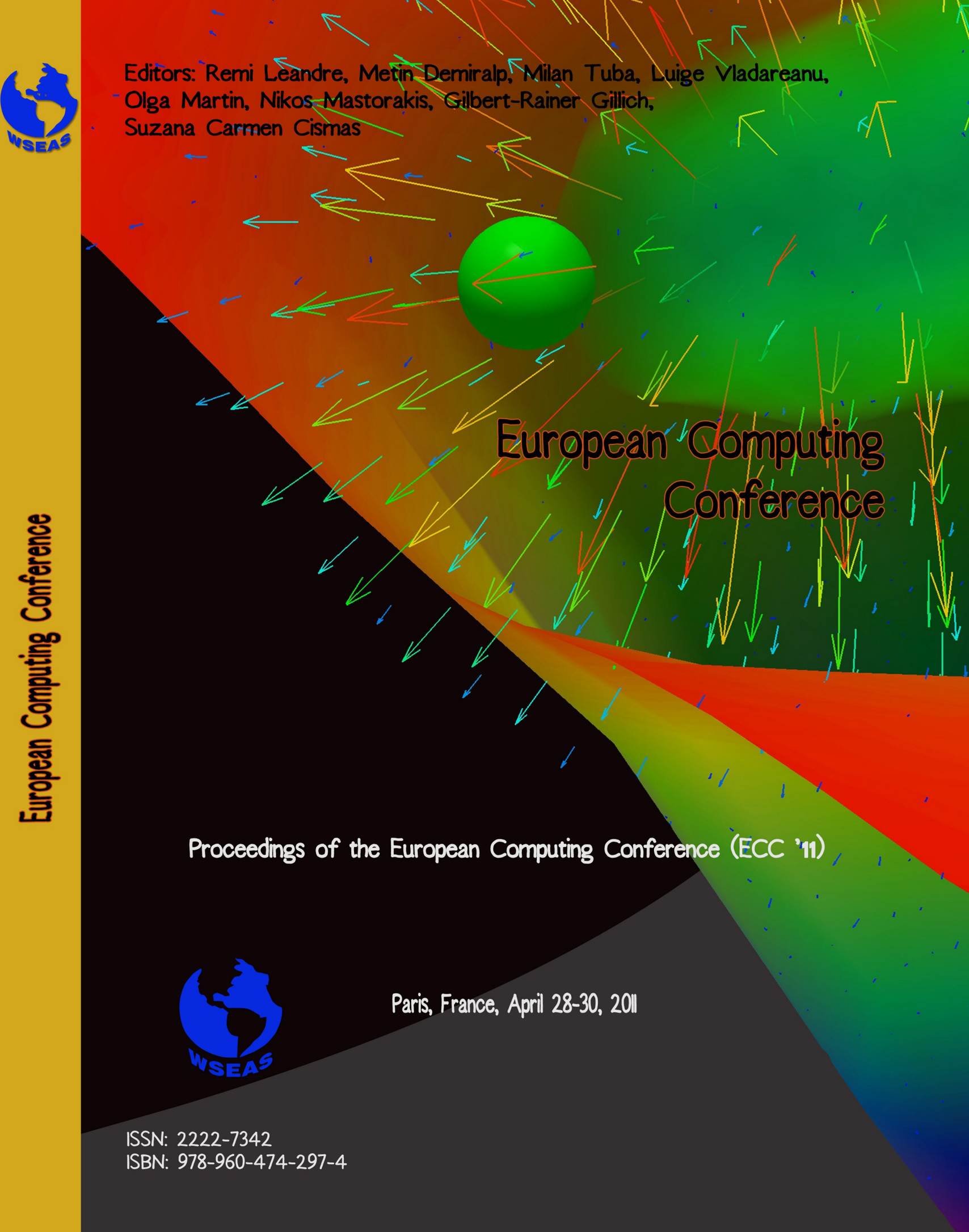

Editors: Remi Leandre, Metin Demiralp, Milan Tuba, Luige Vladareanu,
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# European Computing Conference

European Computing Conference

Proceedings of the European Computing Conference (ECC '11)

Paris, France, April 28-30, 2011

ISSN: 2222-7342
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# EUROPEAN COMPUTING CONFERENCE

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Prof. Remi Leandre, Universite de Bourgogne, France
Prof. Metin Demiralp, Istanbul Technical University, Turkey
Prof. Milan Tuba, University Megatrend Belgrade, Serbia
Prof. Luige Vladareanu, Romanian Academy, Romania
Prof. Olga Martin, University "Politehnica" of Bucharest, Romania
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**Preface**

This year the European Computing Conference (ECC '11) was held in Paris, France, April 28-30, 2011. The conference provided a platform to discuss software engineering, hardware engineering, data bases, industrial systems, web-based education, computer vision, multimedia, video systems, signal processing, image processing, language-speech processing, quantum computing, robotics, fuzzy logic, digital communications, graph theory, supercomputing, computers in education 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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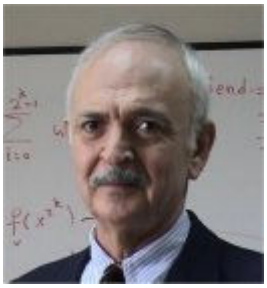
## Keynote Lecture

# High Dimensional Model Representation (HDMR) and Enhanced Multivariance Product Representation (EMPR) as Small Scale Multivariate Decomposition Methods



**Professor Metin Demiralp**
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**Abstract:** The method of finite elements is quite frequently used in the solution of boundary value problems modelled as either ordinary differential equations (ODEs) or partial differential equations (PDEs). It is based on basically weak derivative and Sobolev space concepts. An appropriate bilinear form is constructed from the given equations and accompanying boundary conditions by using these concepts. Then the unknown function is approximately expressed in terms of appropriately defined spline functions over certain convenient subregions of the problem geometry. The linear combination constructed towards this goal contains certain undetermined constants which appear in an algebraic equation, that is linear for the linear ODEs or PDEs, together with linear boundary impositions like Dirichlet or Neumann conditions. The important issue in this approach is the construction of the spline basis set, which is realized in such a way that the resulting algebraic equations possess rather simple structure to be solved for the unknowns. Finite elements can be used for almost anything either derived from ODEs or PDEs, or directly from a function in certain ways although the most desired cases are the differential equations.
Recent developments, especially in last decade, made it possible to decompose a multivariate function or its image under certain appropriate operators to some components which are ordered in ascending multivariance. This approach which was originally proposed by Sobol has been extended to more general representations after the studies by Rabitz group in Princeton and Demiralp group in ?Istanbul, even though the number of the scientists concerning with the issues have been increased recently. The method was named High Dimensional Model Representation (HDMR). There are now many different varieties of HDMR in accordance with the certain particularities of the target function, especially after many works in the Group for Science and Methods of Computing (GfSaMoC, supervised and conducted by Demiralp). Beyond those varieties new quite important approaches like Enhanced Multivariance Product Representation (EMPR) which uses support functions to provide more flexibility to quality control in the truncation approximations have also been developed.
Despite HDMR and EMPR are considered for the continuous structures like multivariate functions of more than one independent variables, recent works of GfSaMoC have shown that these methods can be directly used as orthonormal decomposition methods in Multilinear Algebra even though the preliminary steps to this end were taken by Sobol, Rabitz and some other authors.
Some studies have been realized in GfSaMoC to understand what happens if the HDMR or EMPR geometry is taken to zero limit in the volume. What we have seen was that the constancy measurer of HDMR becomes 1 at the zero volume limit. In other words, the constant component of HDMR was becoming overwhelmingly dominant in that limit, or more precisely, HDMR was becoming composed of just a single constant component. This limiting behaviour was bringing the opportunity of approximating the function under HDMR by just constant component or at most univariate terms when the geometric volume of HDMR diminishes. This urged us to divide the HDMR geometry to certain subgeometries such that the function under consideration can be expressed by at most univariate terms in HDMR for each subregion. The result was a piecewise function whose discontinuities can be smoothened by taking some higher HDMR components or by using an optimisation technique to choose best subregioning through suppressing the function value jumps at the borders of each subregion.
What we have mentioned above can be accordingly modified for the EMPR approach also. Some related theorems about the zero volume properties of HDMR and EMPR together with certain illustrative implementations will be presented during the speech.

**Brief Biography of the Speaker:**
Metin Demiralp was born in Turkey on 4 May 1948. His education from elementary school to university was entirely in Turkey. He got his BS, MS, and PhD from the same institution, Istanbul Technical University. He was originally chemical engineer, however, through theoretical chemistry, applied mathematics, and computational science years he was mostly working on methodology for computational sciences and he is continuing to do so. He has a group


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(Group for Science and Methods of Computing) in Informatics Institute of Istanbul Technical University (he is the founder of this institute). He collaborated with the Prof. Herschel A. Rabitz's group at Princeton University (NJ, USA) at summer and winter semester breaks during the period 1985–2003 after his 14 months long postdoctoral visit to the same group in 1979–1980. Metin Demiralp has more than 90 papers in well known and prestigious scientific journals, and, more than 170 contributions to the proceedings of various international conferences. He gave many invited talks in various prestigious scientific meetings and academic institutions. He has a good scientific reputation in his country and he is one of the principal members of Turkish Academy of Sciences since 1994. He is also a member of European Mathematical Society and the chief–editor of WSEAS Transactions on Computers currently. He has also two important awards of turkish scientific establishments. The important recent foci in research areas of Metin Demiralp can be roughly listed as follows: Fluctuation Free Matrix Representations, High Dimensional Model Representations, Space Extension Methods, Data Processing via Multivariate Analytical Tools, Multivariate Numerical Integration via New Efficient Approaches, Matrix Decompositions, Multiway Array Decompositions, Enhanced Multivariate Product Representations, Quantum Optimal Control.



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## Plenary Lecture 1

# Improvement of Dynamical Stability for the Real Time Walking Robot Control

**Professor Luige Vladareanu**
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**Abstract:** Robust and stable real time control of walking robots in contact with objects in their environment is the basic requirement for achieving the tasks, according to requested applications. Interaction with the environment tried to be solved by Raibert, Craig (1981) and Manson (1980) by providing “hybrid control” in force and position, using decomposition into “position sub-space” and “force sub-space”. Compliant motion control, which is essentially the default force control based on position, was suggested by Lawrence (1987), Kazerooni (1990). Salisbury (1980) presented a method to actively controlling the apparent stiffness of the end-effector in Cartesian space. In a similar work, Hogan (1985), Karen (1986) introduced "impedance control", which seeks to establish a desired dynamic relationship between end-effectors' final position of the robot and the contact force. The article presents strategies for improvement of real-time dynamical stability control for a complex structure of hexapod walking robots with six degrees of freedom for each leg of which, three degrees of freedom for positioning and three degrees of freedom for orientation of the foot. Issues for direct and inverse kinematics of the structure of walking robots are analyzed, by determining the first three coordinates of the robot leg joints and by determination of the joint coordinates for the mechanism of orientation. By kinematic "decoupling" of the movement, a separation of positioning control from the orientation control in robot modeling show up. Linear invariants are studied to calculate the position and orientation of the leg support point to determine robot transfer matrix using the Olinde-Rodriques parameters. In terms of dynamic modeling for robot motion control, walking schemes and dynamic control phases are developed. The control system architecture for the dynamic walking robot is presented in correlation with the control strategy which contains many real time control loops: gait timing control which avoids instabilities on the robot motion at landing, damping control aims to eliminate the oscillations that occurs in the single support phase, ZMP compensation control consists in mathematical modeling of ZMP compensator through the spring-loaded inverted pendulums, rotation/advance platform control which allows the central position of the platform to move in the opposite direction, to the inclined transverse plane and control of tilt over the side of safety which prevents the fall of the walking robot in lateral directions, in case of moving on a bumpy field or external forces. In the end, it is designed a multi-microprocessor architecture with multi-tasking control that allows a fast feedback loop for real time robot control with improving stability and flexibility performance.

**Brief Biography of the Speaker:**
Luige Vladareanu received his M.Sc. degree in electronics from the Polytechnic Institute Bucharest, in 1977. From 1984, scientific researcher of the Institute of Physics and Material Technology, from 1990, team leader of data acquisition systems and real time control systems of the Institute of Solid Mechanics, from 1991, President General Manager of Engineering and Technology Industrial VTC Company. In 1998 he received Ph.D. degree in electronics field from the Institute of Solid Mechanics of Romanian Academy. From 2003, Ministry of Education and Research, executive Department for Financing Superior Education and of Scientific University Research - High Level Expert Consulting for MEC/CNCSIS project, from 2003-2005, member of Engineering Science Committee of Romanian National Research Council, from 2005, Scientific Researcher Gr.I (Professor) of Romanian Academy, from 2009 Head of Mechatronics Department of Institute of Solid Mechanics, Romanian Academy. His scientific work is focused on real time control in solid mechanics applied in robot trajectory control, hybrid position – force control, multi-microprocessor systems for robot control, acquisition and processing of experimental physical data, experimental methods and signal processing, nano-micro manipulators, semi-active control of mechanical system vibrations, semi-active control of magnetorheological dissipaters systems, complex industrial automations with programmable logical controllers in distributed and decentralized structure. He has published 4 books, over 20 book chapters, 11 edited books, over 200 papers in journals, proceedings and conferences in the areas. Director and coordinator of 7 grants of national research – development programs in the last 5 years, 15 invention patents, developing 17 advanced work methods resulting from applicative research activities and more then 60 research projects. In 1985 the Central Institute of Physics Bucharest awarded his research team a price for the first Romanian industrial painting robot. He



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is the winner of the two Prize and Gold of Excellence in Research 2000, SIR 2000, of the Romanian Government and the Agency for Science, Technology and Innovation. 9 International Invention and Innovation Competition Awards and Gold of World's Exhibition of Inventions, Geneva 2007 - 2009, and other 9 International Invention Awards and Gold of the Brussels, Zagreb, Bucharest International Exhibition. He received “Traian Vuia” (2006) award of the Romanian Academy, Romania's highest scientific research forum, for a group of scientific papers published in the real time control in the solid mechanics. He is team leader of two ANCS (Scientific Research National Agency) funded research projects: “Fundamental and Applied Researches for Position Control of HFPC MERO Walking Robots” from CNCSIS-Exploratory Researches Program and “Complex Modular Automation Systems for Technological Flux Control AUTMPG” from AMCSIT-Innovation Program. He is a member of the International Institute of Acoustics and Vibration (IIAV), Auburn University, USA (2006), ABI/s Research Board of Advisors, American Biographical Institute (2006), World Scientific and Engineering Academy Society, WSEAS (2005), International Association for Modelling and Simulation Techniques in Enterprises-AMSE, France (2004), National Research Council from Romania(2003-2005), etc. He is a PhD advisor in the field of mechanical engineering at the Romanian Academy. He was an organizer of several international conferences such as the General Chair of four WSEAS International Conferences (http://www.wseas.org/conferences/2008/romania/amta/index.html), chaired Plenary Lectures to Houston 2009, Harvard, Boston 2010 and Penang, Malaysia 2010 to the WSEAS International Conferences, is team leader of WSEAS scientific research project: Mechanics & Robotics Systems and is serving on various other conferences and academic societies.



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## Plenary Lecture 2

# Reinforcements Learning and Applications

**Professor Dana Simian**
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Romania
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**Abstract:** Stochastic learning automata represent control mechanisms which adapt to changes in their environment, based on a learning process. Reinforcement schemes generate the learning behavior of stochastic learning automata. The importance of stochastic learning automata is given by their great number of applications. The aim of this talk is to make an introduction in stochastic learning automata and to present many new reinforcement schemes. Experimental results prove superior performances for the new schemes we built. The new reinforcement schemes were used for developing a simulator for an Intelligent Vehicle Control System, in a multi-agent approach.

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

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## Plenary Lecture 3

# Multicast Active Probing Measurement Technique for Multimedia Networks

**Professor Tarek Saadawi**
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USA
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**Abstract:** Network resource measurement is a challenge for packet switched networks. Currently, many applications, such as video conferencing and streaming audio, require a guaranteed Quality of Service (QoS) to work properly. Ensuring minimum QoS to traffic flows and groups of flows become an important challenge to network designers. In such an environment, resource measurement algorithms are utilized to ensure that admittance of a new flow into a resource constrained network does not violate the service level agreements guaranteed by the network to admitted flows and at the same time to achieve high network utilization. There has been extensive research on network resource measurement techniques. One category is active probing where probing packets are injected into network to measure network resource, such as bottleneck link bandwidth, available bandwidth. In this presentation, we show how to extend unicast resource measurement techniques to multicast environment to estimate bottleneck link bandwidth. We show that path segment measurement is more suitable to multicast environment, more robust than full path measurement, and reduces error probability of estimating network resources. We also introduce a novel way to measure end-to-end queuing delay by using a pair of packets with different priorities. The approach is edge-based scheme. Measurements are made at each potential receiver at the network edge, and can be easily implemented in various networks. We have evaluated and compared various existing resource measurement approaches through a set of OPNET simulation experiments.

**Brief Biography of the Speaker:**
TAREK N. SAADAWI is a Professor of Electrical Engineering, City University of New York, City College and director of the Center of Information Networking and Telecommunications (CINT). He has published extensively in the area of mobile ad-hoc wireless networks and multimedia networking, and co-authored a text book “Fundamentals of Telecommunications Networks,” John Wiley and Sons, 1994. He’s organizing and chairing the forthcoming conference on Cyber Infrastrucuture Protection (CIP), June 8-9. 2011, www.ccny.cuny.edu/cip He is a former Chairman of IEEE Computer Society of New York City, received IEEE Region 1 Award, and is a co-founder of IEEE Symposium on Computers and Communications (which is in its 15th series, www.comosoc.org/iscc ). Dr Saadawi and has been invited and joined US Dept of Commerce Delegation to the Government of Algeria to address rural communications. He also led a group of US experts to provide a telecommunications master plan for the Government of Egypt under US AID funding. Dr. Saadawi is a Member of the Consortium Management Committee for the Army Research Lab (ARL) Consortium on communications and networks; known as the Collaborative Technology Alliances on Communications and Networks.



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