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MATHEMATICAL & COMPUTATIONAL METHODS

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Proceedings of the 11th WSEAS International Conference on MATHEMATICAL and COMPUTATIONAL METHODS in SCIENCE and ENGINEERING (MACMESE '09)

Baltimore, USA, November 7-9, 2009

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Preface

This year the 11th WSEAS International Conference on MATHEMATICAL and COMPUTATIONAL METHODS in SCIENCE and ENGINEERING (MACMESE '09) was held in the Morgan State University, Baltimore, USA, November 7-9, 2009. The conference remains faithful to its original idea of providing a platform to discuss new mathematical methods and computational techniques in mechanical engineering, civil engineering, environmental science and engineering, naval engineering, marine and ocean engineering etc. with participants from all over the world, both from academia and from industry.

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

The accepted papers of this conference are published in this Book that will be indexed by ISI. Please, check it: www.worldses.org/indexes as well as in the CD-ROM Proceedings. They will be also available in the E-Library of the WSEAS. The best papers will be also promoted in many Journals for further evaluation.

A Conference such as this can only succeed as a team effort, so the Editors want to thank the International Scientific Committee and the Reviewers for their excellent work in reviewing the papers as well as their invaluable input and advice.

The Editors

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Plenary Lecture 1

Exact Responses of Nonlinear Systems under Nonstationary Random Excitations

Professor C. W. Solomon To
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Abstract: The developments of jet and rocket propulsion systems have introduced problems in mechanical and structural vibrations since the 1940's. The intensive pressure fields produced by these systems can only be analyzed statistically because of their irregular time histories. In parallel, many modern structural systems such as tall buildings, structures that house nuclear reactors, naval undersea and surface systems must be designed to withstand various natural and man-made intensive loadings that have to be treated as nonstationary random processes. The intensive random excitations include earthquake loadings, pressure waves of explosions, continuous atmospheric turbulences, and extreme ocean waves. Owing to the high intensities of these loadings, linear analytical techniques can not be employed in this class of mechanical and structural vibration problems. Thus, over the years much efforts have been exerted by many researchers on providing analytical techniques in dealing with the aforementioned class of problems.

It is interesting to point out that to-date no exact solution seems to be available to systems with nonlinearities involving velocity as well as displacement and under nonstationary random excitation. Of course, there are various approximate techniques presented in the literature. The main objective of this paper is, however, to present a method for determining exact responses of nonlinear systems under nonstationary random excitations. For demonstration of the simplicity as well as correctness of the method, the van der Pol-Duffing oscillator under a nonstationary random excitation that is treated as a time modulated zero mean Gaussian white noise process is included in this presentation. Selected computed results are provided and compared with those generated by the Monte Carlo simulation algorithm. It is concluded that for the first time a simple method is available to provide exact solutions of general nonlinear systems with nonlinearities involving velocity as well as displacement and under nonstationary random excitations.

Brief Biography of the Speaker:

Dr. To obtained his doctoral degree in sound and vibration studies from the University of Southampton in April 1980. He is currently a professor in the Department of Mechanical Engineering at the University of Nebraska (UNL). Prior to joining UNL he was a professor (1994-96) and an associate professor (1986-94) at the University of Western Ontario. He was an associate professor (1985-86) and an assistant professor (1982-85) at the University of Calgary. Between 1982 and 1992 he was a University Research Fellow of the Natural Sciences and Engineering Research Council, Canada. He was a Research Fellow at the Institute of Sound and Vibration Research (ISVR), University of Southampton during his doctoral degree studies. After his doctoral degree studies he worked briefly in the Wolfson Unit of the ISVR on machinery noise and vibration problems of drop hammers, and vibration diagnostics in helicopters of the Royal Navy before moving to the University of Calgary. His main academic interests are in nonlinear stochastic structural dynamics, nonlinear finite element analysis with particular reference to laminated composite plates and shells, nonlinear dynamics and control, and mechanics of carbon nano-tubes.

Plenary Lecture 2

Analytical Synthesis Method - A New Mathematical Design Method for the Analog Circuit Design

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Abstract: Analytical Synthesis Method (ASM) has been presented in several papers published in the IEEE Transactions on Circuits and Systems since 2003. It is one of the powerful design methods in the field of analog circuit design. It is the method using a succession of innovative algebra manipulation operations to decompose a complicated transfer function representing the relationship between the output and the input signals of a design project into many simple equations feasible by using the corresponding simple sub-circuitries. The simple sub-circuitries can be constructed by the desired configuration of the element such as the single-ended-input operational transconductance amplifiers (OTAs) and the grounded capacitors, both of which are used for absorbing and reducing the shunt parasitic capacitance and lead to have more precise output responses. In addition to this, the ASM can control the number of the terms in the complicated decomposition process such that the number of both active and passive components used in the circuit is the least compared to the previously reported ones. Then, the ASM is the only one method which can simultaneously achieve the three important criteria for the design of OTA-C circuits without trade-off.

Due to the flexibility of the ASM, the simple sub-circuitries used in the circuit design can be changed and chosen according to different necessities for the target of the circuit design. For example, if the reduction of the number of the active and passive components used in the circuit is more important than the type of the element configurations like single-ended-input/differential-input OTAs and grounded/floating capacitors due to the consideration about power consumption, chip area, noise, and total parasitics……, etc., the minimum component OTA-C circuit can also be investigated and developed successfully using the ASMs. The fully flexible characteristic and the real demonstration in the literature of the ASM may make it be one of the most prospective methods in the field of analog circuit design in the near future.

Brief Biography of the Speaker:

Chun-Ming Chang received the B.S.E.E. and M.S.E.E. degrees from National Cheng Kung University, Tainan, Taiwan, R. O. C. in 1975 and 1977, respectively, and the Ph.D. degree from the University of Southampton, Southampton, U.K., in 2004.

In 1979, he joined the Department of Electrical Engineering, Taipei Institute of Technology, Taipei, Taiwan, R. O. C., as a Lecturer. After one year, he transferred to the Department of Electronic Engineering, Fu Jen Catholic University, Taipei Hsien, Taiwan, R.O.C. In 1982, he joined the Department of Electrical Engineering, Chung Yuan Christian University, Chung-Li, Taiwan, R.O.C., where he became an Associate Professor and a Full Professor in 1985 and 1991, respectively. He is currently a Professor of Electrical Engineering and leader of the Electronic Circuits Group in the Department of Electrical Engineering, Chung Yuan Christian University. He is also a departmental teacher promotion committee member and a college teacher promotion committee member. He was the chairman of the Department of Electrical Engineering of Chung Yuan Christian University from 1995 to 1999. His research interests are divided into two parts: network synthesis and analog circuit design before and after 1991, respectively. The improvement for the approach technique to factorize a paramount matrix used in network synthesis and proposed by Professor I. Cederbaum let him be promoted to a Full Professor in 1991. He has published over 70 SCI papers, in which the most famous is the invention of a new analytical synthesis method for the design of analog circuits which can, for the first time, simultaneously achieve three important criteria for the design of OTA-C filters without trade-offs. Using a succession of innovative algebra manipulation operations, a complicated nth-order transfer function can be decomposed into a set of simple equations feasible using the single-ended-input OTAs and grounded capacitors. Several IEEE Transaction papers on Circuits and Systems with analytical synthesis method have been published in the literature since 2003. Recently, he was invited as the Plenary Speaker of the (i) 7th WSEAS International

Conference on Instrumentation, Measurement, Circuits and Systems (IMCAS '08), Hangzhou China, April 6-8, 2008; (ii) 8th WSEAS International Conference on Electronics, Hardware, Wireless and Optical Communications (EHAC'09), University of Cambridge, UK, February 21-23, 2009; and (iii) 11th WSEAS International Conference on Mathematical and Computational Methods in Science and Engineering (MACMESE'09), Baltimore USA, November 7-9, 2009. He is in the process of writing his professional textbook: "Analog Circuit Design---Analytical Synthesis Method".

Prof. Chang is a senior member of the IEEE Circuits and Systems Society.

Plenary Lecture 3

On the Problem of Packing Trees in Graphs

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Abstract:

We are concerned with undirected graphs $G = (V, E)$ with distinguished set of vertices $K \subseteq V$, $|K| \geq 2$, called terminal vertices. A K-Steiner tree T of G is a minimal tree with respect to the number of edges, containing all the vertices of K. The K-edge connectivity of a connected graph G with terminal vertices K, and denoted as $\lambda_K(G)$, is the minimum number of edges whose removal disconnect at least two vertices of K in G.

In this talk, we will investigate the relationship between the maximum number of edge-disjoint K-Steiner trees and the K-edge-connectivity of a graph G. This problem, known as the ***Steiner Tree Packing Problem*** (STPP), it has attracted considerable attention from researchers in different areas because of its wide applicability as for example in the design of VLSI circuits.

In 2003, the EGRES combinatorial group of the Hungarian Academy of Sciences conjectured that any graph $G = (V, E)$ with arbitrary set of terminal vertices $K \subseteq V$, $|K| \geq 2$, contains at least $\lfloor \lambda_K(G)/2 \rfloor$ edge-disjoint K-Steiner trees.

With regard to this conjecture, we will give a summary of results obtained up until now and we also present new results and conjectures.

Brief Biography of the Speaker:

Dr. Louis Petingi obtained his Ph.D. in Computer Science in 1991 from Stevens Institute of Technology (New Jersey, USA) in the fields of Extremal Graph Theory and Network Reliability. He is currently a Professor of Computer Science at the College of Staten Island (City University of New York). He has recently introduced a new network reliability measure, the Diameter-Constrained Network Reliability (DCR) that determines the probability that a communication network meet delay constraints among a set of participating nodes, given that the set of edges fail independently with known probabilities. Classical network reliability models are based on the existence of end-to-end paths between network nodes, not taking into account the length of these paths. For many applications this is inadequate because the connection will only be established or attain the required quality if the distance between the participating nodes does not exceed a given value (e.g., broadcasting, wireless networks). The DCR of a communication network not only considers the underlying topology, but it also imposes a bound on the diameter, which is the maximum distance between the nodes of the network.

With respect to optimization problems in Graph Theory, Dr. Petingi has achieved international recognition for introducing new techniques to characterize graphs with maximum number of spanning trees among competing topologies with equal number of vertices and edges. This problem has been tackled without much success by many well-known Graph Theorists since the 1960's because of its applicability in the design of reliable networks.

Dr, Petingi is a permanent faculty member of City University of New York Graduate Center and he has obtained several research grants. He is a member of the ACM, and the New York Academy of Sciences.

Plenary Lecture 4

Nonlinear Boundary Value Problem of the Meniscus for the Capillarity Problems in Crystal Growth Processes

Associate Professor Liliana Braescu
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Faculty of Mathematics and Computer Science
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Abstract: The major problem to which crystal growth researchers have been confronted was the development of techniques capable to monitor and control the external shape of melt-grown crystals, and simultaneously to improve the crystal structures. In many crystal growth processes, the shape and the dimensions of the crystal are determined by the liquid meniscus and by the heat transfer at the melt-crystal interface. In addition, the meniscus is also of great practical use for techniques of diameter control: in the weighing method the weight of the melt enclosed by the meniscus appears as an essential parameter; when using video observation the crystal diameter and the interface height have to be measured exactly.
In order to understand the process which leads to a crystal with a constant radius, the static stability of menisci is analyzed. For this aim, starting from the Young-Laplace equation of a capillary surface in equilibrium in the presence of gas pressure, the corresponding nonlinear boundary value problems (BVP) having boundary conditions depending on the chosen configuration are considered. The menisci are computed, and the conditions for which solutions of BVP minimize the total energy functional of the melt column are searched. Necessary or sufficient conditions for the existence of the statically stable convex (or concave, convex-concave, concave-convex) solutions of the considered BVP are established, and numerical illustrations are performed for different configurations of the crystal growth processes.

Brief Biography of the Speaker:
LILIANA BRAESCU obtained her PhD in Mathematics in 2002, and is currently an Associate Professor at the Faculty of Mathematics and Computer Science of the West University of Timisoara, Romania.
Her research interests include control theory, ordinary and partial differential equations, stability and domains of attractions with applicability in modelling of the crystal growth processes, blood coagulation, and dental endosteal implantation. The research accomplishments are reflected through publications in an authored book (Nova Scientific Publishers), 6 chapters in books (Cambridge Scientific Publishers, Wiley & Sons and Springer), 26 peer-reviewed journal articles (Journal of Crystal Growth, Materials Science and Engineering B, Journal of Colloid and Interface Sciences, Optical Materials, International Journal of Theoretical Physics, Nonlinear Studies, Computational Materials Science), and scientific communications at international conferences including the International Workshop in Modeling in Crystal Growth, International Conference on Crystal Growth, European Materials Research Society, International Conference on Nonlinear Problems in Aviation and Aerospace, various conferences of the Society of Photo-Optical Instrumentation Engineers and World Scientific and Engineering Academy and Society.
Liliana Braescu is a member of the following professional societes and organizations: Society of Photo-Optical Instrumentation Engineers (SPIE), European Materials Research Society (E-MRS), World Scientific and Engineering Academy and Society (WSEAS), Sigma Xi, AdAstra Association – Romanian Scientific Community, and Romanian Mathematical Society.

Plenary Lecture 5

Application of the Self Organizing Maps to Biometric Authentication using Behavior Characteristics

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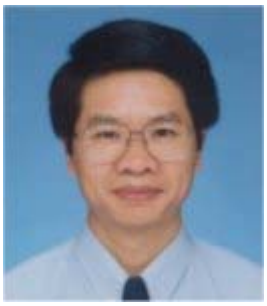
Plenary Lecture 6

A Weakened Weak (W2) Formulation for Certified Solutions with Bounds, Real-Time Computation and Inverse Analysis of Biomechanics Problems



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Abstract: This paper introduces first a weakened weakform (W2) using a generalized gradient smoothing technique for an unified formulation of a wide class of compatible and incompatible displacement methods including settings of the finite element methods (FEM) and meshfree methods of special properties including the upper bound properties. A G space is first defined to include discontinuous functions allowing the use of much more types of methods/techniques to create shape functions for numerical models; Properties and a set of important inequalities for G spaces are then proven in theory and analyzed in detail. We prove that the numerical methods developed based on the W2 formulation will be spatially stable, and convergent to exact solutions. We then present examples of some of the possible W2 models, and show the major properties of these models: 1) it is variationally consistent in a conventional sense, if the solution is sought in a H space (compatible cases); 2) it passes the standard patch test when the solution is sought in a G space with discontinuous functions (incompatible cases); 3) the stiffness of the discretized model is reduced compared to the FEM model and even the exact model, allowing us to obtain upper bound solutions with respect to both the FEM and the exact solutions; 4) the W2 models are less sensitive to the quality of the mesh, and triangular meshes can be used without any accuracy problems. These properties and theories have been confirmed numerically via examples solved using a number of W2 models including compatible and incompatible cases.
An NS-PIM model is then used to establish a real-time computation procedure based on the reduced basis approximation. The real-time computation model is then used to inversely identify the interface property of a dental implant system.

Plenary Lecture 7

Is Ethnic Counting, a Primitive Mathematical Method, a Major Fundamental in Babylonian Culture, and how does Primitive, Now Children's Counting Habits, Reflect in Contemporary Societies?

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Abstract: This plenary speech is meant to become a follow-up to “All-Fo(u)r or Fo(u)r-all. Why twelve ? Duodecimal systems in music and society” by me, Anker Fjeld Simonsen, AMTA'09 in the Czech Republic, which can be read like normal WSEAS books can, on librarys and so on. AS well I'll from May 1. 2009 make a website on HYPERLINK "http://www.anker-fjeld.se/"www.anker-fjeld.se for essays written in English. Here also comments can be written. The essay has the form of a hypothesis about the Assyrian-Babylonian world, the first 4 chapters of Genesis (written 500 b.C.) and the 4-all music, which is defined as the rhythmical 20ieth music, that started its dominance in 1920-er USA with upcoming of technique.
4-all is however before that an ethnic (and all-time-and-place-human) way for counting on fingers, that easy leads to the numbers twelve and fourteen, an alternative to counting 5,10.etc. on hands and feet. The combination of these ways of counting creates the Babylonian positional 60 base number system, as well as the 6 + 1 notion: the week. The logic of the numbers points to summation of ways of counting in ethnic tribes, an anthropomorph basis for the Babylonian Culture, but which research has been and can be done in the development of culture, before and after Babylon, and what impact did the Jews, Genesis, the Babylonian tower and the Babylonian prisonship have ? In the year to come I intend to become more clear about how research in the fields of assyriology, old testament and jewish theology, ethnomusicology and ethnology, especially number theory and its mystical and practical significance in ancient society, the development of the “4-all” rhythmic musical system in the ghettoes of USA and other issues, and hope to form an international or local research group that will develop the issues presented in “All-Fo(u)r or Fo(u)r-All”. In it self this theme is interesting for every man and woman. Why is life not only work, fornification and kids ? Why cults and religion ? Or music ? The 150 years birthday of Charles Darwin's “On the origin of species by means of natural selection or the preservation of favoured races in the struggle for life “ only emphasizes the specific nature of homo erectus and his history. This is only a small philosophical contribution, that you are invited to take part in.

Brief Biography of the Speaker:
Anker Fjeld Simonsen (b. 1944). As a teenager I easyly passed examens and won music competitions, and was driven by curiosity, rather than endeavour for a position in society in my studies of state and music science, while I passed examens in piano playing and music teaching at the Royal Academy in Copenhagen. 1966 – 79 I worked eagerly as a classical musician and music teacher, but an incident in a peace action in a ghetto in Copenhagen 1979 implied big social, physical and psychical problems in my life with no way back in society. In periods of order, in Poland, the Netherlands and at electronic music studios in Denmark, I worked wholeheartedly on music, but mentally I had to compensate in non-ordered periods with translations of dialectic philosophy (from 1986) and other philosophical studies. From 1999 on I in the Netherlands and France dedicated my life to autodidact studies of philosophy, specially music philosophy, and do it still. Upon return from the Netherlands I in 2004 had another incident with Danish authorities, this time upon violation of my constitutional rights as a Danish citizen. I migrated to Sweden. My artistic production consists of poetry, short stories, electronic music, tape theatre, chamber music, and most recently philosophical essays. The beauty of this essay has been the mere deduction from numbers in the Mesopotamian world, Genesis and the 4-all structure of popular American music. What is wrong? What is right? What is well known?

Plenary Lecture 8

The Material Point Method in Large Strain Problems

Professor Zdzislaw Wieckowski
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Abstract: Large strain problems of mechanics like plastic forming or granular flow problems are still difficult to solve although many well-developed computational techniques are available. Some of these techniques are not efficient in the case of problems where large strains appear. For example, the finite element method when formulated in the pure Lagrangian format fails due to large distortions of the element mesh used. On the other hand, the finite element method is not effective in the case of free surface problems when formulated in the purely Eulerian format. Point-based methods, also known as meshless methods, which have been intensely studied recently, can handle problems with large strains efficiently. Among other point-based methods, the material point method (MPM), shows its effectiveness in analyses of large strain problems. The material point method can be regarded as an arbitrary Lagrangian-Eulerian (ALE) formulation of the finite element method. The computational element mesh of the Eulerian type used in MPM can be defined in an arbitrary way which means that the problem of excessive mesh distortions is avoided. The results of analyses related to problems of plastic forming, geomechanics and granular flow will be shown.

Brief Biography of the Speaker:
Address: Chair of Mechanics of Materials, Technical University of Lodz, Al. Politechniki 6, 90-924 Lodz, Poland, e-mail: zwi@p.lodz.pl.
Education:
1974-1979: Technical University of Lodz, Department of Civil and Architectural Engineering, M.Sc. in civil engineering.
1987: Ph.D. Thesis: Duality in finite element method and its applications to some linear and non-linear problems of mechanics of composite materials, Technical University of Lodz.
2000: Dr.Sc. Thesis (Habilitation Thesis): Application of the finite element method to some non-linear problems of solid mechanics. Technical University of Lodz.
Professional experience:
1979-2009: Technical University of Lodz, Lodz, Poland. Current position: Associate Professor, Head of Chair of Mechanics of Materials, Technical University of Lodz, Poland.
1992-1994: Visiting Researcher, Division of Structural Mechanics, Lulea University of Technology, Lulea, Sweden.
1997-1998: Post-doctoral Fellow, Department of Mechanical Engineering, Korea Advanced Institute of Science and Technology, Daejon, Republic of Korea.
09-10.2004: Visiting Professor, Department of Mechanical Engineering, Korea Advanced Institute of Science and Technology, Daejon, Republic of Korea.
2006-2008: Visiting Professor, several 3-week visits, Institute of Geotechnical Engineering, University of Stuttgart, Germany.
Research areas:
Computational methods in mechanics especially the finite element method; equilibrium model of the finite element method; material point method (arbitrary Lagrangian-Eulerian formulation of the finite element method); theory of plasticity and viscoplasticity; mechanics of composite materials; finite element modelling of motion of granular material in a silo; large strain engineering problems; a posteriori error estimation for approximate solutions to boundary value problems of mechanics; gradient and stress fields recovery.

Plenary Lecture 9

Economic Development and Sustainability: New Models and Perspectives

Professor Massimiliano Ferrara
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Abstract: In this paper, we study the neoclassical Solow-Swan model where the natural capital is introduced as a factor of production and modeled as a renewable resource. In contrast with the standard literature, the labor growth rate is assumed to be non constant over time. In this framework, we investigate the conditions under which the economy may be sustainable or unsustainable in the long run, we derive the set of sustainable marginal propensity to consume for any given tax rate, we determine the nature of the non-trivial steady states of the economy. In this framework some new models are introduced to analyse some economic aspects belong to the economic growth theory and the relationship with the environment.

Brief Biography of the Speaker:
MASSIMILIANO FERRARA, was born in Pisa (Italy) on June 8, 1972. He graduated in 1995 in Economics at the University of Messina with academic honors. In 2001 follows the title of Ph.D. with academic honors in "Tools for Mathematical Economics and Finance". Professor in "mathematical methods for the economical, financial and actuarial sciences." since 2002. Chief of the Chairs of Mathematical Economics and Economic Statistics at the Faculty of Law - Economics Degree - Mediterranean University of Reggio Calabria since 2007. Professor in the degree course on European Economics at the Faculty of Political Science, University of Milan, where he also is Professor of Decision Theory on the Master by title “Marketing Intelligence and Data Analysis”. Head of the Economics Degree of the Mediterranean University of Reggio Calabria. Invited Speaker by American Mathematical Society (Western Michigan University, USA) and Calcutta Mathematical Society, INDIA and Visiting Professor at the Lomonosov Moscow State University (Department of Mathematics), the New Jersey Institute of Technology in NewArk (NJ) (USA), (Department of Mathematical Sciences), the Eotvos Lorand University of Budapest (Department of Atomic Physics, Faculty of Sciences), Politehnica of Bucharest (Department of Mathematics). Author of 74 publications on international journals many of them "high impact Scientific International (ISI)” and 4 monographs. His biography is inserted, finding scientific merit in the international collections Who's Who in the world 2006, 2007 and 2008 published by Marquis (since 1899) in the United States, in the collection 2000 Outstanding Intellectuals of the 21st century (years 2006 and 2007), in turn, published by the Biographical Centre, University of Cambridge, England and the prestigious collection Accomplished International Profiles of Leaders, published by American Biographical Institute, Inc. (Year 2008). He has lectured on invitation at the Lomonosov Moscow State University, University of Budapest, University of Hagen, Politehnica of Bucharest, University "Ovidius" Costanza, Bocconi University of Milan, University of Milan. Member of Accademia Peloritana dei Pericolanti (2003-current), Member of the Balkan Society of Geometers (2003- current), Member of the Scientific SET - Advances Center for Studies on Economic Theory - (Center for Advanced Studies Theoretical Economics) at the University of Milan Bicocca (2005-current), Member of the Mathematical Association of America (2007-current), Member of the SIEP (Societa italiana di Economia Pubblica) (2008-current),. Scientific Coordinator of international projects financed by the Ministry of Foreign Affairs: The Executive Programme of scientific and techonological cooperation between Italy and Romania during 2006- 2008 and of the Executive Programme of scientific and techonological cooperation between Italy and Estonia during 2005-2007. Editor and referree of several International Journals. Official Reviewer of Mathematical Reviews (MathSciNet), Division of the American Mathematical Society and Zentralblatt MATH, reviews scientific journal published by the European Mathematical Society, the Heidelberg Academy of Sciences and Fachinformationszentrum Karlshruhe.

Plenary Lecture 10

Applied Engineering on Biosystems

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Abstract: In the last few years the advances done in the fields of Mathematics, Engineering and Computer Science have enabled an inter-relationship and a multitude of techniques of varied disciplines; out of which one can point out the automation in the resolution of processes in several areas. Particularly, the area of Biosystems has been receiving more and more importance every year in the activities either related to human health, or related to the environment. Computational simulation techniques applied to mathematical models of epidemiology, immunology, infectionology and public health have been updated and improved with the use of new contemporary tools such as neural networks, genetic algorithms, fuzzy logics and digital controllers.
With respect to the environment, the growing discussions about the global warming has allowed and also opened some space for the introduction and the adaptation of mathematical and computational models in Biosystems for simulating possible scenarios, for the strategic investment analysis and also for the process optimization. Here it is shown some examples where there is an alliance between new technologies and the recent year's theoretic mathematical development in order to get an exchange of new experiences that will produce an extensive debate and the establishment of ideas in the domain of Biosystems worldwide.

Brief Biography of the Speaker:
Professor Felippe de Souza has concluded his PhD in Engineering at University of Warwick, England, UK, in 1983. He is the Editor of 3 books in the area of Control Systems and Automatic Control; he has been the Vice-President of SBA (Brazilian Society for Automatic Control, the NMO of IFAC in Brazil) from 1987 to 1989; and also the Vice-President of APCA (Portuguese Association for Automatic Control, the NMO of IFAC in Portugal) from 2004 to 2008. He has also been the Head of the Dept of Control & Energy Conversion, Electronics Division at ITA (Aeronautic Institute of Technology, in Brazil) from 1988 to 1989 and, at UBI (University Beira Interior, in Portugal) where he currently holds a position, he has been the Head of the Dept of Electromechanical Engineering, the Head of the Scientific Council of the Faculty of Engineering and Member of the Senate.
Professor Felippe de Souza has over 90 papers published in Journals and International Conferences; has been a regular referee of papers for several International Journals; and he has been visiting Professor for short periods, and also given Mini-courses, in the following American Universities: USC, University of Southern California (1990), UCLA, University of California at Los Angeles (1990 and 1992), Virginia Tech (1990 and 1992) and University of Maryland, Baltimore (1986 and 1992); and also, in France, for one year, at LAAS, Laboratoire d'Analyse et d'Architecture des Systemes, in Toulouse (2002-2003).