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Mathematical Models & Methods in Applied Sciences

- Proceedings of the 13th WSEAS International Conference on Mathematics and Computers in Biology and Chemistry (MCBC '12)
- Proceedings of the 13th WSEAS International Conference on Mathematics and Computers in Business and Economics (MCBE '12)

"G. Enescu" University, Iasi, Romania, June 13-15, 2012

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Preface

This year the 13th WSEAS International Conference on Mathematics and Computers in Biology and Chemistry (MCBC '12) and the 13th WSEAS International Conference on Mathematics and Computers in Business and Economics (MCBE '12) were held at "G. Enescu" University, Iasi, Romania, June 13-15, 2012. The conferences provided a platform to discuss molecular dynamics, bioinformatics, signal transduction, bioengineering, chemical engineering, economic systems, business management, financial accounting, risk management and risk analysis, digital marketing, business law, labor economics, international trade, banking sector etc. with participants from all over the world, both from academia and from industry.

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

The accepted papers of these conferences are published in this Book that will be sent to international indexes. They will be also available in the E-Library of the WSEAS. Extended versions of the best papers will be promoted to many Journals for further evaluation.

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

The Editors

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Keynote Lecture 1

Solving Initial Value Problems of Multivariable Parabolic Systems via Expectation Values: Probabilistic Evolution, Exactness and Approximants

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Abstract: There is an abundancy of systems characterized by parabolic PDEs in science and engineering, especially in chemistry and physics. These systems have a scalar variable, we generally call time, defining the evolution of the system under consideration. The governing equation(s) involves the unknown(s) and their first order partial derivative(s) with respect to this variable. Time variant Schrodinger equations where the unknown is the wavefunction which is responsible for the probability density for the system and Liouville equations for the statistical mechanics where the unknown is somehow responsible for a density in the systems' phase space (here we use the plurality since both case may differ from Hamiltonian to Hamiltonian). Certain PDE(s), depending on so-called spatial coordinates, govern the behavior of the system in these and similar cases even though the
partial differential equation nature is not necessarily needed. Hence we give the following equation for more abstractioning

$$i\frac{\partial\psi(t)}{\partial t} = \widehat{\mathcal{L}}\psi(t) \qquad (1)$$

where we call the unknown entity ψ(t) "wavefunction" by following the quantum mechanical tradition despite ψ(t) need not be a true function. It may be anything like vector, matrix, function, or, operator as long as it lies in an appropriately defined Hilbert space. In this sense it has the abstract meaning "vector" (but not necessarily a Cartesian vector). L stands for a linear operator (which is not necessarily a partial differential operator) mapping from the Hilbert space, where ψ(t) lies, to the same space. Even though it is not explicitly shown here the system is characterized by certain operators we call "System Operators" like the positions and momenta in the case of quantum mechanics. We denote these operators by s1,...,sn or in a shorthand notation s. One way to solve the equation in (1) is to find the vector ψ(t) which may be not so technically easy as its first glance appearence implies even when b L does not explictly depend on t. This autonomy is not so much greater limitation since it can be provided for us even (1) is nonautonomous at the expense of extending the space spanned by ψ(t) to a higher dimension. The second possibility is the utilization of the expectation values of the system operator s and its outer powers. This excludes the determination of ψ(t) but necessitates the evaluation of the expectation values for all nonnegative outer powers of the state operator. A vector ODE is constructed for each outer power of the state vector by
using (1). However, the action of the commutator with L on each outer power is required. By following the general property encountered in the traditional cases we represent these actions in terms of certain Taylor expansion in outer powers of the state operator. Thus we arrive at an infinite set of ODEs with an infinite constant coefficient matrix we call "Evolution Matrix". The formal solution of this set of ODEs can be obtained in terms of a time variant exponential matrix over the Evolution Matrix and the initial value vector. Talk focuses on certain details of these and some related ıssues.

Brief Biography of the Speaker: Metin Demiralp was born in Turkiye (Turkey) on 4 May 1948. His education from elementary school to university was entirely in Turkey. He got his BS, MS degrees and PhD from the same institution, ÿIstanbul Technical University. He was originally chemical engineer, however, through theoretical chemistry, applied mathematics, and computational science years he was mostly working on methodology for computational sciences and he is continuing to do so. He has a group (Group for Science and Methods of Computing) in Informatics Institute of ÿIstanbul 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 month long postdoctoral visit to the same group in 1979–1980. He was also (and still is) in collaboration with a neuroscience group at the Psychology Department in the University of Michigan at Ann Arbour in last three years (with certain publications in journals and proceedings).
Metin Demiralp has more than 90 papers in well known and prestigious scientific journals, and, more than 200 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. 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: Probabilistic Evolution Method in Explicit ODE Solutions and in Quantum and Liouville Mechanics, Fluctuation Expansions in 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

Limiting Behaviour of a SIS Epidemic Model with Environmental Stochasticity

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Abstract: In this talk we extend the classical SIS (susceptible-infected-susceptible) epidemic model from a deterministic one to a stochastic one and formulate it as a stochastic differential equation (SDE) for I(t), the number of infectious individuals at time t. An SIS model is an epidemic model in which a typical individual starts off as susceptible, at some stage catches the disease and after an infectious period becomes susceptible again. Such models are often used for sexually transmitted diseases such as gonorrhoea, or bacterial diseases such as pneumococcus. We survey some relevant deterministic and stochastic models in the literature. We then formulate our basic model. The stochasticity is introduced as a Brownian motion in the disease transmission coefficient (equivalently in the contact rate of infected individuals). This models the effect of random environmental variation. After deriving the SDE for the spread of the disease we then prove that this SDE has a unique positive solution.
For the deterministic model classical results show that there is a unique threshold value R0D, the deterministic basic reproduction number, such that if R0D is less than or equal to one then the disease will die out and if R0D exceeds one then the disease tends to a unique endemic equilibrium. We show that for the stochastic model there is a smaller threshold value R0S and provided that a condition involving the variance of the stochastic noise is satisfied then the disease will die out almost surely (a.s.) for R0S<1. We conjecture that in fact the variance condition is not necessary. If R0S>1 then we show that the disease will fluctuate about a strictly positive level a.s. We discuss the connection between some limiting values of the stochastic threshold R0S and the deterministic threshold R0D. We then show that if R0S>1 the SDE SIS model has a unique non-zero stationary distribution and derive expressions for the mean and variance of this stationary distribution.
All the theoretical results are illustrated and confirmed by numerical simulations. We finish by discussing two real-life examples: first gonorrhoea amongst homosexuals and second pneumococcus amongst Scottish children under two years old.

Brief Biography of the Speaker: David Greenhalgh graduated from Cambridge University, Cambridge, UK, in 1980 with a First Class Honours degree in Mathematics. In 1981 he took Part III Mathematics also at Cambridge University in which he gained a distinction. He remained at Cambridge for his PhD in Operational Research which he completed in 1984. His PhD thesis was entitled 'Stochastic Models for Control of Epidemics'.
From Cambridge he moved to the Department of Pure and Applied Biology at Imperial College, London, UK, where he was awarded a Medical Research Council (MRC) Research Training Fellowship to work with Professor R. M. Anderson FRS, a leading international expert on epidemiology. He moved to the Department of Mathematics, Strathclyde University, Glasgow, UK in 1986 as a Lecturer. Since then he has been promoted to Senior Lecturer in 1997 and Reader in 2003. He currently holds the position of Reader in the recently formed Department of Mathematics and Statistics at Strathclyde University.
Dr. Greenhalgh has research interests in mathematical biology and epidemiology. He is an international expert in mathematical epidemiology and has around thirty years experience in this area. He has collaborated with world leading researchers in mathematics and epidemiology such as Professor Klaus Dietz (Germany), Professor Odo Diekmann (The Netherlands), Professor Istvan Gyori (Hungary) and Professor Xuerong Mao (Scotland). He has published around eighty papers in international refereed journals, seven book articles and over seventy conference papers. He is on the editorial board of fourteen international journals, two as Associate Editor. He has served, and currently still serves, on the UK Engineering and Physical Sciences (EPSRC) Mathematics Peer Review College and has served on many UK MRC Panels. These are two of the most prestigious grant giving bodies in the UK. He has also been awarded substantial research funding from a diverse range of sources. He has supervised seventeen research students, fifteen at PhD level. He is widely involved in the organisation of international conferences and has given over thirty invited talks, including plenary talks, at international meetings.

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Plenary Lecture 2

Partial differential equations in biosubstance crystalization

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Abstract: A new perspective for predicative care in living organism will be presented. The purpose of this lecture to develop a complementary approach to measuring ones, based on mathematical tool. A complex functions with partial differential equations have been applied for autonomous behaviour of biocrystal growth consideration. Design of functional complex system has been illustrated using the associated projections with a set of properties. The distribution function specifies spatial coordinates and set of properties. The biosubstance crystals formation has been considered and their distribution function was derived. Behaviour function of crystal growth and designing granulation has been examined. Crystals population in a perfectly mixed volume with product removal and without product removal has been considered. A distribution function of the complex structure can be defined with geometric velocities, and time rate of change properties. The method involving the general balance with correspond to the integral formulation. The mathematical model which taking a distribution function of crystal properties can generate evolutionary algorithm for design of complex structure. This model has been applied to indicate crystal structure formation of an enzyme and an amino acid. These results have been illustrated power of the new complex model for crystal particles birth and death simulation. Simulation has been performed in dynamic and steady state operation under variable loading conditions.

Brief Biography of the Speaker: Jelenka Savkovic-Stevanovic is a full professor at the University of Belgrade, Faculty of Technology and Metallurgy, Serbia. Education: B.Sc. and M.Sc. degree, Faculty of Technology and Metallurgy, University of Belgrade, PhD University of Belgrade and Technical University of Berlin. At the Faculty of Technology and Metallurgy was elected for assistant 1971st, docent 1982nd, associate professoe 1988th, and full professor 1993rd. She has worked in U.S.A. from 1994 to 1998.
Her research interests include Chemical systems, Biochemical systems, Chemical engineering, Process system engineering, Modelling, Analysis, Synthesis, Design, Optimization; Advanced numerical methods, Data base, Expert systems, Learning Systems; Informatics; Artificial Intelligence, Neural Networks and Fuzzy Systems; Biosystems, Biomedicine, Bioinformatics and Biomedical informatics, and Toxicity. Professor Savkovic-Stevanovic is author of numerous papers, invited books chapter, books, patentees in the field (over 800). Consultant in many companies. She has many awards and honors. She is cited in many monographs and she is one of the world's 100 top Scientists of the IBC-International bibliographic Centre, Cambridge, 2007. The best one Ultimate Achiever-IBC Cambridge, 2009, 2010,2011 and 2012. She had the best paper on the 2nd WSEAS Inter. Conf. on Biomedical Electronics and Biomedical Informatics-BEBI2009, Moscow, Russia, August, 20-22,2009 and the best paper on the WSEAS Inter. Conf. on Mathematics and Computers in Biology and Chemistry-MCB2010, Iasi, Romania, June, 13-15, 2010. She is Amabasadsor of Serbia for Sciences, Communications and Arts.

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Plenary Lecture 3

Mathematical models for different chemical processes

Professor Alina Bărbulescu
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Abstract: Mathematics plays an important role in solving real life problems. Chemistry is one of the main sciences that benefits from the development of new mathematical techniques for modelling the experimental data. In this talk I shall present two different types of approaches for determination of models for data collected in industrial environment, comparing the classical approaches with the new ones from the artificial intelligence and emphasizing the advantages of each method by the results of our research.

Brief Biography of the Speaker: Alina Bărbulescu graduated from the University of Craiova, Romania (Faculty of Mathematics) and from Petre Andrei University of Iasi, Romania (Faculty of Law). After a PhD in Mathematics, from Al I Cuza University of Iasi and one in Cybernetics and Economic Statistics, from Academy of Economic Studies Bucharest, Romania, she worked in the field of mathematics and applied statistics. Nowadays she is associate professor at Ovidius University of Constanta, Faculty of Mathematics and Computer Science. She is author of 18 books and over 90 articles, published in peer rewieved international journal, invited editor for 5 books, being also a member of editorial boards of International Journal of Mathematics and Computation and International Journal of Applied Mathematics and Statistics.

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Plenary Lecture 4

Controlling Cardiac Alternans via Point Stimulation Versus Far-Field Pacing

Associate Professor John W. Cain
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Abstract: In cardiac tissue, beat-to-beat alternation of action potential duration (APD) is a warning sign of potentially serious pathologies. When APD alternans is detected, it is desirable to coax the tissue back to a normal rhythm in which APD has little beat-to-beat variation. Mathematically, this is can be accomplished by applying feedback control to stabilize an unstable equilibrium near a periodic (or chaotic) orbit. Clinically, it is accomplished by applying well-timed electrical stimuli via a medical device such as a pacemaker. Such device intervention can be implemented in several ways, two of which are point stimulation and far-field pacing (FFP). In point stimulation, the device applies spatially localized stimuli through the tip of an electrode, whereas in FFP, large plate electrodes apply pulsed electric fields pulses across the entire heart. FFP creates "virtual" electrodes within the tissue by depolarizing or hyperpolarizing cells near the boundaries of non-conducting obstacles (e.g., dead tissue) and, if the field strength is strong enough, propagating action potentials can emanate from these obstacles. In this study, we analyze a particular feedback control algorithm (extended time-delay autosynchronization, ETDAS) for timing the stimuli in point stimulation, with the goal of controlling alternans in zero and one-dimensional samples of cardiac tissue (i.e., a single cell or a long fiber of cells joined end-to-end), as well as the use of ETDAS as a method for timing the stimuli applied during FFP. Previous theoretical and experimental studies have shown that special cases of ETDAS can terminate alternans in small, "zero-dimensional" patches of cardiac cells in which spatial extent is negligible; however, those special cases of ETDAS perform rather poorly in controlling the spatially discordant alternans in one-dimensional fibers. Here, we explore whether the added robustness of ETDAS can enlarge the spatial domain over which point stimulation can succeed, ultimately comparing our results with those obtained using FFP.

Brief Biography of the Speaker: John W. Cain graduated from Duke University, Durham, NC, USA in 2005 with a Ph.D. in Mathematics. From 2005-2011, he served on the mathematics department faculty at Virginia Commonwealth University and as a Fellow of VCU's Center for the Study of Biological Complexity. In August 2011, Dr. Cain moved to the University of Richmond, where he is Associate Professor of Mathematics and Computer Science. His scholarly work lies at the interface of mathematics and medicine, and involves problems in cardiac electrophysiology, dynamics of biochemical reaction networks, and wound healing. Dr. Cain's research has been featured in interviews with Science, the American Mathematical Society, and in the Notices of the AMS (April 2011). In addition to his biomathematics research articles, he has co-authored two textbooks on differential equations, dynamical systems and bifurcations, both of which are available free-of-charge (by electronic request).

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Plenary Lecture 5

Variational Treatment of Screened Coulomb Potentials: The Yukawa Potential

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Abstract: The most fundamental equation of Theoretical Chemistry and of Atomic Physics is the Schroedinger equation for a hydrogen like system. Its solution can be found in any standard textbook on Atomic Physics, Quantum Chemistry and so on. A similar equation which is somewhat more complicated is the Schroedinger equation for a particle bound in what is known in the literature as screened Coulomb potential. The screening function that will be discussed is one which is solely dependent on the radial variable r and is known in the literature as the Yukawa potential. This potential arises naturally as the position space version of the solution of the Klein-Gordon equation for a static meson field. It was the deuteron problem which inspired the first solutions to the corresponding eigenvalue equation. It is commonly known in plasma physics as the “Debye-Hueckel” potential and represents the effect of the plasma sea on localized two-particle interactions. The Debye-Hueckel potential also approximates the Thomas-Fermi potential in the calculation of the energy levels of the impurity centers in doped semiconductors. Together with the Hulten and the exponential potentials the Yukawa potential plays an important role as a good test case in potential scattering studies also. In quantum chemistry the effect of the core electrons on the valence electrons can be modeled by means of a linear combination of Yukawa or similar potentials. Various approaches have been made to attempt to solve the eigenvalue problem associated to the corresponding Schroedinger equation having Yukawa or similar screened coulomb potentials. Quite a few of these use perturbational and variational techniques. There were also group theoretical approaches. Direct numerical integration of the corresponding Schroedinger equation were also employed and quite succesfully so. Regge trajectories were determined via this means or by utilizing continued fractions. There are of course plenty of other works related to Yukawa potential. The method that will be discussed during the talk is also based on variational treatment of the radial Schroedinger equation with Yukawa potential. It employs a Laguerre basis set extended by an extra function. A parameter used in this extra function and its relation with the energy of the system results in the utilization of an auto-coherent (or self-consistent) scheme. The proposed method does not only give energy values for the ground and the first few excited states consistently up to thirty digits but also gives threshold screening parameter values accurate to 15-20 decimal points.

Brief Biography of the Speaker: N. A. BAYKARA was born in Istanbul,Turkey on 29th July 1948. He received a B.Sc. degree in Chemistry from Bosphorous University in 1972. He obtained his PhD from Salford University, Greater Manchester, Lancashire,U.K. in 1977 with a thesis entitled “Studies in Self Consistent Field Molecular Orbital Theory”, Between the years 1977–1981 and 1985–1990 he worked as a research scientist in the Applied Maths Department of The Scientific Research Council of Turkey. During the years 1981-1985 he did postdoctoral research in the Chemistry Department of Montreal University, Quebec, Canada. Since 1990 he is employed as a Staff member of Marmara University. He is now a Full Professor of Applied Mathematics mainly teaching Numerical Analysis courses and is involved in HDMR research and is a member of Group for Science and Methods of Computing in Informatics Institute of Istanbul Technical University. Other research interests of his for him are “Density Functional Theory” and “Fluctuationlessness Theorem and its Applications” which he is actually involved in. Most recent of his concerns is focused at efficient remainder calculations of Taylor expansion via Fluctuation–Free Integration, and Fluctuation–Free Expectation Value Dynamics.

Plenary Lecture 6

Business Intelligence Approaches

Professor Mihaela I. Muntean
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Abstract: Business Intelligence (BI) is unanimous considered the art of gaining business advantage from data; therefore BI systems and infrastructures must integrate disparate data sources into a single coherent framework for real-time reporting and detailed analysis within the extended enterprise. Also the solution to a business problem is a process that includes business intelligence, BI, by itself, is rarely the complete solution to the problem. Therefore, BI tools must understand the process and how to be part of it.
In Romania, the growth potential for the BI market is very high, with lot of opportunities and interest determined by the crisis itself, even if IT budgets had many corrections suffered. The greatest restriction that limits the adoption of a BI solution is not the technology, but the existence of a limited organizational culture. Subordinated to performance management, Business Intelligence approaches help firms to optimize business performance. Looking inside the business and at the environment in which they operate, managers are able to fundament the most productive and profitable decisions.
Some practice examples will be subject of the debate. Based on the company's information assets, the Business Intelligence value chain represents a „From DATA To PROFIT" approach and is recommended to ground any performance management program.

Brief Biography of the Speaker: Currently, professor Mihaela I. Muntean is the chair of the Business Information Systems Department at the West University of Timisoara and an IT independent consultant. With a background in Computer Science and a Ph.D. obtained both in Technical Science and in Economic Science (Economic Informatics), professor Mihaela I. Muntean focused her research activity on topics like information technology, knowledge management, business intelligence, business information system. Over 70 papers in indexed reviews and conference proceedings and the involvement with success in 8 multi-annual national research grants/projects are sustaining her contributions in the research fields mentioned above.

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Plenary Lecture 7

Controlling Digital Ecosystems for Sustainable Development

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Abstract: A digital ecosystem is a distributed adaptive open socio-technical system with properties of self-organisation, scalability and sustainability. As an emerging field of study, "digital ecosystems" is informed by knowledge of natural ecosystems and is still being defined. The term is used in the mainly in computer industry, high tech industries, and academia.
The digital ecosystem initiative has two target groups:
• SMMEs (of any business sector) which need customised ICT applications and services for improving their efficiency through process and organisation integration and for extending their business beyond local barriers;
• ICT-related organisations: system integrators, service providers, software component developers (with emphasis on open source communities and open systems developers)
This goal is reached through the implementation of new paradigms which exploit the advantages of the EU economical structure (based on SMEs and on diversity and local identity), through the implementation of a sustainable development by protecting the environment.
Humanity has created a hard-to-solve equation:
SCIENCE + TECHNOLOGY = CIVILIZATION + POLLUTION.
The last term of this equation concerns soil pollution, water pollution, air pollution, as well as mental pollution (i.e. the new dimension of pollution affecting the human emotional intelligence by informational blast). We shall focus on the measures concerning the European aquis and praxis in environmental management, which have been implemented in our region.
Translating the above given literal equation into a pure mathematical one is a hard task and even harder is applying the mathematical equation to practice.
These issues are the subject of a series of grants that I have been working at, together with my students, and which will be shortly discussed here.

Brief Biography of the Speaker:
• Academic Positions: Assoc. Professor Ph.D. Eng., Dept. of Automatics and Computers, Faculty of Electrical Engineering and Computer Science, "Stefan cel Mare" University of Suceava, Romania.
• Fields of Scientific Activities: Discrete Event Systems, Complex Measurement Systems, Reliability and Diagnosis of Control Systems, Environmental Management.
• He published 8 books and over 120 scientific papers in conference proceedings and journals.
• Honor Member of the Romanian Society of Electrical & Control Engineering - Member of the Romanian Technical Experts Corp.
• Technical Expert of the Romanian Ministry of Justice.
• President of the Romanian Society of Electrical & Control Engineering, Suceava Branch.
• He is a member of the editorial boards of several international scientific journals and conferences of control systems and electric engineering science. He was designated chairmen at 23 international conferences.

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Plenary Lecture 8

Equilibria of the games in choice form

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Abstract: Since in a noncooperative game the players are not allowed to make commitments, any solution should be self-enforcing i.e. once it is agreed upon, nobody is interested to deviate. The Nash equilibrium (equilibrium point) is the most important solution concept of the noncooperative game theory and it is defined in terms of the normal form of a game, as a strategy combination with the property that no player can gain by unilaterally deviating from it. In the original definition of J.F.Nash, the players options were expressed by utility functions de.ned on the product of the individual strategy spaces, and the most significant existence results refer to this formalization. Later, the original definition was extended to cover more general situations met in the noncooperative competitions. This is the case of the equilibrium of abstract economies (Shafer and Sonnenschein, where the individual preferences are represented as correspondences. Particularly, such correspondences can be derived from the normal form of a game, but as primary elements of the model they generalize the earlier representations of individual preferences. Motivated by the problem of the implementation in noncooperative solutions of the voting operators, a new concept of equilibrium, called Nash equilibrium in choice form, has been introduced (Stefanescu and Ferrara). Rephrased in terms of game strategies and renamed as equilibrium in choice, this concept is discussed in the present paper. The formal framework for the definition of equilibria in choice is the game in choice form, represented as the family of the sets of individual strategies and a choice profile. Intuitively, a choice profile speci.es the desirable outputs of each player, and since each output of the game is associated to a game strategy, it can be represented as a collection of subsets of the set of all game strategies. Particularly, when the players options are represented by utility functions or by preference relations, a choice profile may be the family of the graphs of players best reply mappings, and then the set of equilibria in choice coincides with the set of Nash equilibria. So that, the definition of the equilibrium in choice captures the main idea of the "best reply" from the definition of the Nash equilibrium, but the new concept is more general, responding to various representations of the players options. Two variants of this concept are proposed here. The basic one presumes a relaxation of the best reply principle and has obvious counterparts for classical solutions, if this relaxation is accepted. The stronger form of the equilibrium in choice can be considered as a generic notion of noncooperative solution and several usual versions of such solutions are produced when the choice profile is designed indifferent particular ways.

Brief Biography of the Speaker: Massimiliano Ferrara is Professor of Mathematical Economics at "Mediterranea" University of Reggio Calabria where he was also Dean of the degree in Economics. Actually he is the Director of Culture, Education, Research and University Department at Regione Calabria. He was the Founder and Director of MEDAlics and Vice Rector at "Dante Alighieri" University of Reggio Calabria. He was also Visiting Professor at Harvard University, Cambridge (USA), Morgan State University in Baltimore (USA), Western Michigan University (USA), New Jersey Institute of Technology in Newark (NJ) (USA). He was a speaker at several WSEAS international conferences. He is editor of several international journals: Advances in Management and Applied Economics (AMAE), African Journal of Science, Technology, Innovation and Development Applied Sciences (APPS), International Journal of Functional Analysis, Operator Theory and Applications (IJFAOTA), Far East Journal of Mathematical Sciences (FJMS), Journal of Indian Academy of Mathematics (Jiam), Journal of the Calcutta Mathematical Society and Universal Journal of Mathematics and Mathematical Sciences. His main research interests are: dynamical systems, patterns of growth and sustainable development, mathematical economics, game theory, optimization theory, applied Economics.

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Plenary Lecture 9

Innovative methods for improving portfolio management based on artificial intelligence instruments

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Abstract: Financial markets represent one of the most complex environments for business and there are a lot of types of external factors which impact their dynamics. The recent financial turbulence materialized by the global financial crisis 2008-2009 and the European sovereign debt crisis (2010-2012) made serious pressure on financial markets that proved their fragility and sensitivity in a different manner.
The use of different instruments used on artificial intelligence could be applied in decision making process in financial markets because they offer a unique capability of learning.
The conventional theories regarding the anticipation of financial markets evolution are represented by the efficient market hypothesis (Fama, 1970) and the paradigm regarding the methods to anticipate the future performance of financial assets. The actual interest is to identify optimal strategies for portfolio management by using artificial intelligence.
The basic steps of incorporating different types of artificial intelligences on the study of the future dynamic of the performance of different financial assets are the following: the analysis of the strategies used by different portfolio managers and their performances; the identification of new instruments capable to improve the strategy references; the selection/ development and testing of the new instrument; the analysis of the differential performance.
Actual artificial intelligence instruments are difficult to create/develop and to use because in this paper will be presented a new concept in which the basis will be the application data transformation in order to build different sets of training artificial neuronal networks in order to optimize/modify in an easy way their behavior. This module for simulating the artificial neuronal network is improved by using genetic algorithms to select the best network regarding the predictions of the performance of financial instruments, but also the optimal timing in the process of portfolio management.

Brief Biography of the Speaker: Gabriela Prelipcean graduated in Economic Cybernetics at the Academy of Economic Studies (1988). Ph.D. in Economics awarded by the Academy of Economic Studies, Bucharest. She is Professor and PhD coordinator in Economics at “Stefan cel Mare” University of Suceava. Her research and teaching covered an extended area of Economics and Business, Cybernetics and interdisciplinary domain as Economics of Disasters, Extreme Risk Events (natural disasters and terrorism), and Economics of Migration. Fellowships awarded and academic programs: NEC Fellowships, financed by the New Europe College (NEC), Institute for Advanced Study, Bucharest, 2008-2009; Fulbright Postdoctoral Fellowship, Elizabethtown College, PA, USA, Extreme Events Risk Management, 2006-2007; Research grant at University of Bologna, Italy, 2001; Visiting professor and researcher at Institute for the Study of Labor, Bonn, 2009; Visiting Professor, University of Bologna, Italy, 2005; University of Applied Sciences BFI Vienna, Austria, 2004; University of Bari, University of Modena, Italy, University of Torino. Participation at Conferences and Symposia in the Economics and Business fields in Romania, USA, France, Germany, United Kingdom, Italy, Denmark, Greece, Czech Republic, Austria, China, Ukraine, Moldova. Author and co-author over 10 books, over 60 papers published in professional journals and conference proceedings in Romania and abroad and a frequent reviewer for international and national conferences and journals and research institutions and foundations. I have received many research grants and awards as director. One large-scale project was funded by the European Union. 10 grants and research projects were funded by Romanian sources (CNMP, ANCS, CNCSIS_Consortiu, IER, CEEX, Security Program etc). The main focus is on: Assessing, Managing, and Financing Extreme Events; Crisis Management in Natural Disasters and Terrorism; Financial and Currency Crisis, Economic Crisis, Migration Policies and Remittances; Econometrics. Professional affiliations: Business Excellence (2010-); SAMRO (2010-); Academy of Management (2007-); Romanian Management Society (2007-); European Association of Regional Sciences (2004-); Romanian Association of Regional Sciences (2001-); Romanian Statistics Society (2000-); Romanian General Economists’ Associations - AGER (1992-).

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Plenary Lecture 10

Deterministic and stochastic model for the analysis of the asset price

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Abstract: This paper develops the analysis on heterogeneous beliefs and rational routes to randomness in discrete-time models to a continuous-time model of asset pricing. A stochastic model of asset pricing in continuous-time with heterogeneous agents, who are allowed to switch among two types of strategies, fundamentalists and chartists, based on accumulated profits of the strategies, is presented. Applying the stability and bifurcation theory of the delay differential equations, for the deterministic model, the impact of switching and time horizon, used by the chartists on the market stability, is examined. For the linearized perturbed stochastic system, we identify the differential equations for the square mean values and we study their dynamics. Some numerical simulations and conclusions are provided.

Brief Biography of the Speaker: Mihaela Neamtu was born in Timisoara (Romania) on 1971. She graduated in 1995 the Faculty of Mathematics, West University of Timisoara. In 2001 she obtained the title of Ph.D in mathematics. She followed a didactic career at the Faculty of Economics and Business Administration, West University of Timisoara, Romania and she is currently Professor. She has been a visiting Professor for short periods of time at The Nottingham Trent University, Economics & Politics (Great Britain) and Faculty of Mathematics, Bonn (Germany). Professor Mihaela Neamtu has over 80 articles published in Journals and Proceedings of the International Conferences and 4 monographs; she has been a regular referee of papers for several International Journals and a reviewer of Mathematical Reviews (MathSciNet). She has been participating in 10 multiannual grants (1 of them is international), in 8 as a member and in 2 as a director.

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Plenary Lecture 11

The Impact of Flexicurity Policies on Romanian Employment

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Abstract: In the beginning of years 2010, the aim of public policies is to ensure the balance between flexibility and security on the labour market, so that: more new jobs should be created; there should be conditions for the lifelong development of human resources; the skills and competences of workers should be more efficiently employed. Experience has shown that decreasing job protection has led to new jobs only on the short term. At the same time, the sole support of flexibility has had a negative impact on the ability of the market to create new jobs in the long run. During the past few years, we have been confronted with a pronounced segregation of the labour market into two categories of workers - highly-qualified, well-paid and safely employed individuals, and respectively poorly-qualified, poorly-paid individuals lacking secure employment - which has served to aggravate the insecurity on the job market for the second category. In this new context, the goal of this paper is to analyze how all these transformations are affecting on the one hand the Romanian labour market, and on the other hand the Romanian employment.

Brief Biography of the Speaker: Daniela Zirra is a professor of Economics at Romanian-American University, Bucharest. She did her undergraduate work in 1996, and received the master degree in Human Resources Management in 1997, at The Bucharest Academy of Economic Studies. Also, she received her Ph.D. in Economics in 2005 from Romanian Academy, National Institute of Economic Research Bucharest. Her area of expertise is microeconomics, macroeconomics and investments efficiency. She authored or co-authored over 25 scientific books or manuals and more than 50 papers published in reviewed journals or presented at international conferences (World Scientific and Engineering Academy and Society WSEAS; DAAAM International, Vienna, Austria; Faculty of Economics, South-West University of Neofit Rilski, Blagoevgrad, Bulgaria; International Association of Academies of Sciences, Ukraine, Kiev, etc.). Until now, she was project manager or member in the project teams in 19 research projects or grants (national and international). Daniela Zirra is the Director of Economic Research Centre in Romanian-American University since July 2006. She also had collaborations with Professor Tahereh Hojjat, Ph.D. from De Sales University, Philadelphia, on Microeconomics courses (on-line) during November 2004 - June 2011. She was visiting professor in Tietgen Business College, Denmark in September 2010, and also in Kemi-Tornio University of Applied Sciences, Finland in September 2011.

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