

**Recent Advances in
Mathematics**

**Proceedings of the 2015 International Conference on
Pure Mathematics, Applied Mathematics and Computational Methods
(PMAMCM 2015)**

Zakynthos Island, Greece, July 16-20, 2015

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Imre J. Rudas

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Valery. V. Kozlov

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Table of Contents

<u>Plenary Lecture 1: Evolutionary Algorithms - Cybernetic Overview</u>	12
<i>Ivan Zelinka</i>	
<u>A Priori Hybrid Mesh Adaptation for Turbo-Machinery CFD</u>	15
<i>François Guibault</i>	
<u>A Simple Dual Method for Optimal Allocation of Total Network Resources</u>	19
<i>I. V. Konnov, A. Yu. Kashuba, E. Laitinen</i>	
<u>Multiple-Layer Parking with Screening</u>	22
<i>Sjoert Fleurke, Aernout C. D. Van Enter</i>	
<u>Data Interpolation with Applications via Probabilistic Distribution and Nodes Combination</u>	27
<i>Dariusz J. Jakóbczak</i>	
<u>Polar, Spherical and Orthogonal Space Subdivisions for an Algorithm Acceleration: $O(1)$ Point-in-Polygon/Polyhedron Test</u>	33
<i>Vaclav Skala</i>	
<u>Cluster Flow Modeling on Multi-Lane Supporters</u>	37
<i>Pavel Strusinskiy</i>	
<u>The Linear Complexity over F_2 and F_p of Binary Sequences of Length $4p$ with Optimal Autocorrelation</u>	42
<i>Vladimir Edemskiy</i>	
<u>Design Optimization of Sandwich Structure Subjected to Maximum Displacement Criterion</u>	45
<i>E. Kormanikova, K. Kotrasova</i>	
<u>Seismic Behavior of Fluid Flows Fully Coupled with Rectangular Tank</u>	51
<i>K. Kotrasova, E. Kormanikova</i>	
<u>The Quick Estimation of the Stored Heat in a Cylindrical Wall</u>	57
<i>M. I. Neacǎ, A. M. Neacǎ</i>	
<u>Determination of Unknown Spacewise-Dependent Coefficient in a Parabolic Equation</u>	61
<i>Emine Can, Afet Golayoglu Fatullayev, M. Aylin Bayrak</i>	
<u>SFedU Software Package for Nucleotide Sequence Analysis</u>	66
<i>Boris J. Steinberg, Jumana M. Abu-Khalil, Mikhail G. Adigeyev, Sergey V. Avdyakov, Andrey A. Bout, Anton V. Kermanov, Evgeny A. Pshenichnyy, Galina V. Ramanchauskayte, Natalia Ponomareva</i>	

<u>Iterative Solution Methods for Parabolic Optimal Control Problem with Constraints on Time Derivative of State Function</u>	72
<i>E. Laitinen, A. Lapin</i>	
<u>Genetic Networks Inferring of the Activating-Repressive Type under the Boolean Network Model</u>	75
<i>Evgeny Pshenichnyy, Dmitry Romanov, Natalia Ponomareva</i>	
<u>Study the Existence and Uniqueness of the Weak Solution of Antiplane Electro-Elastic Problem with the Power-Law Friction</u>	79
<i>Dalah Mohamed, Derbazi Ammar</i>	
<u>Grid Computing for Multi-Objective Optimization Problems</u>	84
<i>Aouaouche El-Maouhab, Hassina Beggar</i>	
<u>Evaluation of Melt Pool Geometry During Pulsed Laser Welding of Ti6Al4V Alloy</u>	92
<i>Mohammad Akbari, Seyfolah Saedodin, Afshin Panjehpour, Samaneh Naghieh, Masoud Afrand</i>	
<u>Investigation on the Film Cooling Effectiveness from Cylindrical and Row Trenched Cooling Holes Adjacent the Combustor Endwall Surface</u>	97
<i>Ehsan Kianpour, Arezou Sayyedana, Arash Karimipour, Alireza Shirneshan, Iman Golshokouh</i>	
<u>Hamming Distance Between Partitions, Clustering Comparison and Information</u>	101
<i>Giovanni Rossi</i>	
<u>Comparison of ACO and GA Techniques to Generate Neural Network Based Bezier-PARSEC Parameterized Airfoil</u>	108
<i>Waqas Saleem, Riaz Ahmad, Athar Kharal, Ayman Saleem</i>	
<u>Analytical Solution of a Problem on MHD Flow in a Rectangular Duct</u>	118
<i>Elena Ligere, Ilona Dzenite, Aleksandrs Matvejevs</i>	
<u>Critical Exponents for the Multidimensional Heat Conduction Equation with a Nonlinear Boundary Condition and Variable Density</u>	121
<i>Mersaid Aripov, Zafar Rakhmonov</i>	
<u>Traffic Signal Control in Congested Road Network</u>	126
<i>Alexander Krylatov, Victor Zakharov, Ovanes Petrosian</i>	
<u>The Degree of Influence of Constructive and Regime Factors on the Characteristics Turbine Wheel Steps Shoulder who are More Angles of Rotation</u>	130
<i>Andrey Yu. Fershalov, Yuriy Ya. Fershalov, Lyudmila P. Tsigankova</i>	
<u>Evaluating the Technical and Scale Efficiency of the Large Hospitals in Greece</u>	134
<i>Panagiotis Mitropoulos, Ioannis Mitropoulos</i>	

<u>The Unified Transform for a Reaction-Diffusion Brain Tumor Model that Incorporates Tissue Heterogeneity and Radiotherapy</u>	137
<i>A. G. Sifalakis, M. G. Papadomanolaki, E. P. Papadopoulou, Y. G. Saridakis</i>	
<u>Heat Transfer Analysis in Concrete Slabs Using a General Purpose FEM Computer Code</u>	143
<i>Ioan Both, Frantisek Wald, Raul Zaharia</i>	
<u>On Kolmogorov's Theory of Local Isotropy and its Relation to Ordinary Hydrodynamic Turbulence</u>	148
<i>H. P. Mazumdar, S. Pramanik, C. Mamaloukas</i>	
<u>Problems of Choosing the Optimal Route for a Public Transport System with Regular Trips</u>	154
<i>A. M. Valuev</i>	
<u>Some Refinement of the Conception of Symmetry of Volterra Integral Equations and Constructing Symmetrical Methods for Solving them</u>	159
<i>G. Mehdiyeva, V. Ibrahimov, M. Imanova</i>	
<u>About Some Communications Between Methods of Applications to the Solving ODE and Integral Equations of Volterra Type</u>	163
<i>G. Mehdiyeva, V. Ibrahimov, M. Imanova</i>	
<u>Modern Information and Communication Approaches to Traffic Monitoring</u>	167
<i>Mikhail Volkov, Marina Yashina</i>	
<u>Computer Network Traffic Models: Research, Hypotheses, Results</u>	170
<i>Alexander Buslaev, Alexander Zernov, Pavel Sokolov, Marina Yashina</i>	
<u>The Use of MPI Technology for Solving Problems of Agent-Based Modeling of Traffic Flows</u>	176
<i>Vitalii V. Shiriaev, Grigory M. Chernyak</i>	
<u>On Modelling of Traffic on Multilane Intersection</u>	179
<i>Andrew Yaroshenko, Dmitriy Lopanov</i>	
<u>Discontinuous Hermite Collocation and IMEX Runge-Kutta for a Treated Quasi-linear Heterogeneous Brain Tumor Model</u>	183
<i>I. E. Athanasakis, E. P. Papadopoulou, Y. G. Saridakis</i>	
<u>Fuzzy Sets Theorem and Cause Event</u>	189
<i>Jelenka Savkovic-Stevanovic</i>	
<u>Authors Index</u>	195

Plenary Lecture 1

Evolutionary Algorithms - Cybernetic Overview



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Abstract: Proposed tutorial is focused on mutual intersection of two interesting fields of research i.e. evolutionary algorithms and complex system dynamics and structure. It discusses recent progress on evolutionary algorithms that can be considered like a dynamical complex system with inherent nonlinear dynamics and feedback loop. This dynamics can generate different kind of behavior including chaotic one and can be visualized as a complex geometrical structure. Basics of deterministic chaos will be explained in order to better understand proposed topic, such as universal features of that kind of behavior are explained, quantifying chaotic, period doubling, intermittence, chaotic transients and crises.

With conjunction on this will be demonstrated fruitful intersection of complex dynamics, structures and evolutionary algorithms, that are discussed from a few points of views (chaos control, chaotic behavior of evolutionary dynamics...) including evolutionary dynamics conversion into complex network that can be analyzed and controlled by means of classical as well as modern evolutionary methods.

Further will be explained and demonstrated that evolutionary algorithm can be understand also as a nonlinear feedback loop system that can be controlled and thus performance of the evolutionary algorithm can be controlled too.

Brief Biography of the Speaker: Ivan Zelinka (born in 1965, ivanzelinka.eu) is currently associated with the Technical University of Ostrava (VSB-TU), Faculty of Electrical Engineering and Computer Science. He graduated consequently at the Technical University in Brno (1995 - MSc.), UTB in Zlin (2001 - Ph.D.) and again at Technical University in Brno (2004 - Assoc. Prof.) and VSB-TU (2010 - Professor).

Prof. Zelinka is responsible supervisor of grant research of Czech grant agency GA?R named a) Highly Scalable Parallel and Distributed Methods of Data Processing in E-science (focused on astrophysics), b) Softcomputing methods in control, c) Control Algorithm Design by Means of Evolutionary Approach, and co-supervisor of grant FRV? - Laboratory of parallel computing. He was also working on numerous grants and two EU projects as member of team (FP5 - RESTORM) and supervisor (FP7 - PROMOEVO) of the Czech team. He is also head of research team NAVY <http://navy.cs.vsb.cz/>.

Prof. Zelinka was awarded by Siemens Award for his Ph.D. thesis, as well as by journal Software news for his book about artificial intelligence. He is a member of the British Computer Society,

Machine Intelligence Research Labs (MIR Labs - <http://www.mirlabs.org/czech.php>), IEEE (committee of Czech section of Computational Intelligence), a few international program committees of various conferences, and three international journals. He is also the founder and editor-in-chief of a new book series entitled Emergence, Complexity and Computation (Springer series 10624, see also www.ecc-book.eu).