

Contents

Plenary and Invited Papers

Stepping into Fully GPU Accelerated Biomedical Applications	3
<i>Caroline Mendonca Costa, Gundolf Haase, Manfred Liebmann, Aurel Neic, and Gernot Plank</i>	

Recent Results in the Approximation of Nonlinear Optimal Control Problems	15
<i>Maurizio Falcone</i>	

Development of an Optimization-Based Atomistic-to-Continuum Coupling Method	33
<i>Derek Olson, Pavel Bochev, Mitchell Luskin, and Alexander V. Shapeev</i>	

Numerical Modeling of Fluids and Structures

Soliton Solutions as Inverse Problem for Coefficient Identification.	47
<i>Tchavdar T. Marinov and Rossitza Marinova</i>	

Control and Uncertain Systems

Improved Error Estimate for an Implicit Discretization Scheme for Linear-Quadratic Control Problems with Bang-Bang Solutions	57
<i>Walter Alt and Martin Seydenschwanz</i>	

On Optimization Problems for Differential Inclusions with Random Initial Data.	66
<i>Boris I. Ananyev</i>	

Stability of Switched Systems: An Introduction	74
<i>Andrea Bacciotti</i>	

Optimal Control of Nonlinear Elliptic PDEs – Theory and Optimization Methods	81
<i>J. Coletsos and B. Kokkinis</i>	

The Euler Method for Linear Control Systems Revisited	90
<i>Josef L. Haunschmied, Alain Pietrus, and Vladimir M. Veliov</i>	

On Control Synthesis for Uncertain Differential Systems Using a Polyhedral Technique	98
<i>Elena K. Kostousova</i>	

On the Controllability of a Class of Hybrid Control Systems	107
<i>Mikhail I. Krastanov and Marc Quincampoix</i>	
BV Regularity and Differentiability Properties of a Class of Upper Semicontinuous Functions	116
<i>Antonio Marigonda, Khai T. Nguyen, and Davide Vittone</i>	
Internal Ellipsoidal Estimates of Reachable Set of Impulsive Control Systems Under Ellipsoidal State Bounds and with Cone Constraint on the Control . . .	125
<i>Oxana G. Matviychuk</i>	
Optimal Control Models of Renewable Energy Production Under Fluctuating Supply	133
<i>Elke Moser, Dieter Grass, Gernot Tragler, and Alexia Prskawetz</i>	
Pontryagin's Type Optimality Conditions for a Distributed Control Problem Arising in Endogenous Growth Theory	143
<i>Bernhard Skritek, Tsvetomir Tsachev, and Vladimir M. Veliov</i>	
Invariance Property in Approaching Problem on a Finite Time Interval. . . .	152
<i>Vladimir Ushakov, Alexander Matviychuk, and Sergey Brykalov</i>	
Monte Carlo Methods: Theory, Applications and Distributed Computing	
Hybrid Monte Carlo CT Simulation on GPU	161
<i>Gábor Jakab and László Szirmay-Kalos</i>	
Analysis and Control of the Accuracy and Convergence of the ML-EM Iteration.	170
<i>Milán Magdics, László Szirmay-Kalos, Balázs Táth, and Anton Penzov</i>	
Stochastic Formulation of Newton's Acceleration.	178
<i>P. Schwaha, M. Nedjalkov, S. Selberherr, J. M. Sellier, I. Dimov, and R. Georgieva</i>	
The Role of Annihilation in a Wigner Monte Carlo Approach	186
<i>Jean Michel Sellier, Mihail Nedjalkov, Ivan Dimov, and Siegfried Selberherr</i>	
Theoretical and Algorithmic Advances in Transport Problems	
The Reference Solution Approach to Hp-Adaptivity in Finite Element Flux-Corrected Transport Algorithms	197
<i>Melanie Bittl and Dmitri Kuzmin</i>	
Optimization-Based Conservative Transport on the Cubed-Sphere Grid. . . .	205
<i>Kara Peterson, Pavel Bochev, and Denis Ridzal</i>	

Applications of Metaheuristics to Large-Scale Problems

Application of Metaheuristics to Large-Scale Transportation Problems	215
<i>Luca D'Acierno, Mariano Gallo, and Bruno Montella</i>	
Genetic Operators Significance Assessment in Simple Genetic Algorithm . . .	223
<i>Maria Angelova and Tania Pencheva</i>	
Influence of the Number of Ants on Multi-objective Ant Colony Optimization Algorithm for Wireless Sensor Network Layout	232
<i>Stefka Fidanova, Pencho Marinov, and Marcin Paprzycki</i>	
Dynamic Differential Evolution Algorithm for Clustering Temporal Data . . .	240
<i>Kristina S. Georgieva and Andries P. Engelbrecht</i>	
Adaptive Critic Design and Heuristic Search for Optimization	248
<i>Petia Koprinkova-Hristova</i>	
Using Self-Adaptive Evolutionary Algorithms to Evolve Dynamism-Oriented Maps for a Real Time Strategy Game	256
<i>Raúl Lara-Cabrera, Carlos Cotta, and Antonio J. Fernández-Leiva</i>	
Simple Iterative Heuristics for Correlation Clustering	264
<i>Andrzej Lingas and Mia Persson</i>	
Evolutionary Estimation of Parameters in Computational Models of Thymocyte Dynamics	272
<i>Lavinia Moatar-Moleriu, Viorel Negru, and Daniela Zaharie</i>	
Micro Differential Evolution Performance Empirical Study for High Dimensional Optimization Problems	281
<i>Mauricio Olguin-Carbajal, J. Carlos Herrera-Lozada, Javier Arellano-Verdejo, Ricardo Barron-Fernandez, and Hind Taud</i>	
Free Search in Multidimensional Space	289
<i>Kalin Penev</i>	
Scale Multi-commodity Flow Handling on Dynamic Networks	297
<i>Alain Quilliot, Heito Liberalino, and Benoit Bernay</i>	
Hybrid Genetic Algorithm for Allocation Mapping in Processor Array Design	305
<i>Piotr Ratuszniak</i>	
Hybrid ACO-GA for Parameter Identification of an <i>E. coli</i> Cultivation Process Model	313
<i>Olympia Roeva, Stefka Fidanova, and Vassia Atanassova</i>	

Modeling Forest Fire Spread Through a Game Method for Modeling Based on Hexagonal Cells	321
<i>Evdokia Sotirova, Emilia Velizarova, Stefka Fidanova, and Krassimir Atanasov</i>	
Modeling and Numerical Simulation of Processes in Highly Heterogeneous Media	
Mixed FEM for Second Order Elliptic Problems on Polygonal Meshes with BEM-Based Spaces	331
<i>Yalchin Efendiev, Juan Galvis, Raytcho Lazarov, and Steffen Weißer</i>	
Topology Optimization Using Multiscale Finite Element Method for High-Contrast Media	339
<i>Boyan S. Lazarov</i>	
Numerical Homogenization of Heterogeneous Anisotropic Linear Elastic Materials	347
<i>S. Margenov, S. Stoykov, and Y. Vutov</i>	
How to Make a Domain Decomposition Method More Robust.	355
<i>Nicole Spillane</i>	
Large-Scale Models: Numerical Methods, Parallel Computations and Applications	
Assessment of the Air Quality in Bulgaria - Short Summary Based on Recent Modelling Results	365
<i>Hristo Chervenkov, Dimiter Syrakov, Maria Prodanova, and Kiril Slavov</i>	
Application of POD-DEIM Approach for Dimension Reduction of a Diffusive Predator-Prey System with Allee Effect	373
<i>Gabriel Dimitriu, Ionel M. Navon, and Răzvan Ștefănescu</i>	
FARSITE and WRF-Fire Models, Pros and Cons for Bulgarian Cases	382
<i>Nina Dobrinkova and Georgi Dobrinkov</i>	
Analysis of the Processes Which Form the Air Pollution Pattern over Bulgaria	390
<i>Georgi Gadzhev, Kostadin Ganev, Nikolay Miloshev, Dimiter Syrakov, and Maria Prodanova</i>	
On the Adaptive Time-Stepping in Radio-Frequency Liver Ablation Simulation: Some Preliminary Results.	397
<i>K. Georgiev, N. Kosturski, and Y. Vutov</i>	

Nonlinear Forced Vibration Analysis of Elastic Structures by Using Parallel Solvers for Large-Scale Systems.	405
<i>Stanislav Stoykov and Svetozar Margenov</i>	
A Multy-Domain Operational Chemical Weather Forecast System	413
<i>Dimitar Syrakov, Maria Prodanova, Iglia Etropolska, Kiril Slavov, Kostadin Ganev, Nikolay Miloshev, and Todor Ljubenov</i>	
Automatic Data Quality Control for Environmental Measurements	421
<i>A. Tchorbadjieff</i>	
Stability Properties of Explicit Runge-Kutta Methods Combined with Richardson Extrapolation	428
<i>Z. Zlatev, K. Georgiev, and I. Dimov</i>	
Numerical Solvers on Many-Core Systems	
Peta-Scale Hierarchical Hybrid Multigrid Using Hybrid Parallelization	439
<i>Björn Gmeiner and Ulrich Rüde</i>	
Many-Core Sustainability by Pragma Directives	448
<i>Andreas Kucher and Gundolf Haase</i>	
Towards Efficient Decomposition and Parallelization of MPDATA on Hybrid CPU-GPU Cluster	457
<i>Roman Wyrzykowski, Lukasz Szustak, Krzysztof Rojek, and Adam Tomas</i>	
Cloud and Grid Computing for Resource-Intensive Scientific Applications	
Distributed System for Query Processing with Grid Authentication.	467
<i>E. I. Atanasov, D. Georgiev, T. Gurov, A. Karaivanova, and Y. Nikolova</i>	
Performance Analysis of Cloud-Based Application	476
<i>Peter Budai and Balazs Goldschmidt</i>	
Some Basic Facts About the Atmospheric Composition in Bulgaria – Grid Computing Simulations	484
<i>Georgi Gadzhev, Kostadin Ganev, Nikolay Miloshev, Dimitar Syrakov, and Maria Prodanova</i>	
Harnessing Wasted Computing Power for Scientific Computing.	491
<i>Sándor Guba, Máté Öry, and Imre Szeberényi</i>	
Performance Analysis of Windows Azure Data Storage Options.	499
<i>Istvan Hartung and Balazs Goldschmidt</i>	

Performance Analysis of the Regional Grid Resources for an Environmental Modeling Application	507
<i>Radoslava Hristova, Sofiya Ivanovska, and Mariya Durchova</i>	
Framework for Genetic Algorithms Using Pilot Jobs in Adaptive Grid Workflows	515
<i>Boro Jakimovski, Bojan Ilijoski, Goran Velinov, and Dragan Sahpaski</i>	
Solvation of Fluoroform in Liquid Krypton: A Theoretical Cryospectroscopy Approach on a HPC Environment.	523
<i>Emilija Kohls, Dragan Sahpaski, Anastas Mishev, and Ljupco Pejov</i>	
Image Classification Optimization of High Resolution Tissue Images	532
<i>M. Kozłowski, K. Hegedűs, G. Windisch, L. Kovács, and G. Pintér</i>	
On the Management of Cloud Services in Multi-Clouds for Scientific Applications.	540
<i>Dana Petcu</i>	
GPU Calculations of Unsteady Viscous Compressible and Heat Conductive Gas Flow at Supersonic Speed	549
<i>Kiril S. Shterev, Emanouil I. Atanassov, and Stefan K. Stefanov</i>	
Pseudorandom Bit Generator with Parallel Implementation	557
<i>Borislav Stoyanov and Krasimir Kordov</i>	
Reengineering and Extending the Agents in Grid Ontology	565
<i>Paweł Szmeja, Katarzyna Wasielewska, Maria Ganzha, Michał Drozdowicz, Marcin Paprzycki, Stefka Fidanova, and Ivan Lirkov</i>	
Contributed Papers	
Fitting of Discrete Data with GERBS	577
<i>Jostein Bratlie, Rune Dalmo, and Peter Zanaty</i>	
Discrete Wavelet Compression of ERBS	585
<i>Rune Dalmo and Jostein Bratlie</i>	
Numerical Method for Solving Free Boundary Problem Arising from Fixed Rate Mortgages	593
<i>Juri D. Kandilarov</i>	
A Splitting Numerical Scheme for Non-linear Models of Mathematical Finance	602
<i>Miglena N. Koleva and Lubin G. Vulkov</i>	

Calibration of Parameters for Radio-Frequency Ablation Simulation	611
<i>N. Kosturski, S. Margenov, and Y. Vutov</i>	
Surfaces from Curves on Triangular Surfaces in Barycentric Coordinates . . .	619
<i>Arne Lakså</i>	
Robust Balanced Semi-coarsening Multilevel Preconditioning of Bicubic FEM Systems	628
<i>M. Lymbery</i>	
Mathematical Modeling of Thermal Stabilization of Vertical Wells on High Performance Computing Systems	636
<i>Natalia V. Pavlova, Petr N. Vabishchevich, and Maria V. Vasilyeva</i>	
Large-Scale Simulation of Non-uniform Load Traffic in Studying the Throughput of a Crossbar Packed Switch	644
<i>Tasho Tashev and Vladimir Monov</i>	
Author Index	653