## Contents

### Invited Papers

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preconditioners for Mixed FEM Solution of Stationary and Nonstationary Porous Media Flow Problems</td>
<td>3</td>
</tr>
<tr>
<td><em>Owe Axelsson, Radim Blaheta, and Tomáš Luber</em></td>
<td></td>
</tr>
<tr>
<td>Fast Constrained Image Segmentation Using Optimal Spanning Trees</td>
<td>15</td>
</tr>
<tr>
<td><em>Stanislav Harizanov, Svetozar Margenov, and Ludmil Zikatanov</em></td>
<td></td>
</tr>
<tr>
<td>On Computer Simulation of Fluid-Porous Structure Interaction Problems for a Class of Filtration Problems</td>
<td>30</td>
</tr>
<tr>
<td><em>Oleg Iliev, Dimitar Iliev, and Ralf Kirsch</em></td>
<td></td>
</tr>
<tr>
<td>Spin-Based CMOS-Compatible Devices</td>
<td>42</td>
</tr>
<tr>
<td><em>Viktor Sverdlov and Siegfried Selberherr</em></td>
<td></td>
</tr>
</tbody>
</table>

### Multilevel Methods on Graphs

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shortest-Path Queries in Planar Graphs on GPU-Accelerated Architectures</td>
<td>53</td>
</tr>
<tr>
<td><em>Guillaume Chapuis and Hristo Djidjev</em></td>
<td></td>
</tr>
</tbody>
</table>

### Mathematical Modeling and Analysis of PDEs Describing Physical Problems

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Numerical Approach to Price Path Dependent Asian Options</td>
<td>63</td>
</tr>
<tr>
<td><em>Tatiana Chernogorova and Lubin Vulkov</em></td>
<td></td>
</tr>
<tr>
<td>Operator-Difference Scheme with a Factorized Operator</td>
<td>72</td>
</tr>
<tr>
<td><em>Petr N. Vabishchevich</em></td>
<td></td>
</tr>
<tr>
<td>Computational Identification of the Right Hand Side of the Parabolic Equations in Problems of Filtration</td>
<td>80</td>
</tr>
<tr>
<td><em>V.I. Vasil’ev, M.V. Vasil’eva, A.M. Kardashevsky, and D. Ya. Nikiforov</em></td>
<td></td>
</tr>
</tbody>
</table>

### Numerical Methods for Multiphysics Problems

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algebraic Multigrid Based Preconditioners for Fluid-Structure Interaction and Its Related Sub-problems</td>
<td>91</td>
</tr>
<tr>
<td><em>Ulrich Langer and Huidong Yang</em></td>
<td></td>
</tr>
</tbody>
</table>
### Control and Uncertain Systems

  - Page 101
- Time-Optimal Control Problem in the Space of Probability Measures ................................ Giorgia Cavagnari and Antonio Marigonda
  - Page 109
- Sufficient Conditions for Small Time Local Attainability for a Class of Control Systems .................................................. Antonio Marigonda and Thuy Thi Le
  - Page 117
- Financing the Reduction of Emissions from Deforestation: A Differential Game Approach .................................................. Bernadette Riesner and Gernot Tragler
  - Page 126
- Relaxation of Euler-Type Discrete-Time Control System .................................................. Vladimir M. Veliov
  - Page 134

### Enabling Exascale Computation

- Uncertainty Quantification for Porous Media Flow Using Multilevel Monte Carlo .................................................. Jan Mohring, René Milk, Adrian Ngo, Ole Klein, Oleg Iliev, Mario Ohlberger, and Peter Bastian
  - Page 145
- Task-Based Parallel Sparse Matrix-Vector Multiplication (SpMVM) with GPI-2 .................................................. Dimitar Stoyanov, Rui Machado, and Franz-Josef Pfreundt
  - Page 153

### Efficient Algorithms for Hybrid HPC Systems

- On the Preconditioned Quasi-Monte Carlo Algorithm for Matrix Computations .................................................. V. Alexandrov, O. Esquivel-Flores, S. Ivanovska, and A. Karaivanova
  - Page 163
  - Page 172
- Towards RBF Interpolation on Heterogeneous HPC Systems .................................................. Gundolf Haase, Dirk Martin, and Günter Offner
  - Page 182
- On the Relation Between Matrices and the Greatest Common Divisor of Polynomials .................................................. Nikolai L. Manev
  - Page 191
Applications of Metaheuristics to Large-Scale Problems

Distributed Evolutionary Computing Migration Strategy by Incident Node Participation. .................................................. 203
  Todor Balabanov, Iliyan Zankinski, and Maria Barova

Slot Machine RTP Optimization and Symbols Wins Equalization with Discrete Differential Evolution. ......................... 210
  Todor Balabanov, Iliyan Zankinski, and Bozhidar Shumanov

Application of Ants Ideas on Image Edge Detection ......................... 218
  Stefka Fidanova and Zlatolilya Ilcheva

ACD with ESN for Tuning of MEMS Kalman Filter. ...................... 226
  Petia Koprinkova-Hristova and Kiril Alexiev

Optimal Discretization Orders for Distance Geometry:
A Theoretical Standpoint .................................................. 234
  Antonio Mucherino

Sensitivity Analysis of Checkpointing Strategies for Multimemetic Algorithms on Unstable Complex Networks .................. 243
  Rafael Nogueras and Carlos Cotta

Free Search in Multidimensional Space III .............................. 251
  Kalin Penev

Speeding up Parallel Combinatorial Optimization Algorithms with Las Vegas Method ................................................. 258
  Bogdan Zavalnij

Computational Microelectronics — From Monte Carlo to Deterministic Approaches

Optimization of the Deterministic Solution of the Discrete Wigner Equation .... 269
  Johann Cervenka, Paul Ellinghaus, Mihail Nedjalkov, and Erasmus Langer

The Influence of Electrostatic Lenses on Wave Packet Dynamics ......... 277
  Paul Ellinghaus, Mihail Nedjalkov, and Siegfried Selberherr

  Joydeep Ghosh, Dmitry Osintsev, Viktor Sverdlov, Josef Weinbub, and Siegfried Selberherr

Free Open Source Mesh Healing for TCAD Device Simulations .......... 293
  Florian Rudolf, Josef Weinbub, Karl Rupp, Peter Resutik, Andreas Morhammer, and Siegfried Selberherr
A Non-Equilibrium Green Functions Study of Energy-Filtering Thermoelectrics Including Scattering .................................................. 301
  Mischa Thesberg, Mahdi Pourfath, Neophytos Neophytou, and Hans Kosina

Parallelization of the Two-Dimensional Wigner Monte Carlo Method ...... 309
  Josef Weinbub, Paul Ellinghaus, and Siegfried Selberherr

Large-Scale Models: Numerical Methods, Parallel Computations and Applications

A Splitting Numerical Method for Primary and Secondary Pollutant Models . . 319
  Tatiana Chernogorova, Ivan Dimov, and Lubin Vulkov

Snow Cover Assessment with Regional Climate Model - Problems and Results .............................................................................. 327
  Hristo Chervenkov, Todor Todorov, and Kiril Slavov

Input Data Preparation for Fire Behavior Fuel Modeling of Bulgarian Test Cases (Main Focus on Zlatograd Test Case) ........................................ 335
  Georgi Dobrinkov and Nina Dobrinkova

Supervised 2-Phase Segmentation of Porous Media with Known Porosity . . 343
  Ivan Georgiev, Stanislav Harizanov, and Yavor Vutov

Image Processing Methods in Analysis of Component Composition and Distribution of Dust Emissions for Environmental Quality Management. . . 352
  Andrew Kokoulin, Irina May, and Anastasiya Kokoulina

Fully Implicit Time-Stepping Schemes for a Parabolic-ODE System of European Options with Liquidity Shocks ......................................... 360
  Miglena N. Koleva and Lubin G. Vulkov

Thermoelectrical Tick Removal Process Modeling. ................................. 369
  Nikola Kosturski, Ivan Lirkov, Svetozar Margenov, and Yavor Vutov

Performance Analysis of Block AMG Preconditioning of Poroelasticity Equations ........................................................................ 377
  Nikola Kosturski, Svetozar Margenov, Peter Popov, Nikola Simeonov, and Yavor Vutov

Surface Constructions on Irregular Grids ................................................. 385
  Arne Lakså and Børre Bang

Spline Representation of Connected Surfaces with Custom-Shaped Holes. . 394
  Aleksander Pedersen, Jostein Bratlie, and Rune Dalmo
Contributed Papers

Schur Complement Matrix and Its (Elementwise) Approximation: A Spectral Analysis Based on GLT Sequences

Ali Dorostkar, Maya Neytcheva, and Stefano Serra-Capizzano

An Iterative Process for the Solution of Semi-Linear Elliptic Equations with Discontinuous Coefficients and Solution

Aigul Manapova

Extremal Interpolation of Convex Scattered Data in $\mathbb{R}^3$ Using Tensor Product Bézier Surfaces

Krassimira Vlachkova

Author Index
Large-Scale Scientific Computing
10th International Conference, LSSC 2015, Sozopol, Bulgaria, June 8-12, 2015. Revised Selected Papers
Lirkov, I.; Margenov, S.; Waśniewski, J. (Eds.)
2015, XIII, 444 p. 127 illus. in color., Softcover
ISBN: 978-3-319-26519-3