PROCEEDINGS OF
THE 2010 INTERNATIONAL CONFERENCE ON
SCIENTIFIC COMPUTING

CSC

Editors
Hamid R. Arabnia
George A. Gravvanis

Associate Editors
Lou D'Alotto, James Nystrom
Ashu M. G. Solo, William Spataro
Emre Tokgoz

WORLDCOMP'10
July 12-15, 2010
Las Vegas Nevada, USA
www.world-academy-of-science.org

©CSREA Press
Contents

SESSION: KEYNOTES AND INVITED LECTURES

WORLDCOMP/CSC Keynote: Computing with Words and Perceptions - A Paradigm Shift
Lotfi A. Zadeh

The Infinity Computer and Numerical Computations with Infinite and Infinitesimal Numbers
Yaroslav Sergeyev

SESSION: WORKSHOP ON CELLULAR AUTOMATA, THEORY AND APPLICATIONS

Modelling Discrete and Continuous in the Framework of the New Computational Paradigm
Working Numerically with Infinite and Infinitesimal Numbers
Yaroslav Sergeyev

Simple Cellular Automata-Based Linear Models for a Class of Sequence Generators
Amparo Fuster-Sabater, Pino Caballero-Gil

A Cellular Automata-Based Cryptographic Model with a Variable-Length Ciphertext
Gina Oliveira, Luiz Martins, Leonardo Alt, Giordano Ferreira

A Cellular Automaton Approach for Heat Propagation Under High Gradients
Michael Mueller, Georg-Peter Ostermeyer

Automatic Programming with Combinatorial Topology of Modular Cellular Automata,
Distributed Cellular Automata and Multi-Scale Cellular Automata
John-Thomes Amenyo

Application Context of the SCIDDICA Model Family for Simulations of Flow-Like Landslides
Maria Vittoria Avolio, Salvatore Di Gregorio, Valeria Lupiano, Paolo Mazzanti, William Spataro

A Multithread Scientific Library for Complex Systems
William Spataro, Donato D'Ambrosio, Giuseppe Filippone, Rocco Rongo, Giuseppe Spingola, Pietro Zaccaro, Giuseppe Zito

Random Walks of Tetrahedrons and Cubes
J.F. Nystrom, J. C. Robinson

Cellular Automata Approach to Corrosion and Passivity Phenomena
Dung di Caprio, Janusz Stafiej
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA based Self-Testing and Self-Organizing Processing Arrays</td>
<td>68</td>
</tr>
<tr>
<td>André Stauffer, Joël Rossier</td>
<td></td>
</tr>
<tr>
<td>A Minimal Spatial Cellular Automata for Hierarchical Predatory Prey Simulation of Food Chains</td>
<td>75</td>
</tr>
<tr>
<td>Ken Hawick, Chris Scogings</td>
<td></td>
</tr>
<tr>
<td>An 4-state 3-neighborhood Cellular Automata Pseudorandom Number Generator based on 2-state 3-neighborhood Evolution</td>
<td>81</td>
</tr>
<tr>
<td>Sang-Ho Shin, Kee-Young Yoo</td>
<td></td>
</tr>
<tr>
<td>Temporal Complexity of Totalistic Cellular Automaton Rule 52</td>
<td>87</td>
</tr>
<tr>
<td>Weifeng Jin, Fangyue Chen</td>
<td></td>
</tr>
<tr>
<td>Cellular Automata in Gentrification of City</td>
<td>93</td>
</tr>
<tr>
<td>M. Hadi Kaboli</td>
<td></td>
</tr>
<tr>
<td>A Linear Cellular Automata-Based Model for Generating Cryptographic Sequences</td>
<td>100</td>
</tr>
<tr>
<td>Amparo Fuster-Sabater, Pino Caballero-Gil</td>
<td></td>
</tr>
<tr>
<td>SESSION: NOVEL APPLICATIONS + ALGORITHMS + APPROXIMATION METHODS</td>
<td></td>
</tr>
<tr>
<td>An Integer Programming Formulation for a Single Pallet in the Airlift Loading Problem with Insufficient Aircraft</td>
<td>107</td>
</tr>
<tr>
<td>August Roesener, Shane Hall, Yasar G. Ozen</td>
<td></td>
</tr>
<tr>
<td>Fourier Transform for Pricing Asian Options with Higher-Order Convergence Rates</td>
<td>114</td>
</tr>
<tr>
<td>Chun-Yuan Chiu, Tian-Shyr Dai, Yu-Cheng Tien</td>
<td></td>
</tr>
<tr>
<td>Predictive Modeling of Forecast Uncertainty in the Route Availability Planning Tool (RAPT)</td>
<td>122</td>
</tr>
<tr>
<td>John Hayward, Ngaire Underhill, Richard DeLaura</td>
<td></td>
</tr>
<tr>
<td>The Direct Algorithm Applied to a Problem in Biomechanics with Conformal Mapping</td>
<td>128</td>
</tr>
<tr>
<td>David Easterling, Layne Watson, Michael Madigan</td>
<td></td>
</tr>
<tr>
<td>Linear-Time Combinatorial Option Pricing Algorithms on the Trinomial Lattice Model</td>
<td>134</td>
</tr>
<tr>
<td>Tzu-Chun Chen, Tian-Shyr Dai, Jr-Yang Wang</td>
<td></td>
</tr>
<tr>
<td>Finite Element Analysis of Backfill Above Buried Corrugated Steel Plate Structure</td>
<td>142</td>
</tr>
<tr>
<td>Baodong Liu, Zhimao Feng, Li Feng</td>
<td></td>
</tr>
<tr>
<td>An Efficient Multiplication Algorithm for Thin Matrices and for Matrices with Similar Rows and Columns</td>
<td>147</td>
</tr>
<tr>
<td>Abdullah N Arslan, Arvind Chidri</td>
<td></td>
</tr>
</tbody>
</table>
Autonomous Control of 1-Trailer Mobile Robots
Krishna Raghuvaiya, Shonal Singh, Bibhya Sharma, Jito Vanualailai

Finding the Convex Hull of a Simple Polygon
Ebrahim Yazdi, Vahid Azizi, Ali Nourollah

Nonlinear Motion Planning and Control for Differential Drive Systems
Hamendra Manhar Reddy, Bibhya Sharma, Jito Vanualailai

Third Order Variants of Steffensen Type Methods and Geometric Interpretation
Yilian Zhang

A New Method for Differential Equations
Michael George

Multi-degree-of-freedom Test Benches from Composite Materials
Kamil Khairnasov, Rustem Mulyukov

Swirl Decay in Pneumatic Particulate Conveyance
Farhan Syed, Randall Manteufel

Remi Leandre

SESSION: WAVELETS + WAVE ALGORITHMS
Efficiency in Computing Correlation Matrix of Wavelet Coefficients by Exploiting Index Structure
Claude Turner

Chaotic Regions in Turbulent Magneto-hydro-dynamical (MHD) Waves
Nora Nassiri Mofakham

Study on Solution of Ill-Posed Integral Equations with Wavelet Bases
Khosrow Maleknejad, Kazem Nouri, Leila Torkzadeh

SESSION: COMPUTATIONAL MODELS, SIMULATION, AND NOVEL METHODOLOGIES + HPC
Performance Modeling, Analysis, and Optimization of Cell-List Based Molecular Dynamics
Manaschai Kunaseth, Rajiv K. Kalia, Aiichiro Nakano, Priya Vashishta
Accuracy of the Immersed Boundary Method in Fixed-Point Arithmetic
Gabor Ferencz, Eric Peskin, Charles Peskin

Integrating Dam Breach Modules to Analyze Earth Embankment Dams
Mitchell L. Neilsen, Darrel M. Temple, Gregory J. Hanson

An Evaluation of Parallel Knapsack Algorithms on Multicore Architectures
Hammad Rashid, Clara Novoa, Apan Qasem

A Dynamical Implementation of the Stockholm Resilience Center 'Safe Operating Space' Model
Jack Horner

High-order Parallel Iterative Method For The Heat Equations
Wenrui Hao, Chang Liu

A Scalable Distributed Memory Programming Model for Large-Scale Biological Systems Simulation
Joo Hong Lee, Mark Jones, Paul Plassmann

MapReduce Programming Model for Matrix Computations
Son Tran

Calculation of Lyapunov Exponent Spectras Based on Different Parameter Sets in the Bonhoeffer-van der Pol Model
Wei Pi, Jinwook Shin, Sanghoon Yang, DongSun Park

A Parallel Needleman-Wunsch-Hirschberg Bio-sequence Alignment Algorithm
Luis de la Torre, Jaime Seguel

Computation of the Partially Plastic Stresses in Graded Curved Bars
Eray Arslan, Ahmet N. Eraslan

SESSION: NUMERICAL METHODS, MODELING AND APPLICATIONS + SCIENTIFIC COMPUTING TOOLS

Numerical Methods for Heat Conduction in Systems of Arbitrarily Different Materials
Edward J. Dai

Analysis of Grooved Journal Bearings Using Backward Derivation Approach
Feng-Yi Hsu, Yuan Kang

Collocation and Numerical Quadrature Errors in the Numerical Solution of Linear Volterra Integral Equations of the Second Kind
Khosrow Maleknejad, Esmaeil Najafi, Parvin Torabi
A Mathematica-Based Hydrodynamics Model
George E. Hrabovsky

SESSION: REAL AND/OR DISCRETE OPTIMIZATION AND CONVEXITY

The Number of Minimal Points, Minimal Values and Related Algorithms for Non-linear Mixed Convex Functionals with Unbounded Domain
Emre Tokgoz

The Number of Minimal Points, the Minimal Values and Related Algorithms of Non-linear Mixed Convex Functionals with Bounded Domain
Emre Tokgoz, Asif Adnan

SESSION: DIFFERENTIATION FILTERS, JOB SHOP SCHEDULING, CONSTRAINT PROGRAMMING, SIMULATION, STATISTICAL GEOMETRY, AND SVM

Filters on the Fly - Least Squares Digital Differentiators (LSDD)
Abdulwahab Abokhodair

Introduction to Statistical Geometry
Reza Ahangar

Deep Memory Greedy Search with PSO for the Allocation of Job Shop Scheduling for Optimizing Shop Floor Performance
Hemamalini T, Senthivel A N, Somasundaram S, Ramesh L Thulasiram

Novel Collaborative Constraints Solving Techniques - Case Studies on Synchronizing a MIP Solver and a CP Solver
Chendong Li, Jiayin Wang, Yichen Liu

Large Scale VLSI Circuit Simulation Using Point Relaxation
Subhendu Roy, Yogesh Save, H. Narayanan, Sachin Patkar

Computing Forced Two-Dimensional Turbulence Using Direct Numerical Simulations: Geometrical Aspects
Haris Catrakis

Multidimensional Matrix Algebra and Multidimensional Matrix Calculus: Part 1 of 5
Ashu M. G. Solo