# Grand Challenges in Modeling and Simulation Symposium 2008

# (GCMS 2008)

**Part of the 2008 Summer Simulation Multiconference (SummerSim'08)**

## Edinburgh, Scotland
## 16-19 June 2008

**ISBN: 978-1-62276-360-3**

**Printed from e-media with permission by:**

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571
www.proceedings.com

Some format issues inherent in the e-media version may also appear in this print version.

© 2008 SIMULATION COUNCILS, INC.

Responsibility for the accuracy of all statement in each paper rests solely with the author(s). Statements are not necessarily representative of, nor endorsed by, The Society for Modeling and Simulation International.

Printed by Curran Associates, Inc. (2012)

Permission is granted to photocopy portions of this publication for personal use and for the use of students provided credit is given to the conference and publication. Permission does not extend to other types of reproduction nor to copying for incorporation into commercial advertising nor for any other profit-making purpose. Other publications are encouraged to include 300- to 500-word abstracts or excerpts from any paper contained in this book, provided credits are given to the author and the conference. For permission to publish a complete paper write: The Society for Modeling and Simulation International (SCS), 2598 Fortune Way, Suite I, San Diego, CA 92081, USA.

**Additional copies of the Proceedings are available from:**

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571
curran@proceedings.com
www.proceedings.com/0128.html

or

The Society for Modeling
and Simulation International
2598 Fortune Way, Ste I
Vista, CA 92081 USA
www.scs.org

ISBN: 978-1-62276-360-3
PRINTED IN THE UNITED STATES

# TABLE OF CONTENTS

**The Relationship Between Software Architectures and Visual Programming Languages** ..... 1
*Adam Manzanares, J. A. Hamilton Jr., Xiao Qin*
**Modelling of Cascaded and Interleaved Switched Mode Power Converters using Bond Graphs** ..... 10
*Amod C. Umarikar, Ned Mohan*
**Distributed Simulation of a Large Scale Power Distribution Network** ..... 17
*Michael Kleinberg, Karen Miu, Chika Nwankpa*
**Gradient-Free Stochastic Sensitivity Analysis of the Shipboard Power System** ..... 21
*P. Prempraneerach, J. Foo, M. S. Triantafyllou, C. Chryssostomidis, G. E. Karniadakis*
**On the Stability of Bi-Rate Linear Systems Using Trapezoidal Integration** ..... 28
*Richard Bednar, Roy E. Crosbie*
**A Voltage Driven Field Reconstruction Method for Modeling of Electromechanical Energy Converters** ..... 37
*Amir Khoobroo, Mozhgan Kiani, Babak Fahimi*
**Reliability Modeling of Circuits with Multi-State Aging Gates** ..... 43
*Sanja Lazarova-Molnar, Valeriu Beiu*
**Modelling of Submarine Power System using MATLAB and Simulink** ..... 48
*A. C. Bennett, D. J. Browning*
**Using FPGAs for Ultra-High-Speed Real-Time Simulation** ..... 53
*Dale Word, John J. Zenor, Robert Powelson*
**Multi-Party, Multi-Rate Simulation of an Unmanned Underwater Vehicle** ..... 58
*John J. Zenor, R. Bednar, Sourabh Bhalerao*
**Generalized Non-linear Terminal Modeling Electro-magnetic Interference** ..... 64
*Andrew C. Baisden, Dushan Boroyevich, Fred Wang*
**Modelling and Analysis of a Wire Drawing Machine** ..... 72
*Klemens G. Schulmeister, Martin Kozek*
**Modeling Topological Survivability of Power Systems** ..... 80
*S. V. Poroseva, M. Y. Hussaini, S. L. Woodruff*
**A New Methodology for Automated Assessment of Fault Detection and Isolation Possibilities in Large Power Systems** ..... 88
*D. Düstegör, S. V. Poroseva, M. Y. Hussaini, S. L. Woodruff*
**Design and Basic Evaluation of High-Performance Simulation Engine for HLA Distributed Simulation** ..... 96
*Atsuo Ozaki, Masashi Shiraishi, Hiroyuki Sato, Kazutaka Matsushita, Shusuke Watanabe, Masakazu Furuichi*
**Comparison of Polynomial and Neural Network Models for Information Extraction from a Data Base of Measurements** ..... 105
*Andrea Lorenz, Martin Kozek*
**Considering Uncertainty in Assessment of Impact of Pulse Load Charging Event on Shipboard Power System** ..... 113
*James Langston, Michael Steurer, Thomas Baldwin, Josh Taylor, Franz Hover, James Simpson*
**Automatic Control Parameter Optimization via Controller-in-the-Loop Real-Time Simulation** ..... 121
*Wei Ren, Mischa Steurer, Il-Yop Chung, John Hauer, Ferenc Bogdan*
**All Electric Ships, Internal Compartments and Cabinets Thermal and Psychrometric Simulation** ..... 127
*J. V. C. Vargas, J. C. Ordonez, R. Hovsapian, F. G. Dias*
**Applications of Inverse Simulation Methods to a Nonlinear Model of an Underwater Vehicle** ..... 135
*D. J. Murray-Smith, Linghai Lu, E. W. McGookin*
**Inverse Simulation Methods and Applications** ..... 143
*David J. Murray-Smith, Linghai Lu*
**Uncertainty Analysis of Large-Scale Power Systems Using Collocation** ..... 151
*Josh A. Taylor, Franz S. Hover, Abdelhamid Ouroua*
**Molecular Dynamic Simulations of an Atomic Vacancy in FCC Metal** ..... 159
*Michael S. Sellers, Shidong Li, Cemal Basaran, David A. Kofke*
**Simulating Electromigration and Thermomigration in Power Electronics Packaging** ..... 165
*Shidong Li, Mohd F. Abdulhamid, Cemal Basaran*
**Hybrid-Simulation of Degradation in High Density Power Electronics Packaging** ..... 172
*Mohd Foad Abdulhamid, Cemal Basaran*

**Simulation Model of a Three-port Bi-directional Series Resonant DC-DC Converter to Determine Component Specifications** ..... 180
*H. Krishnaswami, N. Mohan*
**Loss Estimation in High Frequency AC Link Power Electronic Transformer by SABER Simulation** ..... 185
*Kaushik Basu, Amod C. Umarikar, K. K. Mohapatra, Ned Mohan*
**Model Creation for All Electric Ship (AES) Power Systems** ..... 191
*Peter R. Wilson, H. Alan Mantooth, Enrico Santi, Jerry Hudgins*
**Further Research and Application of CoSim (Collaborative Simulation) Grid** ..... 198
*Bohu Li, Xudong Chai, Wenhai Zhu, Baocun Hou, Zhen Tang, Shuai Fan, Chen Yang*
**Research on Independent and Dynamic Fault-Tolerant and Migration Technology for Simulation Grid Resources** ..... 205
*Baocun Hou, Xudong Chai, Bohu Li, Tan Li, Yabin Zhang, Zhihui Zhang*
**Real-time Simulation and Optimization of Multi-scale Shipboard Power Systems** ..... 212
*Yanhui Xie, Gayathri Seenumani, Jing Sun*
**Using Mathematical and Scientific Markup as an Approach to Model Specification** ..... 220
*Joseph B. Collins*
**Nonlinear Hull Form Transformation for Use with Design Optimization** ..... 227
*Steven F. Zalek, Robert F. Beck, Michael G. Parsons*
**Model Development of Large-Scale DoD System-of-Systems** ..... 235
*Santiago Balestrini Robinson, Yongchang Li, Janel N. Nixon, Dimitri N. Mavris*
**Impacts of Type-2 Fuzzy Modeling Approach on Set-Based Design, Based On Results from an Existing Hybrid Agent Design Experiment** ..... 243
*Alexander W. Gray, David J. Singer*
**Realization of the DEVS Formalism In MATLAB/Simulink** ..... 251
*Kyung M. Seo, Tag G. Kim, Chang H. Sung*
**Challenges in Uncertainty-based, Self-configuring Simulation for Design Support** ..... 257
*F. Ponci*
**Empirical Distribution Enhanced Quality Function Deployment Process For Ship Systems Design And Planning** ..... 263
*Stefanos Koullias, Janel N. Nixon, Dimitri N. Mavris*
**Switching Loss Optimization in Hysteresis-Current-Controller Driven Direct-Matrix Converter using MATLAB/Simulink** ..... 271
*Rashmi Prasad, K. K. Mohapatra, Ned Mohan*
**Isogeometric Modeling for Finite Element Analysis: B-Spline Finite Element Development with Rotational Degrees of Freedom** ..... 278
*Hyun Chung, Dale G. Karr*
**Simulation Advances using the ESL Simulation Language and the Virtual Test Bed** ..... 285
*John G. Pearce*
**Modeling and Validation of an Overcurrent Relay Using LabVIEW and RTDS** ..... 291
*Sunil K. Palla, Anurag K. Srivastava, Noel N. Schulz*
**Simulations to Study the Stability Issues in a Shipboard Power System** ..... 299
*Yamilka Báez-Rivera, Noel N. Schulz, Anurag K. Srivastava*
**Improving Requirements Definition for Systems in the Seabasing Concept through Interactive Visualization** ..... 305
*Elise Beisecker, Christianna Taylor, Janel Nixon, Dimitri Mavris*
**Designing and Testing Protective Overcurrent Relay Using Real Time Digital Simulation** ..... 313
*Ankush Saran, Padmavathy Kankanala, Anurag K. Srivastava, Noel N. Schulz*
**Common Information Model for Sensors** ..... 321
*Vinoth M. Mohan, Noel N. Schulz, Anurag K. Srivastava*
**Modeling and Simulation of MAS-Based Reconfiguration for an Integrated Power System** ..... 328
*Qiuli Yu, Noel N. Schulz*
**Comparative Assessment of Differential Relay Model Performance with Hardware Equipment** ..... 336
*Vamsi K. Vijapurapu, Noel N. Schulz, Anurag K. Srivastava, Jimena Bastos*
**FPGA-based Large-scale Parallel Power System Simulation** ..... 343
*Y. Shi, A. Monti*
**Latency-Insertion Method as a Way to Increase Stability and Speed of Co-Simulation** ..... 348
*A. Heilman, A. Monti*
**Propagation of Uncertainty Through Signal Flow Simulation Using Polynomial Chaos Theory** ..... 356
*A. Smith, A. Monti, F. Ponci*
**Logical Analysis of DEVS Models Using Z** ..... 362
*Mohamed Wassim Trojet, Mâmar El-Amine Hamri, Claudia Frydman*

**Damping Impedance Method of Multi-Step Parallel Simulation of Natural-Coupled Systems** ..... 370
*Rodrigo Leonard, Philip Crapse, Roger Dougal*

**Use of Models in the Specification and Procurement of Power Electronic Equipment in Power Systems Center** ..... 376
*A. M. Gole, S. Filizadeh, D. A. Woodford, G. D. Irwin*

**Application of a Multiplayer Computer Gaming Paradigm to Engineering Design Tools** ..... 383
*Jeremiah Shepherd, Jian Shi, Tianlei Zhang, Jijun Tang, Roger A. Dougal*

**Certify: A Parameter Extraction Tool for Power Semiconductor Device Models** ..... 389
*W. Li, Y. Feng, P. R. Wilson, H. A. Mantooth, E. Santi, J. L. Hudgins*

**System Modeling for Power Electronics** ..... 396
*Luis Garcés, Chunchun Xu, Xianghui Huang, Paul Szczesny*

**Modeling and Simulation of a Biomimetic Underwater Vehicle** ..... 402
*Chris Watts, Euan McGookin*

**Particle Swarm Optimization of SynRM for Traction Applications** ..... 409
*A. A. Arkadan, M. N. Elbsat , M. A. Mneimneh*

**Modelling and Simulation in All Phases of Space Mission and System Development** ..... 413
*Joachim Fuchs*

**Polytopic Black-Box Modeling of a Flyback Converter** ..... 419
*Luis Arnedo, Dushan Boroyevich, Rolando Burgos, Fred Wang*

**The Micromagnetic Modeling and Simulation Kit $M^3S$ for the Simulation of the Dynamic Response of Ferromagnets to Electric Currents** ..... 427
*Massoud Najafi, Benjamin Krüger, Stellan Bohlens, Gunnar Selke, Bernd Güde, Markus Bolte, Dietmar P. F. Möller*

**Practical Hydrodynamic Optimization of Ship Hull Forms** ..... 435
*Chi Yang, Hyunyul Kim, Rainald Löhner, Francis Noblesse*

**Design of a Spatial and Stochastic Simulator for Bird Flu Spreading in Corsica** ..... 445
*D. R. C. Hill, A. Muzy, R. Barraud, B. Crozat, J. Madary, F. Leccia*

**Towards a Social Responsible Agents in Hybrid Organization** ..... 453
*W. Alshabi, M. Itmi, S. Ramaswamy, H. Abdulrab*

**Simulating a Predator/Prey Relationship** ..... 458
*Charles E. Knadler Jr.*

**Air Gap Flux Estimation of Dual Stator Winding Induction Machine Using Winding Function Approach** ..... 466
*Zhiqiao Wu, Olorunfemi Ojo, Michael Omoigui*

**Thermal-Mechanical Damage Prediction Toolkit for Composite Structures Subject to Fire** ..... 472
*Jim Lua, Jay Shi, Paul Desjardin, Scott Case*

**Using e-Learning to Achieve a Sustainable Development of High Quality University Education as Part of the University Reform Program in Ethiopia** ..... 480
*Dietmar P. F. Möller, Gerhard Reik*

**Environmental Challenges of Intermodal Transportation** ..... 484
*Dietmar P. F. Möller, Jochen Wittmann, Volker Gollnick*

**Analysis of Shipboard Reconfigurable Firemain Systems** ..... 488
*Don Dalessandro, Albert Ortiz, Kevin J. Brown, Qing Dong, Li Bai, Saroj Biswas*

**Reconfiguration of Heterogeneous Systems Using Distributed Controls** ..... 494
*Karl Schoder, Sanjeev Srivastava, Andreas Poelzleitner, David Cartes*

**Design Optimization of Hybrid Electric Vehicle Power Train Using Particle Swarm Optimization** ..... 500
*N. Al-Aawar, A. A. Arkadan*

**Quantized State System Simulation** ..... 504
*François E. Cellier, Ernesto Kofman, Gustavo Migoni, Mario Bortolotto*

**Horizontal Interaction of Two Gas Bubble Columns** ..... 511
*R. Mosdorf, R. C. Huntsinger*

**Author Index**