

# **29th European Conference on Modelling and Simulation**

**(ECMS 2015)**

**Albena (Varna), Bulgaria  
26-29 May 2015**

**Editors:**

**Valeri M. Mladenov  
Grisha Spasov**

**Petia Georgieva  
Galidiya Petrova**

ISBN: 978-1-5108-0642-9

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

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



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

Copyright© (2015) by the European Council for Modelling and Simulation  
All rights reserved.

Printed by Curran Associates, Inc. (2015)

For permission requests, please contact the European Council for Modelling and Simulation  
at the address below.

[ecms@scs-europe.net](mailto:ecms@scs-europe.net)

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2634  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# TABLE OF CONTENTS

## Plenary Talks - Abstracts

<b>Causality Versus Predictability In Neural Network Modeling</b> <i>Hans-Georg Zimmermann</i> .....	5
<b>Design And Implementation Of Robust Control Laws</b> <i>Petko H. Petkov, J. Krlev, Ts. Slavov</i> .....	6
<b>Multi-Formalism Modeling Of Human Organizations</b> <i>Alexander H. Levis</i> .....	19

## Agent-Based Simulation

<b>Role Of Optimist On Emergence Of Cooperation In Demographic Multi-Attribute Donor-Recipient Game</b> <i>Tsuneyuki Namekata, Yoko Namekata</i> .....	35
<b>Stochastic Multi-Agent Patrolling Using Social Potential Fields</b> <i>Evgeny Shvets</i> .....	42
<b>Confidential Areas In Innovation Communities: An Agent-Based Model Using Fuzzy Logic and Qualitative Empirical Data</b> <i>Michael A. Zaggl, Benjamin Stahl, Zeng Zhong</i> .....	50
<b>Application Of Agent-Based Multimethod Simulation Approach To The Simulation Testbed Prototype For The Concept Exploration And Requirement Analysis Of UGV</b> <i>Sang Yeong Choi, Kang Park, Ji Hyun Yang, Hwan Il Kang</i> .....	57
<b>A First Step Towards Dynamic Hybrid Traffic Modeling</b> <i>Najja Bouha, Gildas Morvan, Hassane Abouaissa, Yoann Kubera</i> .....	64
<b>From Text To Agents – Process Of Developing Evidence-Based Simulation Models</b> <i>Ulf Lotzmann, Martin Neumann, Michael Moehring</i> .....	71

# Simulation of Complex Systems and Methodologies

## Modeling And Simulation Of Torque Distribution Control Strategy For A Series-Parallel Hybrid Electric Bus

*Yicun Xu, Shouchen Pan, Dongchen Qin, Yingjia Wang* .....81

## Upgrading Of The Hydrogeological Model Of Latvia

*Aivars Spalvins, Janis Slangens, Inta Lace, Kaspars Krauklis, Olgerts Aleksans*.....87

## Energy And Information Aspects Of Self-Organisation Of Ecological Systems: Mathematical Models And Interpretations

*Serge V. Chernyshenko, Roman V. Ruzich* .....94

## Modeling And Simulation Of *Caenorhabditis elegans* Chemotaxis In Response To A Dynamic Engineered Bacteria

*Divya A. Pandya, Christopher A. Blonar, Robert P. Smith, Evan C. Haskell* .....100

## Simulation Studies Of The Implementation Of Centralized Two-Phase Locking In DDBMS

*Alina Culciar, Svetlana Vasileva* .....107

## Flood Prediction Model Simulation With Heterogeneous Trade-Offs In High Performance Computing Framework

*Antonio Portero, Radim Vavrik, Stepan Kuchar, Martin Golasowski, Vit Vondrak, Simone Libutti, Giuseppe Massari, William Fornaciari* .....115

# Finance, Economics and Social Science

## Heavy Context Dependence — Decisions Of Underground Soldiers

*Krzysztof Kulakowski, Krzysztof Malarz, Malgorzata J. Krawczyk* .....125

## Resiliency On Order-Driven Markets

*Daniel Havran, Kata Varadi* .....132

## A Simulation Based Approach For The Evaluation Of Outcome Driven Innovation Models

*Marco Gribaudo, Mauro Iacono, Daniele Manini, Marco Pironti, Paola Pisano*.....138

# Simulators for Virtual Prototyping and Training

## **A Computer-Automated Design Tool For Intelligent Virtual Prototyping Of Offshore Cranes**

*Robin T. Bye, Ottar L. Osen, Birger Skogeng Pedersen*.....147

## **Collaborative Virtual Environment For Engineering Laboratory**

*Shuo Ren, Frederic D. McKenzie* .....157

## **Scalable And User-Friendly Simulation**

*Adrian Rutle, Hao Wang, Robin T. Bye, Ottar L. Osen* .....164

## **An Object-Oriented Approach For Virtual Prototyping In Conceptual Ship Design**

*Icaro A. Fonseca, Henrique M. Gaspar*.....171

## **Product Life-Cycle Management In Ship Design: From Concept To Decommission In A Virtual Environment**

*Sthefano L. Andrade, Thiago G. Monteiro, Henrique M. Gaspar* .....178

## **Enhancing Virtual Prototype In Ship Design Using Modular Techniques**

*Olivia S. Chaves, Marcus L. Nickelsen, Henrique M. Gaspar*.....185

# Electric, Electronic and Electromechanical Engineering

## **Diagnosis And Monitoring Of The PMSM Using The Analytical Model Method**

*Virginia Ivanov, Maria Brojboiu, Sergiu Ivanov* .....195

## **The Matlab GUI For The Equipment Computation Of The Production System For Instrument Transformer Manufacturing**

*Maria Brojboiu, Virginia Ivanov* .....201

## **Modification Of A Model Reduction Algorithm For Switched Dynamic Models: Synchronous Generator Case**

*Israel Nunez-Hernandez, Peter C. Breedveld, Paul B. T. Weustink* .....207

## **Comparison Of Several Control Strategies Of The BLDC Motors**

*Sergiu Ivanov, Virginia I. Ivanov, Daniel Cismaru, Florin Ravigan, Dan Selisteanu, Dorin Sendrescu*.....215

## **On Multi-Agent Strategies For Efficiently Designing Competent Integrated Hardware-Generic Simulation Systems Of Wireless Sensor Networks**

*Alexander Filippou, Dimitrios A. Karras* .....221

# Modelling, Simulation and Control of Technological Processes

<b>Half Car Suspension System Integrated With PID Controller</b> <i>Abdullahi B. Kunya, Atef A. Ata</i> .....	233
<b>LQ Control Of Heat Exchanger – Design And Simulation</b> <i>Vladimir Bobal, Petr Dostal, Marek Kubalcik, Stanislav Talas</i> .....	239
<b>A Simple DDS Algorithm For TDS: An Example</b> <i>Libor Pekar</i> .....	246
<b>Simulation Of Robust Algebraic Control Of A Delayed Heat Exchanger With Controller Rationalization</b> <i>Libor Pekar, Roman Prokop</i> .....	252
<b>Enhancing Energy Management Of A Car Manufacturing Plant Through Modelling And Dynamic Simulation</b> <i>Jouni Savolainen, Jari Lappalainen, Antti Aikala, Pekka Ruuska</i> .....	259
<b>Simulation Of Cascade Control Of A Continuous Stirred Tank Reactor</b> <i>Petr Dostal, Vladimir Bobal, Jiri Vojtesek</i> .....	266
<b>Simulation Of 1DOF And 2DOF Adaptive Control Of The Water Tank Model</b> <i>Jiri Vojtesek, Petr Dostal, Martin Maslan</i> .....	273
<b>Predictive Control With Filtering Of Input And Output Variables</b> <i>Marek Kubalcik, Vladimir Bobal</i> .....	280
<b>Modeling Of Alcohol Fermentation In Brewing –Integrated Approach For Control Of Continuous Alcohol Fermentation</b> <i>Stoyan Vassilev, Vasil Iliev, Vesela Shopska, Maria Kaneva, Georgi Kostov</i> .....	286
<b>The Gas Tiny Flow Measurement Instrumentation</b> <i>Milan Adamek, Petr Neumann, Martin Pospisilik</i> .....	292
<b>Method Of Explicit Predictive Control In Case Of Time-Delayed Heat System</b> <i>Stanislav Talas, Vladimir Bobal, Adam Krhovjak, Lukas Rusar</i> .....	299
<b>Possible Approaches Of Disturbance Compensation Of Time-Delayed Systems Using Predictive Control</b> <i>Radek Holis, Vladimir Bobal</i> .....	305

<b>A Comparison Of State Estimation Algorithms For Hybrid Systems</b>	
<i>Gan Zhou, Wenquan Feng, Gautam Biswas, Wenfeng Zhang, XiuMei Guan</i> .....	312
<b>A Model Of Small Airship’s Propelling</b>	
<i>Milan Adamek, Martin Pospisilik, Petr Neumann, Rui Miguel Soares Silva</i> .....	320
<b>Nonlinear Gain Scheduled Controller For A Sphere Liquid Tank</b>	
<i>Adam Krhovjak, Petr Dostal, Stanislav Talas, Lukas Rusal</i> .....	327
<b>Application Of Constraints In Predictive Control Of Time-Delay Systems</b>	
<i>Lukas Rusal, Stanislav Talas, Adam Krhovjak, Vladimir Bobal</i> .....	333
<b>Formulation And Preliminary Application Of An Integrated Model Of Microbial Fuel Cell Processes</b>	
<i>Andrea G. Capodaglio, Daniele Molognoni, Arianna Callegari</i> .....	340
<b>Simulation in Industry, Business and Services</b>	
<b>Functional Modelling And Simulation Of Overall System Ship – Virtual Methods For Engineering And Commissioning In Shipbuilding</b>	
<i>Olaf Berndt, Uwe Freiherr von Lukas, Arjan Kuijper</i> .....	347
<b>Study On Stabilisation Time And Impulse Forces Of Combat Vehicles For Enhancement Of Firepower Performance</b>	
<i>Hwan Il Kang, Hyun Soo Kim, Jai Jeong Pyun</i> .....	354
<b>Design And Simulation Of Process Improvement Scenarios</b>	
<i>Janis Grabis, Charu Chandra</i> .....	359
<b>Operational Flood Forecasting As A Web-Service</b>	
<i>Boris V. Sokolov, Anton Ev. Pashchenkoa, Semyon A. Potryasaeva, Alevtina V. Ziuban, Vyacheslav A. Zelentsov</i> .....	364

# Discrete Event Modelling and Simulation in Logistics, Transport and Supply Chain Management

## A Simulation Study Of Military Land Equipment Availability Under Corrective And Preventive Maintenance Regimes

*Peter C. Jentsch, Abdeslem Boukhtouta* .....373

## Time-Segmented Scatter Plots: A View On Time-Dependent State Relations In Discrete-Event Time Series

*Arne Koors, Bernd Page* .....380

## Simulation and Optimization

### Influence Of Eccentricity On Synchronous Reactive Frequency Doubler

*Aleksandrs Mesnajevs* .....393

### A Precedent-Oriented Simulation In Designing The Templates Of Airplane Parts

*Petr Sosnin* .....398

### A Tool For A Flexible Posterior Analysis Of Simulation Experiments

*Christian Mueller, Christian Krueger* .....406

### Ensemble Population Based Discrete Harmony Search Algorithm For The Job Shop Scheduling Problem

*Lubos Matejcik, Donald Davendra* .....412

### A Compromise Based Fuzzy Goal Programming Approach With Satisfaction Function For Multiobjective Portfolio Optimisation

*Fang He, Rong Qu, Robert John* .....418

### Simulating Airline Marketing Strategies Using System Dynamics Modelling

*Olusola Theophilus Faboya, Peer-Olaf Siebers* .....425

### Memristor Modeling In MATLAB® & PSPICE®

*Valeri M. Mladenov, Stoyan M. Kirilov* .....432

### New Genetic Optimization Strategies In Efficient Off-Line Traffic Engineering For Simulating Multi-Service UMTS Cellular Networks

*Vasilios Pasiadis, Dimitrios A. Karras, Rallis C. Papademetriou* .....438

### Perturbation In Local Search For Scheduling

*Frank Herrmann* .....446



# Simulation of Intelligent Systems

## **A Smart Multimodal Innovative Model For Marine Environmental Monitoring**

*Alessandro Tonacci, Giovanni Lacava, Marco Andrea Lippa, Lisa Lupi, Giovanni Pioggia, Lavinio Gualdesi, Claudio Domenici, Michele Cocco.....455*

## **Emergence Of An Autonomous Robot's Behavior**

*Eva Volna, Martin Kotyrba, Martin Zacek, Adam Barton.....462*

## **Exact Fast Algorithm For Optimal Linear Separation Of 2D Distribution**

*Egor I. Ershov, Vassili V. Postnikov, Arseniy P. Terekhin, Dmitry P. Nikolaev .....469*

## **Using Brain - Computer Interface For Control Robot Movement**

*Jaromir Svejda, Roman Zak, Roman Senkerik, Roman Jasek .....475*

## **Growing RBF Network Models For Solving Nonlinear Approximation And Classification Problems**

*Gancho Vachkov, Valentin Stoyanov, Nikolinka Christova .....481*

## **Reducing Overconfidence In Neural Networks By Dynamic Variation Of Recognizer Relevance**

*Konstantin B. Bulatov, Dmitry V. Polevoy .....488*

## **An Evaluation of Parchments' Degradation A Hybrid Approach**

*Jose Neves, Jose Machado, Guida Gomes, Sergio Sousa, Daniela Tereso, Ana Coelho, Ana Teresa Caldeira, Antonio Pereira, Antonio Candeias, Henrique Vicente .....492*

## **UAV Navigation On The Basis Of The Feature Points Detection On Underlying Surface**

*Ivan A. Konovalenko, Alexander B. Miller, Boris M. Miller, Dmitry P. Nikolaev .....499*

## **A Method Of Periodic Pattern Detection On Document Images**

*Timofey S. Chernov, Vitali M. Kliatskine, Dmitry P. Nikolaev.....506*

## **Detecting Traffic Conditions Model Based On Clustering Nodes Situations In VANET**

*Ayman Abufanas, Evtim Peytchev.....511*

## **Creating Training Datasets For OCR In Mobile Device Video Stream**

*Dmitry A. Ilin, Valeriy E. Krivtsov.....516*

<b>Vision-Based Vehicle Wheel Detector And Axle Counter</b> <i>Anton Grigoryev, Dimitry Bocharov, Arseniy P. Terekhin, Dimitry P. Nikolaev.....</i>	521
<b>A Way To Reduce The Artifacts Caused By Intensely Absorbing Areas In Computed Tomography</b> <i>Marina V. Chukalina, Anastasia Ingacheva, Victor Prun, Alexey Buzmakov, Dimitry P. Nikolaev .....</i>	527
<b>Space Symbol Detection On Complex Background Using Visual Context</b> <i>Alexander Sheshkus, Vladimir Lvovich Arlazarov.....</i>	532
<b>Proposal Of Evaluation Criteria For Free And Open Source Tools For Modelling And Support Of IT Service Management According To ITIL</b> <i>Lukas Kralik, Roman Senkerik, Roman Jasek.....</i>	537
<b>Simulation Of Time-Continuous Chaotic UEDA Oscillator As The Generator Of Random Numbers For Heuristic</b> <i>Roman Senkerik, Michal Pluhacek, Donald Davendra, Ivan Zelinka, Zuzana Kominkova Oplatkova .....</i>	543
<b>Time Satisfaction In Coordinated Multi-Agent Systems With Relative Time Rates</b> <i>Said Layadi, Jean-Michel Ilie, Djamel-Eddine Saidouni.....</i>	549
<b>Self-Adaptive Stepsize Search Applied To Robust Engineering Design Optimisation</b> <i>Ralph Krause, Lars Nolle, Richard J. Cant .....</i>	556
<b>Analysis Of Direct Punch Force In Professional Defence</b> <i>Dora Lapkova, Milan Adamek, Zuzana Kominkova Oplatkova .....</i>	564
<b>Prediction Of Raw Material Batches For The Production Of Clinker By Means Of Artificial Neural Networks - Analysis Of Behaviour</b> <i>Zuzana Kominkova Oplatkova, Roman Senkerik.....</i>	570

# High Performance Modelling and Simulation

## ***Modelling and Simulation of Data Intensive Systems - Special Session -***

<b>Mobile Robot Navigation Algorithms Based On Stereovision</b> <i>Szymon Szominski, Anna Plichta .....</i>	581
<b>MTS<sup>2</sup>: Many Task Scheduling Simulator</b> <i>Adrian Stratulat, Raluca Oncioiu, Florin Pop, Ciprian Dobre.....</i>	586
<b>Classification Of E-Customer Sessions Based On Support Vector Machine</b> <i>Grazyna Suchacka, Magdalena Skolimowska-Kulig, Aneta Potempa .....</i>	594
<b>Data-Aware Scheduling In Massive Heterogeneous Systems</b> <i>Magdalena Szmajduch, Joanna Kolodziej .....</i>	601
<b>Short Analysis Of Implementation And Resource Utilization For The Openstack Cloud Computing Platform</b> <i>Daniel Grzonka, Michal Szczygiel, Artur Bernasiewicz, Andrzej Wilczynski, Marek Liszka .....</i>	608

## ***Probability and Statistical Methods for Modelling and Simulation of High Performance Information Systems - Special Session -***

<b>Power Functions Of Statistical Criteria Defined By Bans</b> <i>Alexander A. Grusho, Nick A. Grusho, Elena E. Timonina .....</i>	617
<b>On Sharp Bounds Of The Rate Of Convergence For Some Queueing Models</b> <i>Alexander Zeifman, Galina Shilova, Victor Korolev, Sergey Ya. Shorgin.....</i>	622
<b>On Truncations For A Class Of Finite Markovian Queuing Models</b> <i>Yacov Satin, Alexander Zeifman, Anna Korotysheva, Ksenia Kiseleva, Victor Korolev .....</i>	626
<b>On The Statistical Methods To Locate The Areas Of A Human Brain Activity By The MEG Signals And Myograms</b> <i>Andrey Gorshenin, Victor Korolev, Tatiana Zakharova, Miroslav Goncharenko, Semen Nikiforov, Maxim Khaziakhetov,Alexander Zeifman.....</i>	631

<b>Forecasting Financial Risks By Modified Grid-Based Decomposition Algorithm For Normal Variance-Mean Mixtures</b>	
<i>Alexander Korchagin, Victor Korolev .....</i>	637
<b>Conditions Of Gaussian Non-Markov Approximation For Multi-Channel Networks</b>	
<i>Hanna V. Livinska, Eugene O. Lebedev .....</i>	642
<b>A Discrete-Time Retrial Queueing System With Service Upgrade</b>	
<i>Ivan Atencia, Inmaculada Fortes, Sixto Sanchez.....</i>	650
<b>On The Effective Bandwidth Estimation In Communication Network</b>	
<i>Evsey V. Morozov, Ksenia A. Kalinina .....</i>	656
<b>Performance Evaluation Of Downlink LTE-Advanced CELL By MOSEL-2 Language</b>	
<i>Aymen I. Zreikat.....</i>	662
<b>Analytical Modeling Of Rate-Based Overload Control With Token Bucket Traffic Shaping On Client Side</b>	
<i>Konstantin Samouylov, Yulia V. Gaidamaka, Pavel O. Abaev, Margarita Talanova, Oleg Pavlotsky .....</i>	669
<b>FSM Based Simulation For Performance Evaluation Of SIP Server Loss-Based Overload Control</b>	
<i>Pavel O. Abaev, Konstantin Samouylov, Ivan Sinitsyn, Sergey Ya. Shorgin.....</i>	675
<b>Design And Software Architecture Of Buffering Mechanism For Peer-To-Peer Streaming Network Simulation</b>	
<i>Yuliya V. Gaidamaka, Andrey K. Samuylov, Ekaterina G. Medvedeva, Ivan Yu. Vasiliev, Pavel O. Abaev, Sergey Ya. Shorgin.....</i>	682
<b>Analytical Modelling And Simulation Of Admission Control Scheme For Non-Real Time Services In LTE Networks</b>	
<i>Irina A. Gudkova, Ekaterina V. Markova, Pavel O. Abaev, Veronika M. Antonova.....</i>	689
<b>Author Index .....</b>	696