



# **DS-RT 2006**

## **Proceedings**



# **Tenth IEEE International Symposium on Distributed Simulation and Real-Time Applications**

**2-4 October 2006 • Torremolinos (Málaga), Spain**

**Edited by**

Enrique Alba and Stephen J. Turner (General Co-Chairs)  
David Roberts and Simon J. E. Taylor (Program Co-Chairs)

**Sponsored by**

IEEE Computer Society Technical Committee on Parallel Processing  
IEEE Computer Society Technical Committee on Simulation  
IEEE Computer Society Technical Committee on Computer Architecture  
ACM Special Interest Group on Simulation (SIGSIM)

**Supported by**

University of Malaga, Spain



Los Alamitos, California

Washington • Tokyo

---

Copyright © 2006 by The Institute of Electrical and Electronics Engineers, Inc.  
All rights reserved.

*Copyright and Reprint Permissions:* Abstracting is permitted with credit to the source. Libraries may photocopy beyond the limits of US copyright law, for private use of patrons, those articles in this volume that carry a code at the bottom of the first page, provided that the per-copy fee indicated in the code is paid through the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

Other copying, reprint, or republication requests should be addressed to: IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, P.O. Box 133, Piscataway, NJ 08855-1331.

*The papers in this book comprise the proceedings of the meeting mentioned on the cover and title page. They reflect the authors' opinions and, in the interests of timely dissemination, are published as presented and without change. Their inclusion in this publication does not necessarily constitute endorsement by the editors, the IEEE Computer Society, or the Institute of Electrical and Electronics Engineers, Inc.*

IEEE Computer Society Order Number P2697  
ISBN-13: 978-0-7695-2697-3  
ISBN-10: 0-7695-2697-7  
ISSN 1550-6525

*Additional copies may be ordered from:*

IEEE Computer Society  
Customer Service Center  
10662 Los Vaqueros Circle  
P.O. Box 3014  
Los Alamitos, CA 90720-1314  
Tel: + 1 800 272 6657  
Fax: + 1 714 821 4641  
<http://computer.org/cspress>  
[csbooks@computer.org](mailto:csbooks@computer.org)

IEEE Service Center  
445 Hoes Lane  
P.O. Box 1331  
Piscataway, NJ 08855-1331  
Tel: + 1 732 981 0060  
Fax: + 1 732 981 9667  
<http://shop.ieee.org/store/>  
[customer-service@ieee.org](mailto:customer-service@ieee.org)

IEEE Computer Society  
Asia/Pacific Office  
Watanabe Bldg., 1-4-2  
Minami-Aoyama  
Minato-ku, Tokyo 107-0062  
JAPAN  
Tel: + 81 3 3408 3118  
Fax: + 81 3 3408 3553  
[tokyo.ofc@computer.org](mailto:tokyo.ofc@computer.org)

*Individual paper REPRINTS may be ordered at:* [reprints@computer.org](mailto:reprints@computer.org)

Editorial production by Stephanie Kawada

Cover art production by Joe Daigle/Studio Productions

Printed in the United States of America by Documation LLC



IEEE Computer Society  
**Conference Publishing Services**  
<http://www.computer.org/proceedings/>



## Tenth IEEE International Symposium on Distributed Simulation and Real-Time Applications

# Table of Contents

Message from General Co-Chairs.....	ix
Message from Program Co-Chairs.....	x
Organizing Committee .....	xi
Reviewers .....	xiv

---

### Session 1: Keynote Speaker

The Distinctive Challenges of Pervasive Games as Distributed Real-Time Applications.....	3
<i>Steve Benford</i>	

### Session 2: Steering and Scenario Generation

A Steering Environment for Online Parallel Visualization of Legacy Parallel Simulations.....	7
<i>Aurélien Esnard, Nicolas Richart, and Olivier Coulaud</i>	

EGRESS: Environment for Generating REalistic Scenarios for Simulations.....	15
<i>K. N. Sridhar, Shuai Hao, Mun Choon Chan, and A. L. Ananda</i>	

### Session 3: Peer-to-Peer

A Peer-to-Peer Architecture for Collaborative Haptic Assembly.....	25
<i>Rosa Iglesias, Sara Casado, Teresa Gutiérrez, Alejandro García-Alonso, Kian Meng Yap, Wai Yu, and Alan Marshall</i>	

Real Time P2P Network Simulation for Very Large Virtual Environment.....	35
<i>Romain Cavagna, Christian Bouville, and Jerome Royan</i>	
A Peer-to-Peer Simulation Technique for Instanced Massively Multiplayer Games .....	43
<i>Fábio Reis Cecin, Cláudio Fernando Resin Geyer, Solon Rabello, and Jorge Luis Victória Barbosa</i>	
Distributed Load Balancing in Heterogeneous Peer-to-Peer Networks for Web Computing Libraries.....	51
<i>Joachim Gehweiler and Gunnar Schomaker</i>	

## **Session 4: Poster and Work in Progress Session**

### **Session 5: Collaborative Virtual Environments**

Occasional Users' Experiences of Visiting a Virtual Environment.....	63
<i>Tarja Tiainen, Tarja Katajamäki, Asko Ellman, and Taina Kaapu</i>	
Comparison of Head Gaze and Head and Eye Gaze within an Immersive Environment .....	70
<i>Norman Murray and Dave Roberts</i>	
Exploring the Effect of Curvature on the Consistency of Dead Reckoned Paths for Different Error Threshold Metrics .....	77
<i>Damien Marshall, Séamus McLoone, David Roberts, Declan Delaney, and Tomás Ward</i>	
Statistical Determination of Hybrid Threshold Parameters for Entity State Update Mechanisms in Distributed Interactive Applications .....	85
<i>Damien Marshall, Séamus McLoone, Declan Delaney, and Tomás Ward</i>	

## **Session 6: Keynote Speaker**

Multi-level Modeling and Simulation in Systems Biology—Promises and Challenges.....	95
<i>Adelinde M. Uhrmacher</i>	

## **Session 7: Capture and Backup**

A Capture and Access Mechanism for Accurate Recording and Playing of 3D Virtual Environment Simulations .....	99
<i>Azzedine Boukerche, Altieres Ribeiro Lopes, and Regina Borges de Araujo</i>	
Scheduling Hard-Real-Time Tasks with Backup Phasing Delay .....	107
<i>Alan A. Bertossi, Luigi V. Mancini, and Alessandra Menapace</i>	

## **Session 8: Interest Management and Group Communication**

Adaptive Interest Management via Push-Pull Algorithms .....	119
<i>Rob Minson and Georgios Theodoropoulos</i>	
Priority Based Overlay Multicast with Filtering Mechanism for Distributed Interactive Applications.....	127
<i>Jun Yu, Ling Chen, and Gen-Cai Chen</i>	
Network Overlays for Efficient Control of Large Scale Dynamic Groups.....	135
<i>George V. Popescu and Zhen Liu</i>	
A Smart Gnutella Overlay Formation for Collaborative Virtual Environments over Mobile Ad Hoc Networks.....	143
<i>Azzedine Boukerche, Anis Zarrad, and Regina Araujo</i>	

## **Session 9: Panel Session**

### **Session 10: Grid and Web Services**

Grid-Enabling FIRST: Speeding Up Simulation Applications Using WinGrid .....	157
<i>Navonil Mustafee, Anders Alstad, Bjorn Larsen, Simon J. E. Taylor,     and John Ladbroke</i>	
Design of Distributed Collaborative Application through Service Aggregation .....	165
<i>Andrew Roczniaik, Jamil Melhem, Pierre Lévy, and Abdulmotaleb El Saddik</i>	
Performance Analysis of an Adaptive Dynamic Grid-Based Approach to Data Distribution Management .....	175
<i>Azzedine Boukerche, YunFeng Gu, and Regina B. Araujo</i>	

## **Session 11: Time Management**

Proximity-Aware Synchronization within Federation Communities.....	185
<i>Aydin Okutanoğlu and Müslüm Bozyigit</i>	
Causality and Proactive Cancellation .....	193
<i>Malolan Chethur and Philip A. Wilsey</i>	
Analysing Probabilistically Constrained Optimism.....	201
<i>Michael Lees, Brian Logan, Dan Chen, Ton Oguara, and Georgios Theodoropoulos</i>	
A Simulation Approach to Facilitate Parallel and Distributed Discrete-Event Simulator Development.....	209
<i>Roland Ewald, Jan Himmelsbach, Adelinde M. Uhrmacher, Dan Chen,     and Georgios K. Theodoropoulos</i>	

## **Session 12: Interoperability and Reusability**

A Middleware Level Active Replication Manager for High Performance HLA-Based Simulations on SMP Systems.....	219
<i>Francesco Quaglia</i>	
The SIP-RTI: An HLA RTI Implementation Supporting Interoperability .....	227
<i>Claude Van Ham and Trevor Pearce</i>	
An International Experiment in Command and Control—Simulation Interoperability Using Web Services.....	235
<i>J. Mark Pullen, Michael R. Hieb, William P. Sudnikovich, and Patrick de Champs</i>	
Simulation Model Composition Using BOMs.....	242
<i>Farshad Moradi, Peder Nordvaller, and Rassul Ayani</i>	

## **Poster Papers**

Limiting Optimism: Time or Event Count?.....	253
<i>Nael B. Abu-Ghazaleh and Richard Linderman</i>	
Exploring the Effects of Hyper-threading on Parallel Simulation.....	257
<i>Luciano Bononi, Michele Bracuto, Gabriele D'Angelo, and Lorenzo Donatiello</i>	
Haptic Applications Meta-Language.....	261
<i>Fayez R. El-Far, Mohamad Eid, Mauricio Orozco, and Abdulmotaleb El Saddik</i>	
Speedup-Precision Tradeoffs in Time-Parallel Simulation of Wireless Ad Hoc Networks.....	265
<i>Damla Turgut, Guoqiang Wang, Ladislau Bölöni, and Dan C. Marinescu</i>	
<b>Author Index .....</b>	<b>269</b>