PROCEEDINGS OF SPIE

SPIDigitalLibrary.org/conference-proceedings-of-spie

Front Matter: Volume 6564

, "Front Matter: Volume 6564," Proc. SPIE 6564, Modeling and Simulation for Military Operations II, 656401 (21 April 2009); doi: 10.1117/12.746444

SPIE.

Event: Defense and Security Symposium, 2007, Orlando, Florida, United States

Modeling and Simulation for Military Operations II

Kevin Schum
Dawn A. Trevisani
Editors

10–12 April 2007
Orlando, Florida, USA

Sponsored and Published by
SPIE—The International Society for Optical Engineering

Proceedings of SPIE—The International Society for Optical Engineering, 9780819466860, v. 6564

SPIE is an international technical society dedicated to advancing engineering and scientific applications of optical, photonic, imaging, electronic, and optoelectronic technologies.

The papers included in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. The papers published in these proceedings reflect the work and thoughts of the authors and are published herein as submitted. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from this book:

Author(s), "Title of Paper," in *Modeling and Simulation for Military Operations II*, edited by Kevin Schum, Dawn A. Trevisani, Proceedings of SPIE Vol. 6564 (SPIE, Bellingham, WA, 2007) Article CID Number.

ISSN 0277-786X
ISBN 9780819466860

Published by
SPIE—The International Society for Optical Engineering
P.O. Box 10, Bellingham, Washington 98227-0010 USA
Telephone 1 360/676-3290 (Pacific Time) • Fax 1 360/647-1445
<http://www.spie.org>

Copyright © 2007, The Society of Photo-Optical Instrumentation Engineers

Copying of material in this book for internal or personal use, or for the internal or personal use of specific clients, beyond the fair use provisions granted by the U.S. Copyright Law is authorized by SPIE subject to payment of copying fees. The Transactional Reporting Service base fee for this volume is \$18.00 per article (or portion thereof), which should be paid directly to the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923. Payment may also be made electronically through CCC Online at <http://www.copyright.com>. Other copying for republication, resale, advertising or promotion, or any form of systematic or multiple reproduction of any material in this book is prohibited except with permission in writing from the publisher. The CCC fee code is 0277-786X/07/\$18.00.

Printed in the United States of America.

Contents

vii	Conference Committee
ix	Introduction

SESSION 1 SENSOR MODELING

- 656403 **Irma 5.2 multi-sensor signature prediction model** [6564-03]
J. Savage, C. Coker, Air Force Research Lab. (USA); B. Thai, O. Aboutalib, A. Chow,
N. Yamaoka, C. Kim, Northrop Grumman Corp. (USA)
- 656404 **Conical-scanning active/passive microwave remote sensor computer simulation** [6564-04]
P. Laupattarakasem, S. Alsweiss, W. L. Jones, Univ. of Central Florida (USA); R. Roeder,
Raytheon Co. (USA)

SESSION 2 VARIABLE SIMULATION FIDELITY AND ARCHITECTURES

- 656405 **Autonomous selection of PDE inpainting techniques vs. exemplar inpainting techniques for void fill of high resolution digital surface models** [6564-05]
M. Rahmes, J. H. Yates, J. D. Allen, P. Kelley, Harris Corp. (USA)
- 656406 **On the criticality of parameter data transfer in avionic simulations** [6564-06]
R. D. Teichgraeber, Lockheed Martin Aeronautics Co. (USA)
- 656408 **Using ontology comparison methods for simulation composition** [6564-08]
M. S. Patki, P. Benjamin, R. Mayer, Knowledge Based Systems, Inc. (USA)

SESSION 3 SIMULATION ENVIRONMENTS

- 656409 **An adversary prediction environment based on DSAP capabilities** [6564-09]
M. Valinski, N. Mia, R. McGraw, RAM Labs., Inc. (USA)
- 65640A **An analysis of the effects of initial velocity errors on geometric pairing** [6564-10]
B. C. Schricker, AT&T Government Solutions, Inc. (USA); L. Ford, Icon Systems, Inc. (USA)
-

Pagination: Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print and on CD-ROM. Papers are published as they are submitted and meet publication criteria. A unique, consistent, permanent citation identifier (CID) number is assigned to each article at the time of the first publication. Utilization of CIDs allows articles to be fully citable as soon they are published online, and connects the same identifier to all online, print, and electronic versions of the publication.

SPIE uses a six-digit CID article numbering system in which:

- The first four digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B ... 0Z, followed by 10-1Z, 20-2Z, etc.

The CID number appears on each page of the manuscript. The complete citation is used on the first page, and an abbreviated version on subsequent pages.

- 65640B **Real-time updates to the DSAP framework to improve calibration and dynamic situational awareness** [6564-11]
R. McGraw, M. Valinski, RAM Labs., Inc. (USA)
- 65640C **Building and analyzing timed influence net models with internet-enabled pythia** [6564-12]
P. W. Pachowicz, L. W. Wagenhals, J. Pham, A. H. Levis, George Mason Univ. (USA)

SESSION 4 TRAINING SIMULATIONS

- 65640D **Evolution of live training by the implementation of an electronic bullet** [6564-13]
D. Fisher, J. Mann, T. Sherrill, M. Kraus, J. Lyons, A. York, Applied Research Associates, Inc. (USA)
- 65640E **Architecture for an integrated real-time air combat and sensor network simulation** [6564-14]
E. A. Criswell, J. Rushing, H. Lin, S. Graves, Univ. of Alabama in Huntsville (USA)
- 65640F **Applied cognition and training research to address emerging military requirements** [6564-15]
D. Nicholson, C. Bowers, L. Davis, C. Fidopiastis, Univ. of Central Florida (USA)

SESSION 5 DYNAMIC SIMULATION AND TARGET GENERATION

- 65640G **Towards fully automated 3D scene reconstruction using feedback from multiple aerial sensors** [6564-17]
M. C. Tarnowski, D. B. Warnaar, Applied Research Associates (USA)
- 65640I **Automating ground-fixed target modeling with the smart target model generator** [6564-19]
D. Verner, Applied Research Associates, Inc. (USA); R. Dukes, Air Force Research Lab. (USA)

SESSION 6 TERRAIN PROFILING AND CHARACTERIZATION

- 65640J **Developing Markov chain models for road surface simulation** [6564-20]
W. B. Israel, J. B. Ferris, Virginia Tech (USA)
- 65640L **Characterizing 2D road profiles using ARIMA modeling techniques** [6564-22]
J. V. Kern, J. B. Ferris, Virginia Tech (USA); D. Gorsich, A. A. Reid, Army RDECOM-TARDEC (USA)
- 65640M **A polynomial chaos approach to ARIMA modeling and terrain characterization** [6564-23]
S. M. Wagner, J. B. Ferris, Virginia Tech (USA)

SESSION 7 METHODS AND APPLICATIONS

- 65640N **The development of an assessment tool for the mobility of lightweight autonomous vehicles on coastal terrain** [6564-24]
M. E. Worley, P. Ren, C. Sandu, D. Hong, Virginia Tech (USA)

- 65640P **Acoustic response modeling of energetics systems in confined spaces** [6564-26]
D. R. González, Naval Surface Warfare Ctr. (USA); R. Hixon, Univ. of Toledo (USA); W. W. Liou, Western Michigan Univ. (USA); M. Sanford, Naval Surface Warfare Ctr. (USA)
- 65640Q **Modeling of space shuttle SRB aft ends for inherent aerodynamic bias determination** [6564-27]
D. R. González, Naval Surface Warfare Ctr. (USA); S. P. Stapf, Patrick Air Force Base (USA); T. J. Gebhard, Naval Surface Warfare Ctr. (USA)

SESSION 8 RELIABILITY AND SAFETY

- 65640T **Modeling and simulation of a VTOL UAV for landing gear performance evaluation** [6564-30]
B. J. Chan, C. Sandu, Advanced Vehicle Dynamics Lab. (USA); A. Ko, T. Streett, AVID LLC (USA)
- 65640U **Emissive signature for HMMWV run flat insert modeling and simulation** [6564-31]
W. Gardetto, Drive Dynamics LLC (USA); D. Gorsich, A. Kurec, J. Mabesa, D. Murray, U.S. Army (USA)
- 65640V **Survey of contemporary aircraft flight dynamics models for use in airspace simulation** [6564-16]
S. M. McGovern, S. B. Cohen, U.S. DOT National Transportation Systems Ctr. (USA)

SESSION 9 INTEGRATED SIMULATION TECHNOLOGY

- 65640W **Modeling and simulation for small system integration of military and homeland security applications** [6564-32]
M. Bennahmias, V. Esterkin, K. Lee, R. Koziol, A. Kostrzewski, G. Savant, T. Jansson, Physical Optics Corp. (USA)
- 65640X **A mixed simulation and hardware-in-the-loop display and controller for autonomous sensing and navigation by unmanned air vehicles** [6564-33]
G. E. Collins, P. S. Vegdahl, Toyon Research Corp. (USA); J. R. Riehl, Univ. of California, Santa Barbara (USA)
- 65640Y **Testbed for distributed scenario simulations with EW and its effects on C2** [6564-34]
L. Tydén, C. Wigren, H. Andersson, S. Olsson, Swedish Defence Research Agency (Sweden)
- 65640Z **An integrated development environment for PMESII model authoring, integration, validation, and debugging** [6564-35]
N. J. Pioch, C. Lofdahl, M. Sao Pedro, B. Krikeles, L. Morley, BAE Systems Advanced Information Technologies (USA)
- 656410 **Modeling multiple communities of interest for interactive simulation and gaming: the dynamic adversarial gaming algorithm project** [6564-36]
E. Santos, Jr., Q. Zhao, Dartmouth College (USA); F. Pratto, A. R. Pearson, Univ. of Connecticut (USA); B. McQueary, A. Breeden, L. Krause, Securboron Inc. (USA)

Author Index

Conference Committee

Symposium Chair

John C. Carrano, Luminex Corp. (USA)

Symposium Cochair

Larry B. Stotts, Defense Advanced Research Projects Agency (USA)

Program Track Chairs

Alex F. Sisti, Air Force Research Laboratory (USA)

Dawn A. Trevisani, Air Force Research Laboratory (USA)

Conference Chairs

Kevin Schum, Air Force Research Laboratory (USA)

Dawn A. Trevisani, Air Force Research Laboratory (USA)

Program Committee

Victoria R. Hahn, Raytheon Missile Systems (USA)

Michael D. Letherwood, U.S. Army Tank-Automotive Research,
Development and Engineering Center (USA)

Judson McCarty, Air Force Research Laboratory (USA)

Session Chairs

- 1 Sensor Modeling
Judson McCarty, Air Force Research Laboratory (USA)
- 2 Variable Simulation Fidelity and Architectures
Robert M. McGraw, RAM Laboratories, Inc. (USA)
- 3 Simulation Environments
Dawn A. Trevisani, Air Force Research Laboratory (USA)
- 4 Training Simulations
Judson McCarty, Air Force Research Laboratory (USA))
- 5 Dynamic Simulation and Target Generation
Kelly R. Feirstine, U.S. Air Force (USA)
- 6 Terrain Profiling and Characterization
Michael D. Letherwood, U.S. Army Tank-Automotive Research,
Development and Engineering Center (USA)

- 7 Methods and Applications
 Michael D. Letherwood, U.S. Army Tank-Automotive Research,
 Development and Engineering Center (USA)
- 8 Reliability and Safety
 Michael D. Letherwood, U.S. Army Tank-Automotive Research,
 Development and Engineering Center (USA)
- 9 Integrated Simulation Technology
 Kelly R. Feirstine, U.S. Air Force (USA)

Introduction

Our Modeling and Simulation for Military Operations II conference survived the sophomore jinx, settling into its second year at the Defense and Security 2007 symposium. Attendance showed it to be as popular as the first conference, with ten countries being represented. Thirty-one papers were presented over two and a half days by some of the brightest luminaries in the simulation and defense communities, covering such topics as Variable Simulation Fidelity and Architecture, Dynamic Simulation and Target Recognition, Integrated Simulation Technology, Simulation Environments, and Sensor Modeling. In addition, this year's conference seamlessly led into a successful new conference called Bio-Inspired and Evolutionary Computation: Theory and Applications I, which was introduced as a special mini-conference last year.

As always, any conference is only as good as the planners, authors, presenters, and attendees make it. In that respect, we have yet to see a better mix of all the ingredients. For those of you who attended, we hope you came away a little more enlightened than when you arrived. We sincerely hope you appreciate the papers that follow, and that they serve to foster further research into, and application of, M&S for military operations. We look forward to seeing you next year at Modeling and Simulation for Military Operations III, to be held at the SPIE Defense and Security Symposium from 16-21 March 2008 in the Orlando, Florida, World Center Marriott Resort and Convention Center.

Kevin W. Schum
Dawn A. Trevisani