

*Commenced Publication in 1973*

Founding and Former Series Editors:

Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

## Editorial Board

David Hutchison

*Lancaster University, Lancaster, UK*

Takeo Kanade

*Carnegie Mellon University, Pittsburgh, PA, USA*

Josef Kittler

*University of Surrey, Guildford, UK*

Jon M. Kleinberg

*Cornell University, Ithaca, NY, USA*

Friedemann Mattern

*ETH Zurich, Zurich, Switzerland*

John C. Mitchell

*Stanford University, Stanford, CA, USA*

Moni Naor

*Weizmann Institute of Science, Rehovot, Israel*

C. Pandu Rangan

*Indian Institute of Technology Madras, Chennai, India*

Bernhard Steffen

*TU Dortmund University, Dortmund, Germany*

Demetri Terzopoulos

*University of California, Los Angeles, CA, USA*

Doug Tygar

*University of California, Berkeley, CA, USA*

Gerhard Weikum

*Max Planck Institute for Informatics, Saarbrücken, Germany*

More information about this series at <http://www.springer.com/series/7409>


Anjum Naweed · Marcin Wardaszko  
Elysabeth Leigh · Sebastiaan Meijer (Eds.)


# Intersections in Simulation and Gaming


21st Annual Simulation Technology and Training Conference, SimTecT 2016  
and 47th International Simulation and Gaming Association Conference, ISAGA 2016  
Held as Part of the First Australasian Simulation Congress, ASC 2016  
Melbourne, VIC, Australia, September 26–29, 2016, Revised Selected Papers

*Editors*

Anjum Naweed   
Central Queensland University  
Wayville, SA  
Australia

Marcin Wardaszko   
Kozminski University  
Warsaw  
Poland

Elysebeth Leigh   
FutureSearch  
Tempe, NSW  
Australia

Sebastiaan Meijer   
KTH Royal Institute of Technology  
Stockholm  
Sweden

ISSN 0302-9743                      ISSN 1611-3349 (electronic)  
Lecture Notes in Computer Science  
ISBN 978-3-319-78794-7              ISBN 978-3-319-78795-4 (eBook)  
<https://doi.org/10.1007/978-3-319-78795-4>

Library of Congress Control Number: 2018937391

LNCS Sublibrary: SL3 – Information Systems and Applications, incl. Internet/Web, and HCI

© Springer International Publishing AG, part of Springer Nature 2018

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Printed on acid-free paper

This Springer imprint is published by the registered company Springer International Publishing AG  
part of Springer Nature  
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

# Preface

Consider these research questions: What would happen if professionals from diverse disciplines were united across the world, the intersection allowing them to share their insights? What would happen if this intersection occurred between the community of the International Simulation and Gaming Association and the community for Simulation, Technology and Training in the Asia-Pacific? You are holding the product of this research question. Welcome, perceptive reader, to *Intersections in Simulation and Gaming*, a proceedings compilation containing the cream of the crop from the first—and thus far only—melding of inspirational research, design, application of modelling, simulation, and gaming of these two communities. This volume contains selected papers from the proceedings of the 47th International Simulation and Gaming Association conference and the 21st Simulation Technology and Training conference, held in the southern hemisphere and under the auspices of the Australian Simulation Congress in Melbourne in 2016.

Since the congress was held, the authors have worked hard to enhance their work and articulate it for a wider audience. The intersection of simulation and gaming in this volume takes you from the darkest depths of mining to the fantastic frontiers of space exploration. While the papers have broadly overlapping topics, they have very different dimensions, and thus in structuring this book, we decided to consider the features of their underlying stories. In recognition of this, and of the unique meeting ground of ideas, the papers in this volume are not structured according to topics, but according to *idioms*.

The first section of the book is all about measuring up to a given standard, in this case, honing our diverse skills, abilities, and expertise. There are strong parallels here with leadership and management, and using whatever tools we have for what is ultimately, all about, making the grade.

The second section is a compendium of exciting ideas and considered reflections. There are theoretical frameworks, high-concept prototypes, and new realizations, some of which really stretch the imagination. Fresh ideas or points may occur to you while reading these, even as you scratch your head, and come to think of it yourself.

The third section provides a nice and intimate foray into simulation, joining the quantitative with the qualitative. There are questions here of what makes things real, how we perceive reality and go about making sense of others. This section is about more than technology; it is fundamentally about the human dimensions, which is worth bearing in mind as you go from here to fidelity.

The fourth section comprises papers that focus on critical industries and contexts. Simulation and gaming applications are undertaken on problems or challenges that define their most important aspects of these environments, revealing their very nature and core values. These are places where the way that things are may even be considered the name of the game.

Last but not least, our fifth section focuses on work that has applied simulation and gaming to extraordinary effect. Here, the work draws on our ethos to solve problems scientifically and answer research questions by thinking ahead, and learning something before others, just so that we may aspire to stay ahead of the game.

The idioms defining this volume capture the intersections in the disciplines, revealing both the heart and soul of simulation and gaming through creative and cultural applications of design, and key innovations and emerging trends.

Our disciplines make us what we are, and it is a privilege to be able to bring this work to you, hopefully inspire you to design, use, and evaluate your games and simulations so that they can be the very best they can be.

The editors wish to thank all of the authors for the work and time they spent on enhancing their papers after the congress. We gratefully acknowledge the outstanding work of everyone listed in the Organization pages. Lastly, we are also very grateful for the incredible efforts of the Simulation Australia staff, particularly Chloe Wagemaker, Bronny Harris, and Michael Monaghan—without your involvement, this meeting ground would not have been possible.

February 2018

Anjum Naweed  
Marcin Wardaszko  
Elysabeth Leigh  
Sebastiaan Meijer

# Organization

## Conference Convenors

Nicole Jones de Rooy (SimTecT)	Australian National University, Australia
Todd Mason (ISAGA)	Northern Health, Australia
Julian van Dijk (SimHealth <sup>1</sup> )	St. Vincent's Health, Australia
Adrian Webb (Serious Games)	University of New South Wales, Australia

## Conference Co-convenors

Michael McGarity (SimTecT)	University of New South Wales, Australia
Sebastiaan Meijer (ISAGA)	KTH Royal Institute of Technology, Sweden
Jessica Stokes-Parish (SimHealth)	University of Newcastle, Australia

## Scientific Convenors

Anjum Naweed (SimTecT)	Central Queensland University, Australia
Elyssebeth Leigh (ISAGA)	FutureSearch, Australia
Robert O'Brien (SimHealth)	University of Melbourne, Australia

## Scientific Co-convenors

Raymond Matthews (SimTecT)	Central Queensland University, Australia
Marcin Wardaszko (ISAGA)	Kozminski University, Poland
Cyle Sprick (SimHealth)	Flinders University of South Australia, Australia

---

<sup>1</sup> The Australasian Simulation Congress also involved the annual SimHealth Conference, although no SimHealth papers feature in this volume.

## **2016 ASC Committee**

Deanna Hutchinson

Shawn Parr

John Welsh



# Contents

## Making the Grade

From Recreational to Clinical Approaches: The Use of the Cuatro Tribus Game-Based Workshop as a Complementary Tool for the Reintegration Treatment of Juvenile Offenders . . . . .	3
<i>Alfonso Atala-Layun, Luis Duran, Annia Gutierrez, Rolando Hernandez, Carlos Pola, Miguel Polanco, and Fernanda Santos</i>	
Constructing Safe Containers for Effective Learning: Vignettes of Breakdown in Psychological Safety During Simulated Scenarios . . . . .	15
<i>Anna Maria Carrera, Anjum Naweed, Elyssebeth Leigh, Teresa Crea, Ben Krynski, Kevin Hevelde, Marc Lyons, Cameron Knott, and Sanjay Khetia</i>	
Leading from the Engine Room . . . . .	30
<i>Cat Kutay and Elyssebeth Leigh</i>	
A Management Model for Effective Team Communication in Business Simulation Games . . . . .	43
<i>Anna Palyga and Marcin Wardaszko</i>	
Artillery Simulation as a Pedagogical Tool in Military Education . . . . .	58
<i>Björn Persson</i>	

## Come to Think of it

Soft Overcomes Hard: Simulation Leadership as Mediation of Choice Architectures . . . . .	73
<i>Cory Wright-Maley</i>	
Building Strategies for Organizational Development with Simulation Games . . . . .	84
<i>Marcin Wardaszko</i>	
Pitfalls for Debriefing Games and Simulations: Theory and Practice . . . . .	101
<i>Bill Rounge, Marieke de Wijse, Sebastiaan Meijer, and Alexander Verbraeck</i>	
Assessment and Evaluation of Learning via Simulation . . . . .	116
<i>Peter Radonyi and Elyssebeth Leigh</i>	

A Katana Design Experience . . . . .	134
<i>Tim McGinley, Kei Hoshi, Petra Gruber, Shane Haddy, Yannis Zavoleas, Linus Tan, and David Blaiklock</i>	
“Polyphonic Games” for Leadership Training . . . . .	149
<i>Natalia Isaeva</i>	
Swarm Mechanism for “Hedgehog” Asteroid Rover, Using Netlogo Simulations . . . . .	163
<i>William Crowe, Divya Jindal, John Page, and John Olsen</i>	
<b>From Here to Fidelity</b>	
Rail Simulation and Training: A Socio-Cultural and Technical Orchestration . . . . .	175
<i>Anthony Mildred, Anjum Naweed, Angelina Ambrosetti, and Roberta Harreveld</i>	
A Qualitative Evaluation of the Role of Virtual Reality as a Safety Training Tool for the Mining Industry . . . . .	188
<i>Shiva Pedram, Pascal Perez, Stephen Palmisano, and Matthew Farrelly</i>	
Exploring Avatar Facial Fidelity and Emotional Expressions on Observer Perception of the Uncanny Valley . . . . .	201
<i>Jacqueline Bailey, Karen Blackmore, and Grant Robinson</i>	
Making Virtual Sense: Display Type and Narrative Medium Influence Sensemaking in Virtual Environments . . . . .	222
<i>Sarah J. Hibbard, Susannah J. Whitney, Laura Carter, Justin J. T. Fidock, Philip Temby, and Luke Thiele</i>	
<b>The Name of the Game</b>	
Supporting Energy Efficient Train Operation by Using Gamification to Motivate Train Drivers . . . . .	239
<i>Małgorzata Ćwil and Witold Bartnik</i>	
Addressing Challenges of Planning in Multimodal Transportation Nodes with Simulation Games . . . . .	254
<i>Maria Freese, Shalini Kurapati, Heide K. Lukosch, Daan Groen, Rens Kortmann, and Alexander Verbraeck</i>	
A Study on Gaming Simulation as a Key of Meta-Frame of Planning for Neighborhood Immigrant Integration and Co-existing Diversity . . . . .	276
<i>Pongpisit Huyakorn, Paola Rizzi, and Hidehiko Kanegae</i>	

Oceanic Oil Spill Simulations Provide Memorable Disaster Preparedness Training . . . . .	292
<i>Megan L. Phillips</i>	
Milk Supply Chain Management Game for Waste Reduction . . . . .	302
<i>Mizuho Sato, Hajime Mizuyama, and Masaru Nakano</i>	
<b>Ahead of the Game</b>	
Challenges and Solutions for Integrating Simulation into a Transportation Device. . . . .	317
<i>Chris Bosomworth, Maksym Spiryagin, Colin Cole, Sanath Alahakoon, and Mark Hayman</i>	
Simulation Game Impacts on Perceptions of Nuclear Energy . . . . .	331
<i>Stephan J. Franciosi</i>	
Sink or SWMM: Simulating the Hydrological Effects of Retention Tanks in a Small Urban Catchment. . . . .	342
<i>Richard J. B. Gale</i>	
The Effectiveness of Negotiation Games in Citizenship Education: An Examination of Diplomatic Negotiation Game INDEPENDENCE DAY in a Japanese High School . . . . .	360
<i>Hiroki Baba, Masahiro Ohyama, Misaki Sato, and Jun Yoshinaga</i>	
Development of Business Simulation Game with Use of Design Science Research . . . . .	371
<i>Michal Jakubowski and Jakub Ryfa</i>	
Gaming Simulation as a Science of Design Approach . . . . .	380
<i>Willy Christian Kriz and Werner Manahl</i>	
A Serious Game for Eliciting Tacit Strategies for Dynamic Table Assignment in a Restaurant . . . . .	394
<i>Hajime Mizuyama, Ayano Yoshida, and Tomomi Nonaka</i>	
<b>Author Index</b> . . . . .	411