

# **Annual Simulation Symposium (ANSS 2019)**

2019 Spring Simulation Multi-Conference (SpringSim'19)

Simulation Series Volume 51 Number 1

Tucson, Arizona, USA  
29 April – 2 May 2019

ISBN: 978-1-5108-8473-1

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

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571  
[www.proceedings.com](http://www.proceedings.com)



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

© 2019 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. (2019)

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](mailto:curran@proceedings.com)  
[www.proceedings.com/0128.html](http://www.proceedings.com/0128.html)

or

The Society for Modeling  
and Simulation International  
11315 Rancho Bernardo Road, Suite 139  
San Diego, CA 92127 USA  
[www.scs.org](http://www.scs.org)

ISBN: 978-1-5108-8473-1  
PRINTED IN THE UNITED STATES

## TABLE OF CONTENTS

<b>A Value Sensitive ABM of the Refugee Crisis in the Netherlands .....</b>	1
<i>Ross Gore, Philip Wozny, Frank Dignum, Leron Shults, Christine Boshuijzen - Van Burken, Lamber Royakkers</i>	
<b>Ideal, Best, and Emerging Practices in Creating Artificial Societies.....</b>	13
<i>Philippe Giabbanielli, Alexey A. Voinov, Brian Castellani, Petter Törnberg</i>	
<b>Simulating Complex Social-behavioral Systems .....</b>	25
<i>Kathleen M Carley</i>	
<b>Modeling Metaphysics: the Rise of Simulation and the Reversal of Platonism.....</b>	37
<i>F. Leron Shults</i>	
<b>Modeling Ethics: Reflections at the Intersection of Ethics and Simulation .....</b>	49
<i>Wesley Wildman</i>	
<b>Modeling Epistemology: Examples and Analysis in Computational Philosophy of Science.....</b>	60
<i>Patrick Grim</i>	
<b>Adequacy: What Makes a Simulation Good Enough? .....</b>	72
<i>Samarth Swarup</i>	
<b>Bond Graph Model of a Pivoting Axle Concept Vehicle.....</b>	84
<i>Alex Beckerman, Donald Margolis, Jordan McCrone</i>	
<b>Scenario-based V&amp;V in a Maritime Co-simulation Framework .....</b>	96
<i>Arnold Akkermann, Bjørn Åge Hjelmo</i>	
<b>Security Analysis of Multiple SDN Controllers Based on Stochastic Petri Nets.....</b>	108
<i>Laila Almutairi, Sachin Shetty, Liang Hong</i>	
<b>Multi-domain Flight Simulation with the DLR Robotic Motion Simulator.....</b>	120
<i>Andreas Seefried, Alexander Pollok, Richard Kuchar, Matthias Hellerer, Martin Leitner, Daniel Milz, Christian Schallert, Thiemo Kier, Gertjan Looye, Tobias Bellmann</i>	
<b>A Bond Graph Approach to Analysis and Simulation of a Coupled Torsion Beam Axle.....</b>	132
<i>D. Jordan McCrone, Donald Margolis, Namho Kim</i>	
<b>ART-GCS : an Adaptive Real-Time Multi-Agent Ground Control Station .....</b>	144
<i>Juan A. Bonache-Seco, José A. López-Orozco, Eva Besada-Portas, José L. Risco-Martín</i>	
<b>Drafting Agent-based Modeling into Basketball Analytics .....</b>	156
<i>Matthew Oldham, Andrew Crooks</i>	
<b>DSLEUTH: a Distributed Version of SLEUTH Urban Growth Model .....</b>	168
<i>Gargi Chaudhuri, Samantha Foley</i>	
<b>Co-designing Social Simulation Models for Policy Advise: Lessons Learned from the INFSO-SKIN Study .....</b>	179
<i>Petra Ahrweiler, Nigel Gilbert, Demian Frank</i>	
<b>Multimodal Graph Analysis of Cyber Attacks.....</b>	191
<i>Nirnimesh Ghose, Loukas Lazos, Jerzy Rozenblit, Ronald Breiger</i>	
<b>A Real-time Mechanical Structures Monitoring System Based on Digital Twin, IoT and Augmented Reality .....</b>	203
<i>Roberto Revertria, Flavio Tonelli, Lorenzo Damiani, Melissa Demartini, Federico Bisio, Nicola Peruzzo</i>	
<b>A Cell-DEVS Model for Logistic Urban Growth .....</b>	213
<i>Bruno St-Aubin, Gabriel Wainer</i>	
<b>Heterogeneous Crowd Simulation.....</b>	225
<i>Srivastav R. Janapalli, Omar Hesham, Gabriel Wainer</i>	
<b>The Role of Elites in the Diffusion of Social Norms of Humanitarianism.....</b>	237
<i>Khadijeh Salimi, Erika Frydenlund, Jose Padilla, Hanne Haaland, Hege Wallevik</i>	
<b>Interacting with Human Simulations: a Prototype Application .....</b>	249
<i>Ivan Puga-Gonzalez, Saikou Diallo</i>	
<b>Advancing Simulation Experimentation Capabilities with Runtime Interventions.....</b>	259
<i>Joonseok Kim, Hamdi Kavak, Umar Manzoor, Andreas Zufle</i>	
<b>A Behavior Annex for AADL Using the DEVS Formalism.....</b>	270
<i>Ehsan Ahmad, Hessam Sarjoughian</i>	
<b>Pledge: a Private Ledger Based Decentralized Data Sharing Framework .....</b>	282
<i>Ronald Doku, Danda Rawat</i>	
<b>Park and Parcel: an Agent-based Exploration of Last-Mile Freight Delivery Behavior as It Relates to Parking .....</b>	293
<i>Sarah Wise, Kostas Cheliotis, Oliver Bates, Fraser McLeod, Tom Cherrett, Julian Allen, Maja Piecyk, Tolga Bektas</i>	

<b>From Simulation to Runtime Verification and Back: Connecting Single-run Verification Techniques .....</b>	303
<i>Kristin Yvonne Rozier</i>	
<b>Multi-resolution Modeling for Adaptive UAV Service Systems .....</b>	313
<i>Bernard Zeigler, Doohwan Kim</i>	
<b>Author Index</b>	