

# SPRINGSIM

Spring Simulation Multi-Conference 2017

# APRIL 23-26, 2017

Virginia Beach Convention Center, Virginia Beach, VA

2017 Spring Sim Sponsors





# MOSIMTEC \*\*

# Institute for Simulation UCF and Training

UNIVERSITY OF CENTRAL FLORIDA

SCS and SpringSim'17 Thanks to the Following Sponsors

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Organization Committee

**General Chair:** Saurabh Mittal Vice-General Chair: **Gregory Zacharewicz Program Chair:** Andrea D'Ambrogio Proceedings Co-Chairs: Deniz Cetinkaya and Marina Zapater Sponsorship Chair: Saikou Diallo Awards Chair: Navonil Mustafee Publicity Chair: Masoud Fakhimi Tutorial Chair: Umut Durak Publicity Chair: Andrew Collins WIP Chair: Mamadou D. Seck Poster Session and Student Colloquium Chair: Caroline C. Krejci Student M&S Demo Session Salim Chemlal and Mohammad Moallemi

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Welcome to Spring Sim'17

Welcome from the SpringSim'17 Conference Chairs

On behalf of the Organizing Committee, it is our pleasure to welcome you to the 2017 Spring Simulation Multi-conference in Virginia Beach, Virginia. Virginia Beach is in the Hampton Roads area which is home to NASA Langley, the Virginia Modeling Analysis and Simulation Center (VMASC) and over 20 military installations from the Army Navy and Coast Guard. Hampton Roads is also the historical hub of the Colonial era of America filled with ancient cities, wineries and civil war sites. The conference is organized by the Society for Modeling and Simulation International (SCS), the World's oldest international M&S society, which, from its inception in 1952, has effectively engaged our community and continues to play a significant role in advancing research and its contribution to practice. SpringSim'17 covers state-of-the-art developments in M&S methodology, technology and application in disciplines as diverse as applied computing, communications and networking, medicine, adaptive and autonomous systems. This year, SpringSim is co-located with MODSIM World Conference, chaired by Eric Weisel. SpringSim'17 and MODSIM together provide an excellent opportunity to learn the state-of-the-art in modeling and simulation.

We have an excellent program to offer our attendees this year. This includes presentation of peer-reviewed original research papers, posters, work in progress, PhD student colloquium, keynote speeches, featured speeches, and tutorials delivered by experts. This year's conference consists of the following eight symposia: Agent-Directed Simulation Symposium (Chaired by Yu Zhang and Gregory Madey), Annual Simulation Symposium (Shafagh Jafer and Jose J. Padilla), Communications and Networking Symposium (Abdolreza Abhari and Hala ElAarag), High Performance Computing Symposium (Lucas Polok and Masha Sosonkina), Symposium on Modeling and Simulation in Medicine (Jerzy Rozenblit and Johannes Sametinger), Symposium on Theory of Modeling and Simulation (Fernando Barros and Xiaolin Hu), Simulation of Complexity in Intelligent, Adaptive and Autonomous Systems (Saurabh Mittal and Jose L. Risco Martin) and a new symposium for SpringSim'17 - Chaired by Andrea D'Ambrogio and Umut Durak - Model-driven Approaches for Simulation Engineering. We would like to thank the organisers of the symposia and their respective technical program committees and reviewers for their effort in putting together the exciting program. As a Multi-conference our success depends on their contribution.

We have an exciting line-up of distinguished keynote speakers; we would like to express our gratitude to Benoit Montreuil and Pieter Mosterman for accepting our invitation to deliver keynote speeches.

Welcome to Spring Sim'17

This year we are launching two new initiatives: Featured Speakers and Student M&S Demo Session. The Featured Speakers series brings spotlight to the authors of invited papers in selected symposia. This emphasizes the state-of-the-art contributions the Featured Speaker is making in the chosen field, as considered by the Chairs in the particular symposium. This year we have Bernard P. Zeigler as the Honorary Featured Speaker, along with Andreas Tolk, Neal Wagner, Eric Nielsen, Wes Bethel, Theodore A. Bapty, Umut Durak, Navonil Mustafee and Janet Roveda. We thank our Featured Speakers in defining the bleeding-edge. The Demo Session replaces the earlier Mobile App Competition. It is led by Salim Chemlal and Mohammad Moallemi. It encourages students to showcase their running simulations that they have authored in the contributed papers. We plan to grow the M&S Demo towards an online archive so that each simulation article has an accompanying simulation "execution" to inform the reader in a better way.

We would like to thank our sponsors who have donated money, software licences and books and which has made it possible for us to recognise best papers in the conference, support student travel, and provide an enhanced conference experience for our delegates. We sincerely thank VMASC, Old Dominion University, MOSIMTEC, Institute for Simulation and Training, University of Central Florida, and VMASC Industry Association.

Our sincere gratitude goes to our Organization Committee. We would like to thank Deniz Cetinkaya, Marina Zapater and Marc Banghart (Proceedings Co-Chairs), Saikou Diallo (Sponsorship Chair), Navonil Mustafee (Awards Chair), Andrew Collins (Publicity Chair), Umut Durak (Tutorial Chair), Murat Gunal (WIP Chair), Caroline C. Krejci (Poster Session and Student Colloquium Co-Chair) and Salim Chemlal and Mohammad Moallemi (Student M&S Demo Session Co -Chairs). We would also like to thank SCS Executive Director, Oletha Darensburg and Carmen Ramirez for their conference coordination activities and Mike Chinni for his help with the proceedings and digital libraries.

Thank you for making SprimSim'17 a success through your participation. We look forward to your continued participation in SpringSim'18.

Saurabh Mittal General Chair The MITRE Corporation USA Gregory Zacharewicz Vice-General Chair University of Bordeaux France

Andrea D'Ambrogio Program Chair University of Rome Tor Vergata Italy

Spring Sim'17 Sponsors

#### The Virginia Modeling, Analysis and Simulation Center (VMASC)

The Virginia Modeling, Analysis and Simulation Center (VMASC) at Old Dominion University is a multi-disciplinary research center dedicated to solving real world problems through the application of modeling and simulation techniques and to developing new approaches to representing physical, social, and human systems in simulation. We are one of the world's leading research centers for computer modeling, simulation, and visualization.

#### VMASC Industry Association (VIA)

The VMASC Industry Association enjoys the partnership with ODU's VMASC to further the application of research and development and increase awareness of how modeling, simulation, analysis can be applied to some of our nation's most difficult challenges. This year we continued initiatives like scholarships, education support, sponsorships, and entrepreneurial contests, while expanding initiatives that increase the visibility of ODU MSVE and enhance collaborative R&D in modeling, simulation, and analysis. We also embarked on a robust strategic planning effort that is culminating in a strategy to enable the VMASC industry association to help ODU VMASC achieve its objectives while growing the local modeling and simulation industry.

#### **Mosimtec**

The Founders of MOSIMTEC met at The McDonough School of Business at Georgetown University. The team's background in engineering, technology, finance, and business lends itself well to support solutions providing company. We focus on just providing modeling & simulation services. This business model allows us to effectively partner with and complement clients, engineering firms, and management consultants. As an experienced team we are able to handle large projects building on techniques, tools and lessons learned from work done in various industries. The continuity of service we provide supports our clients today and into the future. We have key strategic alliances with software vendors, research institutions, and industry associations. We view these alliances as a key success factor in being able to provide our clients with best practice offerings and latest simulation solutions.

# Spring Sim'17 Sponsors

# <u>University of Central Florida (UCF), The Institute for Simulation and Training</u> (IST)

The Institute for Simulation and Training (IST) was established to conduct research and develop technology that advances the state of the art in affordable and effective human-centered simulation capabilities and training systems. Founded in 1982 as a research unit of the University of Central Florida and reporting directly to the Vice President for Research and Commercialization, the Institute provides a wide range of research and information services for the modeling, simulation and training community. Laboratories, work space, and administrative offices are distributed among IST's four Central Florida Research Park buildings, Partnership II, Partnership III, Partnership IV, and the Army Research Laboratory - Orlando, SFC Paul Ray Smith Center. The Institute is one of more than 150 public and private entities specializing in simulation and training and located along a coast-to-coast high tech corridor from Tampa to Daytona Beach—the largest concentration of this expertise in the world.

IST actively assists UCF in the development of simulation-related curricula. First in the nation with a master's degree in simulation systems, the university in collaboration with IST also offers a truly multidisciplinary PhD in Modeling and Simulation. The Institute annually employs more than 100 graduate and undergraduate students in a variety of research and support positions. For many outstanding graduates, work experience at IST becomes a launching pad to a career in the simulation industry. A significant number of existing professionals, both in government and industry, enroll in modeling and simulation graduate and certificate programs to continue their advanced education and hone their research skills. The Institute includes in its efforts development of research projects with potential commercial applications and adaptation of military technology to civilian markets. IST communicates the results of its research through seminars, conferences, publications, and workshops. In cooperation with UCF, the University of South Florida, and University of Florida, and with considerable participation from area industry and economic development organizations, IST promotes economic growth in the modeling and simulation industry throughout the Central Florida High Tech Corridor.

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# **KEYNOTES**

# Keynotes Onformation

TITLE:Simulation Challenges in Assessing and Enabling the<br/>Physical InternetAUTHOR:Professor Benoit Montreuil, Coca-Cola and Georgia<br/>TechLOCATION:Ballroom 2DAY/TIME:Monday, April 240900-1000

#### ABSTRACT:

The Physical Internet aims to enable order-of-magnitude improvements in the efficiency and sustainability of the way physical objects are moved,



deployed, realized, supplied, designed and used across the world. Challenging current paradigms, it opens a new era of smart hyper connected logistics, supply chain and transportation. Its potential needs to be rigorously assessed. Innovative technologies, solutions, services and business models must be designed, engineered and put into action. Roadmaps must be planned to evolve from vision to large-scale adoption and exploitation by industry stakeholders. After exposing how simulation plays a critical role in the Physical Internet journey, this talk addresses the conceptual, methodological and technological challenges in tackling the large-scale, wide-scope, fine-granularity and multi-stakeholder nature of the Physical Internet.

#### SHORT BIO:

Benoit Montreuil is Professor and Coca-Cola Material Handling & Distribution Chair in the Stewart School of Industrial & Systems Engineering at Georgia Tech where he is Director of the Physical Internet Center and Director of the Supply Chain & Logistics Institute. Dr. Montreuil is leading the International Physical Internet Initiative, engaging academic, industry and government leaders worldwide into research and innovation projects on smart, hyper connected and sustainable logistics, supply chains, transportation, businesses and regions.

Dr. Montreuil graduated in 1978 from the Université du Québec à Trois-Rivières (UQTR). He earned a master's and a Ph.D. in Industrial Engineering from Georgia Tech in 1980 and 1982 respectively. After serving on the industrial engineering faculty of UQTR and Purdue University, from 1988 to 2014, he was a Professor of operations and decisions systems in the faculty of Business Administration at Université Laval in Quebec City, Canada.

His main research interests generically lie in developing concepts, methodologies and technologies for creating, optimizing, transforming and enabling businesses, supply chains and value creation networks to thrive in a fast evolving hyper connected world. He stands at the crossroads of industrial and systems engineering; operations research; computer sciences; operations, logistics, supply chain, strategic management; and sustainability science. His research builds mostly on a synthesis of systems science & design theory, discrete & agent-based simulation modeling, as well as optimization modeling and mathematical programming.

Dr. Montreuil is a world-renowned scientist who has introduced in collaboration with students and colleagues an imposing set of paradigm-challenging leading edge contributions through nearly four decades of research, shared through 300 scientific publications, 260 scientific communications and numerous keynote speeches at international scientific and professional conferences. He has extensive advisory, entrepreneurial and collaborative research experience with industry and government.

Keynotes Onformation

# TITLE: A Changing Technology Landscape with Value Drivers for Modeling & Simulation

AUTHOR:Pieter J. Mosterman, Senior Research Scientist,<br/>MathWorksLOCATION:Ballroom 2DAY/TIME:Tuesday, April 250830–0930

#### **ABSTRACT:**

Miniaturization in electronics has liberated design of complex functionality from the impeding form factor of a physical



implementation. The size and power constraints of an integrated circuit allow embedding complex functionality in devices such as smartphones, televisions, and watches as well as machines such as washers, automobiles, and humanoid robots. With computational power exploding, these systems are rapidly evolving to span all phases of decision making, which Colonel John Boyd identified as a cycle of (I) observe, (ii) orient, (iii) decide, and (iv) act (the OODA loop). Over the past decades, the automation of observation followed by determining an action based on perception and a given control strategy has been the province of automatic control. More recently, automation of orientation (e.g., by means of deep learning) has enabled strategies that interpret a given situation and adapt to it. Additionally, automation of decision allows reasoning about a given situation and is at the core of autonomy. Beyond individual systems becoming more adept at all phases of the OODA loop, exploiting ensembles of systems has opened up otherwise unattainable areas of the design space. Ensembles of automatic control have brought about distributed control, adaptive ensembles support cooperation, and ensembles of autonomous systems are becoming collaborative. This presentation will give an overview of the changing landscape along the various axes and highlight some emerging value drivers to advance the use of Modeling & Simulation in the engineering of such emerging systems.

#### SHORT BIO:

Pieter J. Mosterman is a Senior Research Scientist at MathWorks in Natick, Massachusetts, where he works on computational modeling, simulation, and code generation technologies. He also holds an adjunct professor position at the School of Computer Science at McGill University. Prior to this, he was a research associate at the German Aerospace Center (DLR) in Oberpfaffenhofen. He earned his PhD in Electrical and Computer Engineering from Vanderbilt University in Nashville, Tennessee, and his M.Sc. in Electrical Engineering from the University of Twente, the Netherlands. His primary research interests are in Computer Automated Multiparadigm Modeling (CAMPaM) with principal applications in design automation, training systems, and fault detection, isolation, and reconfiguration. Dr. Mosterman designed the Electronics Laboratory Simulator that was nominated for The Computerworld Smithsonian Award by Microsoft Corporation in 1994. In 2003, he was awarded the IMechE Donald Julius Groen Prize for his paper on the hybrid bond graph modeling and simulation environment HyBrSim. In 2009, he received the Distinguished Service Award of The Society for Modeling and Simulation International (SCS) for his services as editor in chief of SIMULATION: Transactions of SCS. Dr. Mosterman was guest editor for special issues on CAMPaM of SIMULATION, IEEE Transactions on Control Systems Technology, and ACM Transactions on Modeling and Computer Simulation.



TITLE:Innovative Applications of Modeling and Simulation in<br/>IARPA Test and EvaluationAUTHOR:Paul Lehner, Intelligence Advanced Research<br/>Projects Activity (IARPA)LOCATION:Ballroom 2DAY/TIME:Wednesday, April 260815-0845



#### ABSTRACT:

The Intelligence Advanced Research Projects Activity (IARPA) engages in high risk/high payoff (IARPA-hard) research to address critical challenges in the

Intelligence Community. A required element of every IARPA research program is a Test and Evaluation (T&E) plan where progress can be rigorously and independently measured. When addressing IARPA-hard problems, achieving rigorous T&E can itself be a hard challenge, requiring innovation. Imagine for example a program to improve analytic accuracy, where rigorous T&E might require quantitative measurement of the accuracy of causal claims in complex unstructured domains such a geopolitical analysis. This presentation will examine some innovative applications of modeling and simulation to addressing hard T&E challenges.

#### SHORT BIO:

Dr. Paul Lehner is the chief of testing and evaluation at the Intelligence Advanced Research Projects Activity (IARPA). He joined IARPA in 2015 as a program manager for the Scientific advances to Continuous Insider Threat Evaluation (SCITE) program, and became chief of testing and evaluation in 2016. Prior to IARPA, he worked at MITRE and served in several roles, including chief engineer for both the Information Technology Division and the Internal Revenue Service Federally Funded Research and Development Center. Before MITRE, he was an associate professor of system engineering at George Mason University and the technical director for the Decision Systems Group at PAR Technology Corporation. Paul holds a bachelor's degree in psychology from Bethany College in West Virginia. He has masters' degrees in mathematics and psychology, and a doctorate in mathematical psychology from the University of Michigan. His doctoral dissertation focused on automated reasoning and strategic planning in the oriental game of Go.

# **GENERAL INFO**

Honorary and Featured Speakers

## **Honorary Featured Speaker**

**Bernard P. Zeigler**, RTSync Corporation, USA *M&S of Complexity in Intelligent, Adaptive and Autonomous Systems Symposium* **Title:** Emergence of Human Language: A DEVS-Based Systems Approach

### Featured Speakers

kov Chain Model

Andreas Tolk, MITRE Corporation, USA Annual Simulation Symposium Title: Bias ex Silicio – Observations on Simulationist's Regress

**Neal Wagner**, Massachusetts Institute of Technology, USA Annual Simulation Symposium **Title**: Capturing the Security Effects of Network Segmentation via a Continuous-time Mar-

**Eric Nielsen**, NASA, USA *High Performance Computing Symposium* **Title:** Adjoint-Based Aerodynamic Design of Complex Aerospace Configurations

Wes Bethel, Lawrence Berkeley National Laboratory, USA High Performance Computing Symposium Title: In Situ Methods, Infrastructures, and Applications on HPC Platforms: Knowledge Discovery with Minimal I/O

Theodore A. Bapty, Vanderbilt University, USA Symposium on Model-driven Approaches for Simulation Engineering Title: Integrated Modeling and SImulation for Cyberphysical Systems: Extending Multi-Domain M&S to the Design Community

**Umut Durak**, German Aerospace Center, Germany *M&S of Complexity in Intelligent, Adaptive and Autonomous Systems Symposium* **Title:** Tackling the Complexity of Simulation Scenario Development in Aviation

Featured Speakers and Panels

## **Featured Speakers**

**Umut Durak**, German Aerospace Center, Germany *M&S of Complexity in Intelligent, Adaptive and Autonomous Systems Symposium* **Title:** Tackling the Complexity of Simulation Scenario Development in Aviation

#### Navonil Mustafee, University of Exeter UK

*M&S of Complexity in Intelligent, Adaptive and Autonomous Systems Symposium* **Title:** Investigating the Use of Real-time Data in Nudging Patients' Emergency Department (ED) Attendance Behavior

Janet Roveda, University of Arizona, USA Modeling and Simulation in Medicine Symposium Title: Dream Sweet Dreams: A new Framework for Sleep Tracking and Body Change Prediction

### Panels

#### Monday 1630-1730 (Room 5A)

TMS/DEVS Symposium Title: Challenges in M&S of Cyber-Physical Systems Moderator: Xiaolin Hu, Georgia State University

#### Panel members:

- Bernard Zeigler, University of Arizona and RTSync Corp.
- Pieter Mosterman, Mathworks
- Hans Vangheluwe, University of Antwerp and McGill University
- Andrea D'Ambrogio, University of Rome Tor Vergata
- Fernando Barros, University of Coimbra

#### Tuesday 1000-1200 (Ballroom Two)

MODSIM World Title: "The Simulation Century" – Bringing Big Data to Life Moderator: Richard Boyd, CEO, Tanjo, Inc. **Panel members:** -Jennifer Arnold, Vice President, Booz Allen Hamilton -Jeff Frazier, Managing Director, Special Projects Office of the Chairman, Cisco Systems - Jon Kraftchick, Vice President, Cherry Bekaert

- Dave Rose, Vice President, Mission Solutions, Oracle (Invited)

Spring Sim'17 Symposia

- Agent-Directed Simulation (ADS) General Chair: Yu Zhang General Co-Chair: Gregory Madey
- Annual Simulation Symposium (ANSS)
   General Chair: Shafagh Jafer
   General Co-Chair: Jose J. Padilla
   Program Chair: Erika Frydenlund
- Communications and Networking Symposium (CNS)
   General Chair: Abdolreza Abhari
   Co-Chair: Hala ElAarag
- Theory of Modeling and Simulation (TMS/DEVS)
   General Chair: Ferrando Barros
   General Co-Chair: Xiaolin Hu
- High Performance Computing Symposium (HPC) General Chair: Lukas Polok General Co-Chair: Masha Sosonkina Program Chair: William Thacker Program Co-Chair: Josef Weinbub Publicity Chair: Karl Rupp

Spring Sim'17 Symposia

 Modeling and Simulation of Complexity in Intelligent, Adaptive and Autonomous Systems (MSCIAAS)

General Chair: Saurabh Mittal General Co-Chair: Jose Luis Risco Martin

Model-driven Approaches for Simulation Engineering (Mod4Sim)

General Chair: Andrea D'Ambrogio General Co-Chair: Umut Durak Program Chair: Deniz Cetinkaya

- Modeling and Simulation in Medicine (MSM)
   General Chair: Jerzy Rozenblit
   General Co-Chair: Johannes Sametinger
- Work in Progress (WIP)
   General Chair: Mural Gunal
- Poster Session and Student Colloquium
   General Chair: Caroline C. Krejci
- Student M&S Demo Session
   General Chair: Salim Chemlal
   General Co-Chair: Mohammad Moallemi

General Onformation

# Registration

This year SpringSim'17 is co-locating with Modsim and you may attend their events as well. For more information on their agenda go to http://www.modsimworld.org/. Only Sunday events will be at the Hilton Garden Inn Virginia Beach Oceanfront on the 2nd floor. Your registration for SCS's 2017 Spring Simulation Multi-conference (SpringSim'17) includes morning and afternoon breaks each day, the Monday and Tuesday evening reception in the Virginia Beach Convention Center and access to all sessions, tutorials and special presentations (unless otherwise noted).

- Registration Hours (Second Floor) \*Hilton Garden Inn Virginia Beach Oceanfront\*
  - ♦ Sunday, April 23rd 0800-0900 and 1600 -1800 (Pre-registrations only)
- Registration Hours (Main Lobby & Ballroom Three) \*Virginia Beach Convention Center\*
  - Monday, April 24th 0700–1700
  - Tuesday, April 25th 0700–1700
  - $\Diamond$ Wednesday, April 26th-0730-1500

Please note that the Registration Desk will be closed for lunch Mon-Wed from 1200-1330

# Breaks

- Coffee Breaks (Near Ballroom Three):
  - Monday, April 24th 1000–1030 | 1500-1530
  - Tuesday, April 25th 0930–1000 | 1500-1530
  - $\Diamond$ Wednesday, April 26th - 1000-1030 | 1500-15:30

# **Opening/Plenary/Keynotes**

- Plenary Session and Keynotes (Ballroom Two):
  - Monday 0900-1000 SCS Keynote:  $\Diamond$ 
    - Professor Benoit Montreuil, Coca-Cola and Georgia Tech, Simulation  $\Diamond$ Challenges in Assessing and Enabling the Physical Internet
  - Tuesday 0830-0930 ModSim and SCS Keynote:  $\Diamond$ 
    - $\Diamond$ Pieter J. Mosterman, Senior Research Scientist, MathWorks, A Changing Technology Landscape With Value Drivers for Modeling & Simulation
  - Wednesday 0800-0845 ModSim Keynote:  $\Diamond$ 
    - Paul Lehner, Advanced Research Projects Activity (IARPA), Innovative  $\Diamond$ Applications of Modeling and Simulation in IARPA Test and Evaluation
  - (See Keynote pages for more information on the speakers)  $\Diamond$

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General Information

# **Conference Meetings & Events**

SCS Board Meeting (0900); Executive Boardroom
 \*SCS Board Members

Tutorials (0915-1800); Salon 2

Student Colloquium (0900–1030); Salon 1

Poster Presentations (1045-1215); Salon 1

MS&V Capstone (0900-1200); Salon 3

Demo Session (1300–1730); Salon 3

Fellows Dinner (1900-2100); Salon 1 & 2

Monday: Plenary Session and Keynote Address: Ballroom 2, (0900-1000)
 \*\*Benoit Montreuil\*\*

Social (1730-1900); Near Ballroom 3 \*All conference attendees invited

•• Tuesday: Plenary Session and Keynote Address: Ballroom 2 (0830-0930) \*\*Pieter J. Mosterman\*\*

Spring 2018 Organization Planning Meeting with Symposia Chairs (1230-1330); Room 5B \*By Invitation Only

General Information

# **Best Paper Award**

The Overall Best Paper Award for SpringSim'17 will be presented at Monday's Plenary Session.

# Student Colloquium/Posters (Hilton Garden Inn, Salon 1)

The Student Colloquium and Poster presentations will take place on Sunday, April 23, 2017 (see agenda for more details).

**Student Colloquium:** The colloquium is intended to bring together students in both early and advanced stages of their careers who are working on any modeling and simulation topics, to provide them a friendly forum and an opportunity to present, discuss and illustrate their ongoing research in a constructive and enjoyable atmosphere.

<u>Posters:</u> These outstanding short paper submissions will be presented in a poster format at the conference. The short papers present interesting recent results, novel ideas or works-in-progress that are not quite ready for a full-length paper. The posters will be on display throughout the week to be viewed near the break area.

# Fellows (Hilton Garden Inn, Salon 1 & 2)

SCS will be hosting the Second Annual Fellows Dinner on Sunday, April 23, 2017 .from 1900–2100 at the Hilton Garden Inn Virginia Beach Oceanfront. It is a formal event where the most recent SCS Fellows will be celebrated with the Society.

# Demo Session (Hilton Garden Inn, Salon 3)

The purpose of the M&S Demo Session is to engage students in simulation development, implementing M&S theories in the simulation application. The simulation environment can be as simple as a desktop M&S application or remote M&S interface on a tablet device, to as complicated as M&S tool running on a distributed platform. The demo will include execution of at least a single simulation scenario on desktop or mobile platform and displaying the results of the simulation. Use of open-source tools and libraries can be incorporated into the system, however, the use of commercial simulation tools is not allowed in the demo. Allotted time for each demo is 15mins with 5mins of Q&A.

# Capstone (Hilton Garden Inn, Salon 3)

#### Best of MS&V Capstone Conference Session

On Thursday, April 20, 2017, The MS&V Student Capstone Conference offers seven presentation tracks this year. Each track has two awards – the best paper and the best presentation. The overall winner of the conference will be honored with the Gene Newman award! The Virginia Modeling, Analysis and Simulation Center's Capstone Conference features students in Modeling and Simulation (M&S) undergraduate & graduate degree programs and fields from many colleges and universities. Students present their research to an audience of fellow students, faculty, judges, and other distinguished guests. For the students, the presentations afford them the opportunity to impart their innovative research to members of the M&S community from academic, industry, and government backgrounds.

This year on Sunday, April 23, 2017, SpringSim 2017 is proud to be showcasing the best of the MS&V Capstone winners from Thursday's event.

Social Events and Meals

# Monday Reception (Virginia Beach Convention Center (Near Ballroom 3)

There will be a Welcome Reception in the Virginia Beach Convention Center near Salon 3 open to all SpringSim'17 attendees, on Monday, April 24, 2017, from 1730-1900. Hors d'oeuvres served.

# **Tuesday Reception (Near Ballroom 3)**

ModSim and SCS Networking Event in Ballroom 3 of the Convention Center.

# Breakfast (Ballroom 3)

Breakfasts will be held Monday – Wednesday from 0630 – 0800, at the Virginia Beach Convention Center. All presenters are invited on the day of their presentation to join their session chairs for a continental breakfast. We ask that you plan on attending only on the day of your presentation.

# Lunch (Ballroom 2)

Lunch will be held Monday through Wednesday from 1200-1330, located at the Virginia Beach Convention Center.

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# 2017 Symposium on Simulation for Architecture and Urban Design (SIMAUD '17)

May 22-24, 2017 MaRS Discovery District & University of Toronto, Toronto The 8th annual Symposium on Simulation for Architecture and Urban Design (SimAUD) tackles the interdisciplinary aspects of the development and use of simulations to measure, predict, assess, comprehend and manage the performances of buildings and cities, in regard to their technical and non-technical requirements. SimAUD offers the opportunity to present innovative simulation methods and techniques and to discuss their roles in urban planning, architecture, engineering, construction, and management. This year's event will be held at the MaRS Discovery District and at the University of Toronto in Canada, in the heart of one of the largest urban innovation hubs.

# 2017 Summer Simulation Multi-Conference (SummerSim '17) July 9-12, 2017, Sheraton Bellevue, Bellevue (A Suburb near Seattle), WA, USA

The Summer Simulation Multi-Conference 2017 (SummerSim'17) is a combination of the Summer Computer Simulation Conference (SCSC) and the International Symposium on Performance Evaluation of Computer and Telecommunications Systems (SPECTS). SummerSim is SCS's premier international conference in cooperation with ACM SIGSIM. The conference focuses on modeling and simulation, tools, theory, methodologies and applications and provides a forum for the latest R&D results in academia and industry. This year's focus is on the pervasive role of simulation tools, methodologies and technologies for enabling a more informed and effective online decision making. We encourage you to take this opportunity to experience the tutorials, tracks, and workshops that will be available.

Please visit www.scs.org for more information about the above events.

# TUTORIALS

Tutorials Information

# Tutorial Schedule (Sunday, April 23, 2017)

Tutorial Chair: Umut Durak

Room: Hilton Garden Inn, Salon 2

Metamodeling Using Extended System Entity Structure– Basic Theory, Software Tools, Applications Time: 0915–1045 Speaker: Thorsten Pawletta

SHORT BREAK 1045-1100

Introduction to Parallel DEVS Modelling and Simulation Time: **1100–1230** Speaker: Yentl Van Tendeloo

LUNCH BREAK 1230-1330

Modeling More Than Two Decision-Makers: Agent-Based Modeling and Game Theory Time: 1330–1500 Speakers: Andrew J. Collins

SHORT BREAK 1500-1515

Hands-On Introduction to DesignDEVS Time: 1515–1615 Speaker: Rhys Goldstein

SHORT BREAK 1615-1630

An Introduction to Statecharts Modelling and Simulation Time: 1630–1800 Speaker: Simon Van Mierlo

Tutorials Onformation (Cont.)

TITLE: Metamodeling Using Extended System Entity Structure—Basic Theory, Software Tools, Applications

DAY/TIME: Sunday, April 23 0915 - 1045

SPEAKER: Thorsten Pawletta, Wismar University of Applied Sciences

# Abstract

The tutorial introduces into basics of the System Entity Structure (SES) Ontology, originally introduced by B.P. Zeigler. Additionally, some extensions of the SES Ontology will be introduced to make it more pragmatic for metamodeling of complex simulation models or families of simulation models. Afterwards, two prototypes of new software tools for designing SES models will be presented. One of the tools is implemented within MATLAB and the other one in Python using PyQt. The core of both tools is a graphical SES model editor. Using the MATLAB-based tool, an application problem will be modeled with an SES. Subsequently, a new framework for an automatic simulation model generation based on an SES model and an appropriate Model Base (MB) will be pictured. Then, the employment of the framework will be illustrated by generating an executable Simulink model. Finally, future work will be discussed.

Tutorials Information (Cont.)

TITLE: Introduction to Parallel DEVS Modeling and Simulation

DAY/TIME: Sunday, April 23 1100 - 1230

SPEAKER: Yentl Van Tendeloo, University of Antwerp; Hans Vangheluwe, University of Antwerp, Flanders Make vzw, and McGill University

# Abstract

DEVS is a popular formalism for modelling complex dynamic systems using a discrete-event abstraction. During a bounded time interval, only a finite number of relevant events can occur. The state variables are considered to change instantaneously, with the state being constant in between two state changes. Main advantages of DEVS are its rigorous formal definition, and its support for modularity: models can be nested. Thanks to its precise specification as well as its modularity. DEVS frequently serves as a simulation "assembly language" to which models in other formalisms are mapped. It is suited for both manual modelling, as well as for automated generation. This furthermore makes it possible to combine models in different formalisms together, by mapping both to DEVS. This tutorial provides an introductory tutorial on the practical usage of the Parallel DEVS formalism. The formalism is explained in a bottom-up fashion, starting from simple autonomous Atomic (i.e., nonhierarchical) DEVS models, up to Coupled (i.e., hierarchical) DEVS models. Each aspect of the DEVS formalism is considered individually by means of a minimal running example: a simple traffic light. While the focus is on the practical use of DEVS modelling and simulation, the necessary theoretical foundations are interleaved, albeit at a high level of abstraction. More advanced topics, such as closure under coupling, are briefly mentioned. Examples are presented using PythonPDEVS, though the foundations and techniques apply equally well to other DEVS simulation tools.

Tutorials Information (Cont.)

TITLE: Modeling More Than Two Decision-Makers: Agent-Based Modeling and Game Theory

DAY/TIME: Sunday, April 23 1330 - 1500

# SPEAKER: Andrew J. Collins, Virginia Modeling, Analysis and Simulation Center

### Abstract

There is more than one way to skin a cat and there is more than one way to model situations involving groups of people. In this workshop we look at two such paradigms: agent-based modeling (ABM) and nperson game theory. We will discuss background and theoretical foundations of both paradigms. For agent-based modeling, we will give discussion on complex adaptive systems, emergent behavior, and heterogeneity. Examples shown will include Schelling's segregation model, predator-prey and Reynold's Boids. For n-person game theory, some background in general game theory is given first before a discussion on the characteristic function, core, nucleolus, and Shapley value. The examples games include three guns, tolling auction game, and the Lilliput Security Council. By the end of the workshop, the participants will have a basic understanding of both paradigms and will be able to recognize key terminology connected to them. This workshop is not for the mathematically shy so beware: equations will be used. There might be a fun game or two played as well.

Tutorials Information (Cont.)

TITLE: Hands-On Introduction to DesignDEVS DAY/TIME: Sunday, April 23 1515 - 1615

SPEAKER: Rhys Goldstein, Autodesk Research

# Abstract

DesignDEVS is a simulation development environment based on the Discrete Event System Specification (DEVS) formalism. The software aims to promote understanding and appreciation of model-simulator separation, delayed binding of models, and other key principles of a systems engineering approach. To minimize installation and learning time, a lightweight scripting language called Lua is embedded as the primary programming language for model implementation. Lua is extended to both enforce and communicate a number of modeling constraints implied by DEVS theory, including restrictions on state changes and data references.

This tutorial will introduce SpringSim attendees to DesignDEVS, and challenge the community to consider strategies for achieving widespread utilization of scalable, theory-based M&S practices. The tutorial will consist of three segments: (1) a brief presentation of DesignDEVS; (2) hands-on instruction in which participants install and use the software; and (3) an overview of more recent research aiming to promote the adoption of systems approaches.

Tutorials Information (Cont.)

TITLE: An Introduction to Statecharts Modelling and Simulation DAY/TIME: Sunday, April 23 1630 -1800 SPEAKER: Simon Van Mierlo, University of Antwerp; Hans Vangheluwe, University of Antwerp, Flanders Make vzw, and McGill University

### Abstract

Statecharts is a formalism to model timed, reactive, autonomous systems. It uses a discrete-event abstraction: state changes can occur when an event arrives from the environment, or if one is raised locally. Many tools have been developed to model, simulate, and generate code from Statecharts. They are successfully used to model user interfaces, embedded controller software, artificial intelligence, and much more.

In this tutorial, we introduce Statecharts and explain how they can be modelled, simulated, and debugged using a visual modelling and simulation interface. We start from the basic (non-hierarchical) concepts of states and transition, and then move on to more advanced concepts of hierarchy, concurrency, and history. We use a simple traffic light application as a running example to demonstrate each concept. Although we focus on the practical aspect of modelling with Statecharts, we introduce the theoretical underpinnings along the way.

We use Yakindu, an Eclipse-based visual Statecharts modelling and simulation environment, but the techniques taught in this tutorial can be applied to any other Statecharts modelling and simulation tool.

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# Sessions at a Glance and Agendas

# SpringSim'17 Sessions at a Glance

		ADS	ANSS	CNS	TMS/DEVS
Monday	24-Apr-17				
0830 - 1000	SCS Plenary				
1000 - 1030	Break				
1030 - 1200	Session Block I	Room 4D	Room 4E	Room 3E	Room 5A
1200 - 1330	Lunch (on your own)				
1330 - 1500	Session Block II	II Room 4D Room 4E Room 3E		Room 3E	Room 5A
1500 - 1530	Break				
1530 - 1700	Session Block III	Room 4D	Room 4E	Room 3E	Room 5A
1700 - 1800	<b>Evening Session</b>				
Tuesday	25-Apr-17				
0830 - 1000	SCS Plenary				
1000 - 1030	Break		I	I	
1030 - 1200	SCS Plenary				
1200 - 1330	Lunch (on your own)				
1330 - 1500	Session Block IV	Room 4D	Room 4E		Room 5A
1500 - 1530	Break				
1530 - 1700	Session Block V		Room 4E		Room 5A
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Wednesday	26-Apr-17				
0830 - 1000	Session Block VI		Room 4E		Room 5A
1000 - 1030	Break				
1030 - 1200	Session Block VII		Room 4E		Room 5A
1200 - 1330	Lunch (on your own)		_		
1330 - 1500	Session Block VIII		Room 4E		
1500 - 1530	Break		1	1	T
1530 - 1700	Session Block IX				

# SpringSim'17 Sessions at a Glance

MOD4SIM	HPC	MSCIAAS	MSM	WIP	
Room 5B	Room 4B		Room 3D		
Room 5B	Room 4B		Room 3D		
Room 5B	Room 4B		Room 3D		
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Room 4B	Room 3E	Room 3D	Room 4A	
Room 4B				
Room 4B				
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# **49th Agent-Directed Simulation (ADS)**

# Agenda

# Monday, 24 April 2017

#### Session I 1030 – 1200 Room: Room 4D Chair: Greg Madey

- Aging Out of Crime: Exploring the Relationship between Age and Crime with Agent-based Modeling (Caitlin Cornelius, Christopher Lynch and Ross Gore)
- Social Network Interaction Quantification and Relationship Trend Analysis with Multi-Agent Systems (Yu Zhang and Po-Hung Lin)
- Modeling Social Risk Amplication During Recall Crises (Yun Liu, Jerry Busby and Bhakti Stephan Onggo)

#### Session II 1330 – 1500 Room: Room 4D Chair: Yu Zhang

- An Output and 3D Visualization Concept for the MSaaS System MARS (Jan Dalski, Christian Hüning and Thomas Clemen)
- Modeling Through Model Transformation with MARS 2.0 (Daniel Glake, Julius Weyl, Carolin Dohmen, Christian Hüning and Thomas Clemen)
- Utilizing the Positive Impacts of Software Piracy in Monoploy Industries (Jue Wang, Robert L. Axtell and Andrew Loerch)

#### Session III 1530 – 1700 Room: Room 4D Chair: II Chul Moon

- Agent-based Model of Criminal Gang Formation (Andrew Collins, John Sokolowski and Caitlin Cornelius)
- Mosquito Larval Habitat Model: a Complete Climate-Driven Approach (Casey Ferris and Greg Madey)
- An Agent-Based Model of Regional Food Supply Chain Disintermediation (Teri Craven and Caroline Krejci)

# Tuesday, 25 April 2017

#### **Session IV**

#### on IV 1330 – 1500

Room: Room 4D

**Chair: Greg Mandy** 

- Individual Strategic Behavior in a Team Formation Agent-Based Simulation (Andrew Collins, Daniele Vernon-Bido and Justin Lane)
- Modeling Within a Synthetic Environment the Complex Reality of Mass Migration (Agostino Bruzzone, Marina Massei, Paolo Di Bella, Marco Giorgi and Marina Cardelli)
- A Theoretical Model of Identity Shift in Protracted Refugee Situations (Erika Frydenlund, Jose J. Padilla and David C. Earnest)
  - **40**

Notes

# **50th Annual Simulation Symposium (ANSS)**

# Agenda

# Monday, 24 April 2017

#### Session I 1030–1200 Room: Room 4E Chair: Shafagh Jafer

• Bias ex Silicio–Observations on Simulationist's Regress (Andreas Tolk) (Featured Speaker)

#### Session II 1330 – 1500 Room: Room 4E Chair: Erika Frydenlund

- Exploring Simulation Based Dynamic Traffic Assignment With a Large-Scale Microscopic Traffic Simulation Model (Peter Foytik, Craig Jordan, and Robert Robinson)
- Development of a Simulation Model for Pedestrian Evacuation under fire condition (Zhenyu Wang, Hong Yang, and Zelin Zhu)
- A Framework for Modelling the Ripple Effect of Crowding at Public Transport Facilities (Nam Huynh and Johan Barthelemy)

#### Session III 1530 – 1700 Room: Room 4E Chair: Mariem Sbayou

- A Model for Use in the Prognosis of Tendinopathy (Thomas Stevens, Hannah Schmitz, Andres Zuniga, John Szivek, Mihra Taljanovic, Latt L. Daniel and Russell Witte)
- DEVS Modelling and Simulation for Healthcare Process: Application for Hospital Emergency Department (Mariem Sbayou, Gregory Zacharewicz Julien François, Judicael Ribault, Youssef Bouanan)
- Simulating Market-Oriented Policy Interventions For Stimulating Antibiotics Development (Christopher Okhravi, Carl Kronlid, Steve McKeever, Olof Lindahl, Enrico Baraldi and Francesco Ciabuschi)

# Tuesday, 25 April 2017

#### Session IV 1330 – 1500 Room: Room 4E Chair: Jose Padilla

• Capturing the Security Effects of Network Segmentation via a Continuous-time Markov Chain Model (Neal Wagner (Featured Speaker), Cem Sahin, Jaime Pena, James Riordan, and Sebastian Neumayer)

#### Session V 1

1530- 1700

Room: Room 4E

Chair: Samantha Collins

- Modeling of a Human Driver for a Car Driving Simulation (Antoni Kopyt, Tomasz Dziewonski, Dominik Jastrzebski, and Karol Golon)
- Through the Virtual Barrier: Virtual Prototyping and Analysis with Model-Based Systems Engineering (Omar Valverde and Larry Sun)
- Modeling Real-Time Schedulers for Use in Simulations through a Graphical Interface (Fernanda Peronaglio, Aleardo Manacero, Renata Lobato and Roberta Spolon)

# **50th Annual Simulation Symposium (ANSS)**

# Agenda

# Wednesday, 26 April 2017

#### Session VI 0830 – 1000 Room: Room 4E Chair: Mohammad Mamun

- Visualization of Event Execution in a Discrete Event System (Samantha Collins, Lee Dumaliang, Nathan Gonda, James Leathrum, and Roland Mielke)
- An Efficient Simulation Algorithm for Continuous-Time Agent-Based Linked Lives Models (Oliver Reinhardt and Adelinde Uhrmacher)
- MABSDairy: A Multiscale Agent Based Simulation of a Dairy Herd (Mohammad A Al-Mamun and Yrjo Grohn)

#### Session VII 1030 – 1200 Room: Room 4E Chair: Daniele Vernon-Bido

- Forecasting Courses with Uncertain Student Demand: Proof of Sub-Problem Independence for Course Loading Optimization (Cheryl Eisler, Peter Dobias, Min Jing Liu)
- Durable Solutions and Potential Protraction: The Syrian Refugee Case (Daniele Vernon-Bido, Erika Frydenlund, Jose J. Padilla and David C. Earnest)
- Dynamics of Knowledge-Seeking Interactions in Organizational Behavior (Daniele Vernon-Bido and Andrew Collins)

#### **Session VIII** 1530 – 1700

Room: Room 4E Chair: Robson De Grande

- Towards the Design of an Interoperable Multi-Cloud Distributed Simulation System (Dan Liu, Robson De Grande and Azzedine Boukerche)
- Distributed Simulation Using DDS and Cloud Computing (Michael Madden and Patricia Glaab)
- Modeling and Analysis of Multistage Failures of a System (Manoj Banik and Bharat B. Madan)

# **20th Communications and Networking Symposium (CNS)**

# Agenda

# Monday, 24 April 2017

Session I 1030 – 1200 Room: Room 3E Chair: Dr. Abdolreza Abhari/Dr. Hassan Rajaei

- A Distributed Simulation Platform for Cloud Computing (Hassan Rajaei, Fatimah Alotaibi and Saba Jamalian)
- \* Analytical Model of Hierarchical Cache Optimization in the Network with Unbalanced Traffic (Lev Softman)
- Devs-based Modeling of Cached and Segmented Video Download Algorithms in Lte-a Cellular Networks (Ala'a Al-Habashna and Gabriel Wainer)

#### Session II 1330 – 1500 Room: Room 3E Chair: Dr. Abdolreza Abhari/Dr. Hassan Rajaei

- The Spread of Wi-Fi Router Malware Revisited (Hamdi Kavak, Jose J. Padilla, Daniele Vernon-Bido, Saikou Y. Diallo and Ross J. Gore)
- \*Formal Modeling and Simulation to Analyze the Dynamics of Malware Propagation in Networks Using Cell-Devs (Baha Uddin Kazi and Gabriel Wainer)
- Modeling and Simulation of User Mobility and Handover in Lte and Beyond Mobile Networks Using Devs Formalism (Baha Uddin Kazi, Gabriel Wainer and Victor Guimaraes da Silva)

#### **Session III 1530 – 1730 Room: Room 3E**

- Procedurally Generated Environments for Simulating RSSI-Localization Applications (Sam Shue and James Conrad)
- Comparing Quantitative and Comment-Based Ratings for Recommending Open Educational Resources (Dalia Hana, Abdolreza Abhari and Alexander Ferworn)
- Generating Stochastic Data to Simulate a Twitter User (Jason Li and Abdolreza Abhari)
- A Comparative Study on Content-Based Papepr-to-Paper Recommendation Approaches in Scientific Literature (Bahareh Kazemi and Abdolreza Abhari)

#### Chair: Dr. Hassan Rajaei

Notes

# 10th Annual Symposium on Theory of Modeling & Simulation (TMS/DEVS)

### Agenda

# Monday, 24 April 2017

#### Session I 1030 – 1200 Room: Room 5A Chair: Fernando Barros

- Modeling and Verification of Network-on-Chip using Constrained-DEVS (Soroosh Gholami and Hessam Sarjoughian)
- Restricting DEv-PROMELA with a Hierarchy of Simulation Formalisms (Aznam Yacoub, Maamar elamine Hamri and Claudia Frydman)
- Social Interaction in Pedestrian Evacuation: A Cellular Discrete Event Simulation Approach (Yanhong Wang, Mamadou Traoré and Xia Wang)

#### Session II 1330 – 1500 Room: Room 5A Chair: Claudia Frydman

- The Case for DEVS in Networking M&S: Upload User Collaboration in Mobile Networks using Coordinated Multipoint (Misagh Tavanpour, Jan Mikhail, Gabriel Wainer and Gary Boudreau)
- Upgrade Campaign Simulation and Evaluation for Highly Available Systems (Oussama Jebbar, Ferhat Khendek and Maria Toeroe)
- DEVSML 3.0 Stack: Rapid Deployment of DEVS Farm in Distributed Cloud Environment using Microservices and Containers (Saurabh Mittal and José Luis Risco Martín)

#### Session III 1530–1730 Room: Room 5A Chair: Xiaolin Hu

- Co-Simulation of Cyber Physical Systems with HMI for Human In the Loop Investigation (Nicolai Pedersen, Jan Madsen and Tom Bojsen)
- Modeling Cyber Effects in Cyber-Physical Systems with DEVS (Suresh Damodaran and Saurabh Mittal
- Panel Discussion: Challenges in M&S of Cyber-Physical Systems (Xiaolin Hu (moderator), Bernard Zeigler, Pieter Mosterman, Hans Vangheluwe, Andrea D'Ambrogio and Fernando Barros)

# 10th Annual Symposium on Theory of Modeling & Simulation (TMS/DEVS)

### Agenda

# Tuesday, 25 April 2017

#### Session IV 1330 – 1500 Room: Room 5A Chair: Xialin Hu

- Improved Time Representation in Discrete-Event Simulation (PhD) (Damian Vicino)
- An approach for formal verification and simulation of discrete-event systems: A PROMELA Application (PhD) (Aznam Yacoub)
- Contribution to a Modelling and Discrete Event Simulation Framework: Application to the Information Spreading in Social Networks (PhD) (Youssef Bouanan)

#### Session V 1530 – 1730 Room: Room 5A Chair: Rhys Goldstein

- PDEVS-Based Hybrid System Simulation Toolbox for MATLAB (Christina Deatcu, Birger Freymann and Thorsten Pawletta)
- Automatic Parallelization of Multi-Rate FMI-based Co-Simulation on Multi-Core (Salah Eddine Saidi, Nicolas Pernet and Yves Sorel)
- Hybrid System Modelling and Simulation with Dirac Deltas (Cláudio Gomes, Yentl Van Tendeloo, Joachim Denil, Paul De Meulenaere and Hans Vangheluwe)
- Chattering Avoidance in Hybrid Simulation Models: A Modular Approach Based on the HyFlow Formalism (Fernando Barros)

# 10th Annual Symposium on Theory of Modeling & Simulation (TMS/DEVS)

### Agenda

# Wednesday, 26 April 2017

#### Session VI 0830 – 1000 Room: Room 5A Chair: Joachim Denil

- Explicit Modelling and Synthesis of Debuggers for Hybrid Simulation Languages (Simon Van Mierlo, Claudio Gomes and Hans Vangheluwe)
- Time- and Space-Conscious Omniscient Debugging of Parallel DEVS (Yentl Van Tendeloo, Simon Van Mierlo and Hans Vangheluwe)
- A Taxonomy of Event Time Representations (Rhys Goldstein and Azam Khan)

#### Session VII 1030 – 1230 Room: Room 5A Chair: Andreas Tolk

- The Experiment Model and Validity Frame in M&S (Joachim Denil, Stefan Klikovits, Pieter J. Mosterman, Antonio Vallecillo and Hans Vangheluwe)
- An Abstract Discrete-Event Simulator considering Input with Uncertainty (Damian Vicino, Gabriel Wainer and Olivier Dalle)
- Formal Specification of Hypotheses for Assisting Computer Simulation Studies (Fabian Lorig, Colja A. Becker and Ingo Timm)
- A Modeling and Simulation Language for Biological Cells with Coupled Mechanical and Chemical Processes (Endre Somogyi and James Glazier)

# **Model-driven Approaches for Simulation Engineering (Mod4Sim)**

#### Agenda

### Monday, 24 April 2017

#### Session I 1030 – 1200 Room: Room 5B

- Integrated Modeling and Simulation for Cyberphysical Systems: Extending Multi-Domain M&S to the Design Community (invited) (Theodore A. Bapty (Featured Speaker), Jason Scott, Sandeep Neema and Robert Owens)
- DEVS Specification for Modeling and Simulation of the UML Activities (Abdurrahman Alshareef and Hessam Sarjoughian)
- System Entity Structure and Model Based Framework in Model Based Engineering of Simulations for Technical Systems (Umut Durak, Thorsten Pawletta, Halit Oguztuzun and Bernard P. Zeigler)

#### Session II 1330 – 1500 Room

#### Room: Room 5B

- Automated Development of Web-based Modeling Services for MSaaS Platforms (Andrea D'Ambrogio, Paolo Bocciarelli, Andrea Giglio and Antonio Mastromattei)
- Semi-Automatic Paralleization of Simulations with Model Transformation Techniques (Bilge Kaan Gorur and Atilay Nebi Calli)
- Owl Ontology to Ecore Metamodel Transformation for Designing A Domain Specific Language to Develop Aviation Scenarios (Shafagh Jafer, Bharvi Chhaya and Umut Durak)

# Session III 1530 – 1700 Room: Room 5B Chair: Thorsten Pawletta

- Deriving Architecture Design Variants for System Optimization from Design Space Descriptions Expressed Using UML Profile (Alexander Wichmann, Francesco Bedini, Ralph Maschotta and Armin Zimmermann)
- An fUML Extension Simplifying Executable UML Models Implemented for a C++ Execution Engine (Francesco Bedini, Alexander Wichmann, Ralph Maschotta and Armin Zimmermann)
- SaVeSoC—Safety Aware Virtual Prototype Generation and Evaluation of a System on Chip (Ralph Weissnegger, Martin Schachner, Christian Kreiner, Kay Römer, Markus Pistauer and Christian Steger)

# Tuesday, 25 April 2017

# Special Session on Model Driven and Simulation Engineering for the Future EnterpriseSession IV1330 – 1500Room: Room 5BChair: Carlos Agostinho

- Cyber Physical Systems Based Model-Driven Development for Precision Agriculture (Mihnea Moisescu, Ioan Sacala, Ioan Dumitrache and Dragos Repta)
- Reconfigurable and Updatable Product-Service Systems: The Path For Sustainability and Personalizaiton (Maria Marques, Carlos Agostinho, Greg Zacharewicz and Ricardo Jardim-Goncalves)
- Fault Tolerant Sensing Model for Cyber-Physical Systems (Sudeep Ghimire, João Sarraipa, Carlos Agostinho and Ricardo Jardim-Goncalves)

#### **Chair: Umut Durak**

**Chair: Andrea D'Ambrogio** 

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# **49th High Performance Computing Symposia (HPC)**

# Agenda

# Monday, 24 April 2017

Session I

1030 - 1200

Room: Room 4B

**Chair: Lukas Polok** 

- \* Fault Tolerant Variants of the Fine-Grained Parallel Incomplete LU Factorization (Evan Coleman, Masha Sosonkina and Edmond Chow)
- Adjoint-Based Aerodynamic Design of Complex Aerospace Configurations (invited) (Eric Nielsen) (Featured Speaker)

Session II 1330 – 1500 Room: Room 4B Chair: Masha Sosonkina

- Pivoting Strategy for Fast LU decomposition of Sparse Block Matrices (Lukas Polok and Pavel Smrz)
- Comparing Allinea's and Intel's Performance Tools for HPC (Glenn Luecke, Brandon Groth, Nathan Weeks and Marina Kraeva)
- A Framework For Unit Testing With Coarray Fortran (Ambra Abdullahi Hassan, Valeria Cardellini and Salvatore Filippone)
- Session III 1530 1700 Ro

Room: Room 4B

**Chair: Layne Watson** 

- Efficient Algorithms for Assortative Edge Switch in Large Labeled Networks (Hasanuzzaman Bhuiyan, Maleq Khan and Madhav Marathe)
- Performance, Management, AND Monitoring of 68 Node Rasberry PI 3 Education Cluster: Big Orange Bramble (BOB) (John Mitchell, Aaron Young, Jordan Sangid, Kelley Deuso, Patricia Eckhart, Taher Naderi and Mark Dean)
- Improving the Performance of Optimistic Time Management Mechanism with Sub-state Saving (Bilge Kaan Gorur, Kayhan Imre, Halit Oguztuzun and Levent Yilmaz)

# **49th High Performance Computing Symposia (HPC)**

### Agenda

# Tuesday, 25 April 2017

Session IV 1330 – 1500 Room: Room 4B Chair: Layne Watson

- Designing Large Hybrid Cache for Future HPC Systems (Jiacong He and Joseph Callenes-Sloan)
- Optimizing Energy Consumption in GPUs through Feedback-Driven CTA Scheduling (Amin Jadidi, Mohammad Arjomand, Chita Das and Mahmut Knademir)
- Evaluating Effects of Application Based and Automatic Energy Saving Strategies on NWCHEM (Vaibhav Sundriyal, Ellie Fought, Masha Sosonkina and Theresa Windus)

Session V 1530 – 1700 Room: Room 4B Chair: Will Thacker

- Scaling Constituent Algorithms of a Trend and Change Detection Polyalgorithm (Rishu Saxena, Valerie A. Thomas, Layne T. Watson, and Randolph H. Wynne)
- Adaptive Particle Routing in Parallel/Distributed Particle Filters (Xudong Zhang, Lixin Huang, Evan Ferguson-Hull and Feng Gu)
- Implicant Based Solver for Xor Boolean Linear Systems (Jayashree Katti, Virendra Sule and B.K. Lande)

#### Wednesday, 26 April 2017

Session VI 0830 – 1000 Room: Room4B Chair: Masha Sosonkina

• In Situ Methods, Infrastructures, and Applications on HPC Platforms: Knowledge Discovery with Minimal I/O (invited) (Wes Bethel) (Featured Speaker)

Session VII 1030 – 1230 Room: Room 4B Chair: Lukas Polok

- To Share or Not to Share: Comparing Burst Buffer Architectures (Lei Cao, Bradley Settlemyer and John Bent)
- Global Deterministic and Stochastic Optimization in a Service Oriented Architecture (Chaitra Raghunath, Tyler Chang, Layne T. Watson, Mohamed Jrad, Rakesh K. Kapania and Raymond M. Kolonay)
- Matrix-Free Finite-Element Computations on Graphics Processors with Adaptively Refined Unstructured Meshes (Karl Ljungkvist)
- OpenFOAM on GPUs using AmgX (Thilina Rathnayake and Sanath Jayasena, and Mahinsasa Narayana)

# Modeling and Simulation of Complexity in Intelligent, Adaptive and Autonomous Systems (MSCIAAS)

# Agenda

# Tuesday, 25 April 2017

#### Session IV 1330 – 1500 Room: Room 3E Chair: Saurabh Mittal

- Emergence of Human Language: A DEVS-Based Systems Approach (invited) (Bernie Zeigler (Honorary Featured Speaker)
- Verification and Validation of Ethical Decision-Making in Autonomous Systems (Levent Yilmaz)

#### Session V 1530 – 1720 Room: Room 3E Chair: Saurabh Mittal

- Tackling the Complexity of Simulation Scenario Development in Aviation (invited) (Shafagh Jafer and Umut Durak (Featured Speaker)
- Investigating the Use of Real-time Data in Nudging Patients' Emergency Department (ED) Attendance Behavior (invited) (Navonil Mustafee (Featured Speaker), John H. Powell, Susan Martin, Andrew Fordyce, and Alison Harper)
- Integration of a Physical System, Machine Learning, Simulation, Validation and Control Systems towards Symbiotic Model Engineering (Sebastian Bohlmann, Volkhard Klinger and Helena Szczerbicka)
- Detection and Classification of Emergent Behavior using Multi-agent Simulation Framework (WIP) (Shweta Singh, Shan Lu, Mitch Kokar and Paul Kogut)

# **Modeling and Simulation in Medicine (MSM)**

# Agenda

# Monday, 24 April 2017

#### Session I1030 – 1200Room: Room 3DChair: Jerzy Rozenblit

#### **TOPIC: Featured Keynote Talk**

• Dream Sweet Dreams: A new Framework for Sleep Tracking and Body Change Prediction (invited) (Ao Li, Janet M. Roveda (Featured Speaker), Linda S. Powers, Michelle M. Perfect, and Stuart F. Quan)

#### Session II 1330 – 1500 Room: Room 3D Chair: Johannes Sametinger

#### **TOPIC:** Modeling Frameworks and Data Analytics in Healthcare

- Identification Of Motion-Based Action Potentials In Neural Bundles Using A Continuous Symbiotic System (Volkhard Klinger, Sebastian Bohlmann and Helena Szczerbicka)
- A comparison study on the effect of false positive reduction in deep learning based detection for juxtapleural lung nodules: CNN vs DNN (Jiaxing Tan, Yumei Huo, Zhengrong Liang and Lihong Li)
- Towards Use Of Electronic Health Records: Cancer Classification (Siyu Liao, Jiehao Xiao, Yi Xie and Feng Gu )

#### Session III 1530 – 1730 Room: Room 3D Chair: Johannes Sametinger TOPIC: Computer-Assisted Surgical Training

- A Simulation-Based Assessment System For Computer Assisted Surgical Trainer (Minsik Hong, Jerzy Rozenblit and Allan Hamilton)
- Augmented Reality Visual Guidance for Spatial Perception in the Computer Assisted Surgical Trainer (Adam Wagner and Jerzy Rozenblit)
- Image-based Object State Modeling of a Transfer Task in Simulated Surgical Training (Kuo Shiuan Peng, Minsik Hong and Jerzy Rozenblit)
- Safety-Assured Offline-Online Path Planning In Simulated Surgical Training (Aakarsh Rao, Michael Valenzuela and Jerzy Rozenblit)

# Tuesday, 25 April 2017

Session V1530 – 1700Room: Room 3DChair: Jerzy RozenblitTOPIC: Modeling for Medical Practice and Medical Devices

- Composite Risk Modeling For Automated Threat Mitigation In Medical Devices (Aakarsh Rao, Jerzy Rozenblit, Roman Lysecky and Johannes Sametinger)
- The Reference Model Estimates Medical Practice Improvement In Diabetic Populations (Jacob Barhak)

# Work In Process (WIP)

# Agenda

# Tuesday, 25 April 2017

#### Session V

Room: Room 4A

- The Impact of Information Blackouts on the Bullwhip Effect of a Supply Chain (Elizabeth Rasnick and Dean Chatfield)
- Aural Spatial Mapping Tool: Sonic Event Agent Behaviors (Merate Barakat)

1530 - 1710

- Factors Affecting County Violence in the State of Texas (E. L. Perry, Fortune Mhlanga and Robert Kirchner)
- A New Mysleep Framework for Sleep Tracking and Body Changer Prediction (Janet Roveda)

# **Poster and Student Colloquium**

# Agenda

# Sunday, 23 April 2017

#### Poster/Student Colloquium

#### Session I 0900 – 1030 Room: Salon 1 Chair: Caroline C. Krejci

- The Modeling Task Migration for Fault Tolerance in Matrix-Matrix Multiplication (Erik Jensen & Masha Sosonkina)
- Making the Case for an Empirical Investigation into the Utility of Problem Structuring Methods (Yin Thaviphoke & Patrick Hester)
- Employing Reinsurance Industry to Improve Resilience Management in Oil and Gas Drilling Process (Farinaz Sabz Ali Pour & Adrian Gheorghe)
- Modeling Blockchain Technology Diffusion Mechanism using Agent-Based Simulation (Leili Soltanisehat & Adrian Gheorghe)
- Agent-Based Modeling of Natural Gas Systems (Nima Shahriari, Adrean Gheorge, Matthew Amissah, & Sarah Bouazzaoui)
- Simulation and Evaluation of Resource Allocation for Heterogeneous Workloads in Large-Scale Data Centers (Wael Khallouli & Jingwei Huang)
- Integration of Simulation and Optimization in Container Terminals to Aid with Decision Making (Mariam Kotachi)
- Re-Use of a Simulation Model to Increase the Productivity of an EAF Steel Meltshop: A Case Study (Roberto Revetria)
- Using Quick System Dynamics Model for the Study of Rolling and Forging Processes in a Steelworks: A Case Study (Roberto Revetria)
- Improving Teaching and Learning through Interactive Gaming: Strategic Decisions in Electric Utility Infrastructure (Nathapon Siangchokyoo, Danho Ange-Lionel Toba, Issakar Ngatang, Trai Corte, & Nicholas Benfield)

#### **Poster/Student Colloquium**

Session II

Room: Salon 1 Chair: Caroline C. Krejci

• Poster Session (All Presenters)

1045 - 1215

# Student M&S Demo Session

### Agenda

## Sunday, 23 April 2017

#### Student M&S Demo Session

#### Session I

#### Room: Salon 3 Chair: Salim Chemlal

• Verifying the Unverifiable (Soroosh Gholami and Hessam Sarjoughian)

1300 - 1500

- Re-Use of a Simulation Model to Increase the Productivity of an EAF Steel Meltshop: A Case Study (Roberto Revetria )
- Rapid USV Model Prototyping System (Beau Branch, Samantha Collins, Lee Dumaliang, Nathan Gonda, Timothy Lane, Kari Miles, Melissa Periman and Dominic Scerbo)
- Graphical Specification of Flight Scenarios with Aviation Scenario Definition Language (ASDL) (Bharvi Chhaya, Shafagh Jafer and Umut Durak)
- A Data-Driven Spatial Agent-Based Simulation Application with In-Memory Caching Support (Hamdi Kavak and Jose Padilla)
- ACTIVEFLOVE: A Framework for Explorative Visualization of Large Flow Data (Katherine Smith, Zhanping Liu and Yuzhong Shen)
- Showcasing the MSAAS System MARS 2.0 with a Large-Scale Model (Christian Hüning and Jan Dalski)

#### Session II 1515 – 1700 Room: Salon 3 Chair: Salim Chemlal

- An Instrument for Assessing Chest Wall Deformities and Improvements (Mohammad Obeid, Nahom Kidane and Frederic (Rick) McKenzie)
- Infusing Simulatability into Software Models (Abdurrahman Alshareef and Hessam Sarjoughian)
- Using Quick System Dynamics Model for the Study of Rolling and Forging Processes in a Steelworks: A Case Study (Roberto Revetria)
- Devs-Based Framework for Modeling and Simulation Propagation Phenomena in Social Networks: Application to the Information Spreading in a Multi-Layer Social Network (Youssef Bouanan, Greg Zacharewicz and Bruno Vallespir)
- Twitter Recommender System Simulator (Jason Li and Abdolreza Abhari)
- Visualization of Event Execution in a Discrete Event System (Samantha Collins, Lee Dumaliang and Nathan Gonda)
- The Micro Simulation Tool (Jacob Barhak)

Notes







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