REVIEW OF THE 2013 SPRING SIMULATION MULTI-CONFERENCE

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ABSTRACT

The Society for Modeling and Simulation (SCS) Spring Simulation Multi-Conference 2013 (Spring-Sim’13) was conducted April 7-10, 2013, at the Bahia Resort in San Diego, California. This conference comprised eight symposia and a tutorial and poster track. This paper gives a review of the highlights, the team members, best papers, and some personal observations of the General Chair.

1 INTRODUCTION

There is life after a major conference! I am sure that many of my predecessors as General Chair of one of the main SCS conferences felt the same. When I heard that we are breaking even with our costs I was a relieved as I was when I heard that all keynote speakers made it in time and that the number of no-shows were pretty low. No major problems with the rooms, no big complaints about the hotel, overall a success for the SCS and its members.

I wrote this paper to summarize the main topics of SpringSim’13, starting with the organization team and the symposia, presenting the awarded papers, and capture some lessons learned (again). I cannot thank everybody here, so I will limit my personal thank-you notes to those I directly worked with. Many more people deserve credits, in particular in the various symposia. This includes the organization teams in the symposia, the authors, the reviewers, the panelists, and our members who contributed to lively discussions and memorable networking events.

2 THE MULTI-CONFERENCE

SpringSim is a Multi-Conference. As such, SpringSim is a roof organization supporting conducting independent conferences or symposia that all are affiliated with SCS. By providing a common multi-conference organization team and a common submission infrastructure with aligned deadlines, a common format, and common proceedings, SpringSim grew over the last years to become the annual main SCS event providing a platform to exchange the latest research results as well as connecting with partners from industry, government, or academia.

The conference on Theory of Modeling and Simulation (TMS)/Discrete Event Simulation (DEVS) was conducted as a sub-conference of SpringSim. Also, the 2013 event was co-located with the Spring Simulation Interoperability Workshop (SIW) conducted by the Simulation Interoperability Standards Organization (SISO). SpringSim’13 supported seven symposia.

- Agent-Directed Simulation (ADS) Symposium, chaired by Levent Yilmaz, Auburn University, and Tuncer Ören, University of Ottawa
- 46th Annual Simulation Symposium (ANSS), chaired by Eric Imsand, GaN Corporation, and Shaoen Wu, University of Southern Mississippi
- 16th Communications and Networking Symposium (CNS), chaired by Hassan Rajaee, Bowling Green State University
Each symposium had many additional helpers to conduct the reviews, group the papers into sessions, organize the sessions, panels, and invited papers, chair the session, and many things more. All these volunteers filled SpringSim with life and made it a success. All accepted and presented papers were of high quality and are archived in the Association for Computing Machinery (ACM) Digital Library. We hope to continue to improve the process and get the proceedings indexed by SCOPUS in the future.

Such high objectives are hard to reach for individual symposia. The overarching organization team tried to accomplish as much as possible to keep more tasks off the plate of the symposium chairs. For spring 2013, the team comprised the following persons:

- General Chair was Andreas Tolk, Old Dominion University
- Vice-General Chair was Mamadou Traoré, Blaise Pascal University LIMOS
- Program Chair was Saikou Diallo, Old Dominion University
- Proceedings Chair was Andrea D'Ambrogio, University of Rome
- Awards Chair was Agostino Bruzzone, University of Genoa DIPTEM
- Tutorial Chair was Daniele Gianni, University of Rome
- Poster Co-Chairs were Shafagh Jafer, Milwaukee School of Engineering, and Mohammad Moallemi, Carleton University

SCS recently supported the policy that the vice chair will become the general chair of the next SpringSim, the program chair becomes the vice chair, and the new person committing to become program chair actually makes a three year commitment to serve as a SpringSim officer. By following this rule, the “corporate knowledge” on how to conduct such multi-conference is preserved best. It also supports the idea of coaching, as the general chair knows exactly what needs to be done – and what can go wrong – on all levels of his supporting officers.

3 THE KEYNOTES AND OTHER PROGRAM HIGHLIGHTS

The 2013 SpringSim faced a particular interesting challenge triggered by the defense budget situation within the United State. The weeks leading to the conference were characterized by high uncertainties regarding travel budgets and conference attendance, which did lead to a significant problem of defense related personal to commit to delivering a keynote. Fortunately, SCS has many international experts that are of high caliber to ensure that worthwhile keynotes could be delivered even under this unfavorable constraints. For SpringSim 2013, two general keynotes were presented:

- Professor Tag Gon Kim from the SMS (Systems Modeling and Simulation) Lab, Department of Electrical Engineering, KAIST, South Korea, presented his Simulations Interoperation Approach for Modeling and Simulation of Defense System as System of Systems. The presented approach first develops component defense system models using tools, each specialized to M&S of each component system in its own environment. Employed M&S tools interoperated via HLA/RTI include DEVSim++ for discrete event M&S, MATLAB for continuous system M&S, OPNet for communication system M&S, Cellular Automata Simulator for chemical warfare M&S and other ad hoc Simulators.

Professor Agostino Bruzzone from DIPTEM University of Genoa, Italy, presented his current work on New Challenges for Modeling & Simulation in the Maritime Domain. The presentation focused on ongoing activities of NATO Navy forces and how they can be supported by M&S approaches. All application
domains from analysis via training and education to support of operations are part of the ongoing evaluations. The keynote should that M&S has now a very well established role within NATO.

In addition to these keynotes, the Communications and Networking Symposium organized two high level presentations. Aftab Ahmad from the Norfolk State University, and Richard Wells from the University of Idaho presented a new framework for putting logic into the modeling of biological neurons. In the second presentation, Max Ehammer from the Salzburg University shared his visions of the future aeronautical data network. The symposia on High Performance Computing (HPC) and Simulation for Architecture and Urban Design (SimAUD) also invited experts in their field.

SpringSim’13 was also breaking ground regarding more coordination between the independent symposia. In close collaboration of symposium chairs and the program chair, topics of common interest were identified and several joint sessions resulted. While we had joint sessions in other SpringSim events as well, this years they were purposefully designed to support the visitors with special interests, ensuring that papers with the same topic were conducted in joint sessions, and not in parallel sessions. We even had a joint session on the past, present, and future of Human, Social, Cultural, and Behavioral Modeling with a SISO group, which attracted a diverse audience and resulted in interesting discussions exposing many complementary viewpoints.

Another activity of particular interest for student members of SCS was the SISO SmackDown event (http://sisosmackdown.com). This event was first conducted during the SISO SW/SpringSim 2011 in Boston, MA, designed as an international interuniversity event. In its third year, it evolved also into an interactive problem solving experience for students supporting their “job readiness” as future simulationists. Supported by their partners (SISO, AEGis Technologies, ForwardSim Inc., VT MAK, the Global Institute for Cyber Security and Research, Pitch Technologies, MBDA, and NASA), several university based groups developed simulations that were federated and executed for this event.

4 BEST PAPER AWARDS

Each symposium selected a best paper. As all contributed papers were peer reviewed, the selection could be backed by the evaluation results looking at innovation, contribution of the paper to the field, relevance of presented results, readability, references to related work, etc. Only contributed papers were eligible. Under the lead of the awards chair, the overall best paper was selected from these best papers.

4.1 Agent Directed Simulation

Chase Cockrell, Scott Christley, Gary An, Eugene Chang, and Marc Ward received the ADS Best Paper award for their work on “Examining the dynamics of epithelial metaplasia and pouchitis in an ileal pouch with a spatially-explicit computational multi-scale gut model (MSGM)”

Abstract: In patients with a history of proctocolectomy with ileal pouch-anal reconstruction for ulcerative colitis (UC), epithelial metaplasia in the pouch, a conversion from the short crypts, high villi and few goblet cells of ileal mucosa to colonic-like mucosa with deeper and wider crypts, short villi and more goblet cells, appears to predispose to pouchitis. Inflammation is known to be associated with both pouch metaplasia and pouchitis, but the mechanisms by which the histological transformation occurs, and the functional consequences thereof, are unclear. We propose that appropriate contextualization of the role of inflammation on metaplasia requires understanding the cellular control system that determines the epithelial crypt-villus architecture. Towards this end we have developed a spatially explicit computational model, the multi-scale gut model (MSGM), in order to dynamically represent existing knowledge concerning the behavior of gut epithelial tissue, and to help posit and visualize plausible mechanistic relationships between molecular and genetic entities of interest and provide predictions as to the most promising lines of future inquiry.
4.2 Annual Simulation Symposium
Garrett Bernstein and Kyle O’Brien received the ANSS Best Paper award for their paper on „Stochastic Agent-Based Simulations of Social Networks.”

Abstract: The rapidly growing field of network analytics requires data sets for use in evaluation. Real world data often lack truth and simulated data lack narrative fidelity or statistical generality. This paper presents a novel, mixed-membership, agent-based simulation model to generate activity data with narrative power while providing statistical diversity through random draws. The model generalizes to a variety of network activity types such as Internet and cellular communications, human mobility, and social network interactions. The simulated actions over all agents can then drive an application specific observational model to render measurements as one would collect in real-world experiments. We apply this framework to human mobility and demonstrate its utility in generating high fidelity traffic data for network analytics.

4.3 Communications and Networking Symposium
The CNS Best Paper award went to Thouraya Bouabana-Tebibel and Khadidja Ayad for their work on “Hash Chains to Secure Proactive Protocols.”

Abstract: Several secure extensions have been proposed to deal with the OLSR proactive routing protocol security, but they often involve a very high resource consumption that degrades network performances. The protocol ADVSIG is one of these extensions. It presents an efficient security approach, but generates very high computational costs due to the cryptographic operations it performs on the control messages. In this paper, we present a secure mechanism for OLSR, based on ADVSIG protocol, that we call ADVHCA. Its purpose is to improve ADVSIG performances using hash chains to reduce the cost of securing HELLO control messages. A watching mechanism is also proposed to counter the wormhole attack. The whole solution is simulated and analyzed using NS2.

4.4 Emerging M&S Applications in Industry and Academia
Emre Irfanoglu, Ilker Akgun, and Murat M. Gunal received the EAIA Best Paper award for the contribution on “Metamodeling by using Multiple Regression Integrated K-Means Clustering Algorithm.”

Abstract: A metamodel in simulation modeling, as also known as response surfaces, emulators, auxiliary models, etc. relates a simulation model’s outputs to its inputs without the need for further experimentation. A metamodel is essentially a regression model and mostly known as “the model of a simulation model”. A metamodel may be used for Validation and Verification, sensitivity or what-if analysis, and optimization of simulation model. In this study, we proposed a new metamodeling approach by using multiple regression integrated K-means clustering algorithm especially for simulation optimization. Our aim is to evaluate the feasibility of a new metamodeling approach in which we create multiple metamodels by clustering input-output variables of a simulation model according to their similarities. In this approach, first, we run the simulation model of a system, second, by using K-Means clustering algorithm, we create metamodels for each cluster, and third, we seek the minima (or maxima) for each metamodel. We also tested our approach by using a fictitious call center. We observed that this approach increases the accuracy of a metamodel and decreases the sum of squared errors. These observations give us some insights about usefulness of clustering in metamodeling for simulation optimization.

4.5 High Performance Computing
The HPC Best paper award was received by Prasanna Balaprakashy, Darius Buntinasy, Anthony Chany, Apala Guhayz, Rinku Guptay, Sri Hari Krishna Narayanany, Andrew A. Chiényzy, Paul Hovlandy, and Boyana Norrisy for their work on “Exascale Workload Characterization and Architecture Implications.”

Abstract: We use a hybrid methodology based on binary instrumentation and performance counters to characterize a set of proxy applications (mini-apps and PETSc applications) representative of a broad
range of scientific applications (and particularly DOE’s future high performance computing workloads).
From this empirical basis, we create statistical models that extrapolate application properties (instruction mix, memory size, and memory bandwidth) as a function of problem size. We validate them and project the first quantitative characterization of an exascale computing workload. Finally, the exascale workload is used to evaluate a radical new exascale architecture, stacked DRAM with processor under memory (PUM). Of the two projections, one shows major potential benefits in using PUM. However, the second, more conservative projection suggests that only a small number of exascale applications are likely to be memory-bandwidth limited, but even these are fundamentally memory-capacity limited.

4.6 Military Modeling and Simulation
The paper on “Collaborative Modeling & Tailored Simulation for Course of Action Validation” by Mark Sumile was awarded as the best paper for MMS.

Abstract: The purpose of this paper is to outline a target set of Command and Control (C2) Modeling & Simulation (M&S) capabilities critical to providing Commanders with adequate situational awareness (SA) to enable globally integrated operations. Specifically, it will provide a conceptual framework that can be used to formulate a Collaborative Information Environment (CIE) that can support Course of Action (COA) modeling and validation while planning during execution. This paper is operationally focused, but is also intended to be compatible with technology-focused principles and in information management concepts.

4.7 Simulation for Architecture and Urban Design
Chrysanthi (Sandy) Karakouni, Ava Fatah gen Schieck, Martha Tsigkari, and Angelos Chronis work presenting “Façade apertures optimization: Integrating-cross-ventilation performance analysis in fluid dynamics simulation” was recognized as the SimAUD Best Paper.

Abstract: Performance-oriented design has as a primary aim to introduce spaces that achieve acceptable levels of human comfort. Wind-induced airflow plays a significant role in the improving occupants’ comfort in a building. This paper explores the extent to which simulation of natural airflow can potentially be a contributing parameter in the conception of performance-aware designs.

Testing the natural ventilation performance of a pavilion, the study employs Fast Fluid Dynamics simulation. A performance analysis is conducted, whereby an array of automated feedback loops carried out by a genetic algorithm can produce a number of acceptable solutions as regards the optimization of facades’ openings. The experimentation conducted proves the ability of the model to yield design instances that fulfill a number of environmental criteria related to airflow and human comfort. In this light, the paper suggests that the aforementioned method can be used as an experimentation platform to influence the direction a designer may take when considering a design proposal.

4.8 Theory of Modeling and Simulation / Best SpringSim’13 Paper
Ning Ge, Shin Nakajima, and Marc Pantel did not only receive the TMS/DEVS Best Paper award for their contribution on “Efficient Online Analysis of Accidental Fault Localization for Dynamic Systems using Hidden Markov Model,” this paper was also selected as the BEST SPRINGSIM’13 PAPER.

Abstract: This paper proposes a novel approach to do online analysis of accidental fault localization for dynamic systems by using Hidden Markov Model (HMM). By introducing reasonable and appropriate abstraction of complex system, HMM is used to represent the fault and no-fault states of system’s components and system’s behaviour. The HMM is parametrized to be statistically equivalent to real system’s behaviour. Inspired by the principles of Fault Tree Analysis and maximum entropy in Bayesian probability theory, we propose the algorithms to estimate HMM’s parameters, instead of learning, because in real systems the learning data for accidental fault is difficult to obtain. We design a specific test bed to gener-
ate large quantity of test cases, and give out the experimental results to assess the accuracy and efficiency. Meanwhile, we apply the approach to a simple helicopter control system case study, and give out convincing results.

Of particular interest for future conferences is although the main author that Ning Ge was fully registered for the conference, but due to visa challenges could not come to San Diego in person. She therefore presented the paper via an Internet presentation, took questions from the floor during the discussion phase, and professionally presented the best paper from the distance.

4.9 Poster Session

The poster session conducted during SpringSim’13 continued to grow as well. What started as a pool for papers that should be discussed but are not ready for the prime time to be presented in one of the symposia several years ago became by now a platform for students and researchers to discuss their ideas or preliminary results early and on a high quality level. As a result, poster are now peer-reviewed as well. This year, the poster on DEV&DESS-Based Cyber-Physical Systems Modeling Language with Uncertainty Consideration, prepared and presented by Hae Young Lee, Ingeol Chun, and Won-Tae Kim, received the Best Poster Award.

The references to the awarded papers are given at the end of this paper.

5 SUMMARY

The new SCS mission as accepted during the SpringSim meeting is fivefold:

- To promote modeling and simulation as a discipline and a profession
- To contribute to the development of its theoretic foundations
- To foster its application in new areas through research and education
- To provide a forum to publish, present, and discuss new results, developments, applications, and lessons learned
- To provide a forum enabling the exchange between and mutual support of industry, government, and academia

SpringSim 2013 contributed to all five tenets of this mission. I hope that we will be able to continue to provide high-value tutorials, challenging panel-discussions, quality research papers, and a platform for industry, government, and academia.

As SISO is currently restructuring their conferences, SpringSim’13 may have been the last event with collocated SISO and SCS activities, although no final decisions have been officially announced. If the SmackDown event will find a new home during the SpringSim’14 event remains to be seen. In any case will we support more student driven activities.

For me remains to wish all the best to Mamadou Traoré and Saikou Diallo, who will be in charge as the General Chair/Vice Chair team to make the Spring Simulation Multi-Conference 2014 a success. I am looking forward for many interesting activities and many good papers.

REFERENCES


**AUTHOR BIOGRAPHY**

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