QUANTIFYING SIMULATION VALIDATION THROUGH VALIDATION COVERAGE

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ABSTRACT

The field of Modeling and Simulation (M&S) has been growing rapidly in usage and influence. Researchers and practitioners from a wide variety of areas rely upon M&S for investigating their potential system vulnerabilities, evaluating system alternatives, seeking opportunities for system improvements, or simply for understanding the system better. Complex systems are widely studied using the tools of M&S, including natural systems such as population mobility or cancer cell growth; systems that are yet to be built such as missile defense or nuclear reactors; or systems for which making changes in the real-life/runtime environment to study their impact is very expensive or dangerous, such as the process of patient care in a hospital emergency department or automotive control. Scientists, engineers, and domain experts utilize a number of different modeling approaches such as discrete-event, continuous, system-dynamics, etc. for developing their simulation models. Regardless of the process that is followed and the tools that are used to develop these models and simulations, they need to be properly verified and validated before their results can be trusted.

Model credibility is typically ascertained by validating the model through the exercise of different validation techniques. Traditionally models are assigned a qualitative measure of trustworthiness based on domain experts' opinions and other V&V activities performed on the model. In our recent work we have described an approach to better quantify the credibility of a simulation model, which involves tracking both the validation techniques that could be used and the validation techniques that are successfully used within the three main categories: behavioral, structural, and data.

In this tutorial, we will discuss the current state-of-the-art of simulation validation, explain our previously published process for quantifying simulation validation, and demonstrate using our web-based tool for applying the process to any simulation model. Participants will be invited to use the tool during the tutorial for either their own model or a provided example model to practice the concepts, ask questions, and provide feedback.

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MEGAN OLSEN is an Associate Professor of Computer Science at Loyola University Maryland. She earned her M.S. (2009) and Ph.D. (2011) in computer science from University of Massachusetts Amherst, and her B.S. in computer science from Virginia Tech (2005). Dr. Olsen's research currently focuses on improving simulation approaches and validation. Recent work includes quantifying the level of validation achieved on a simulation model, guidelines for using metamorphic testing for simulation validation, and utilizing reinforcement learning within agent-based predator-prey models. Recent work has been published in SummerSim, WinterSim, SpringSim, and the International Conference on Computational Science.

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