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An Advanced Computational Approach to System of Systems Analysis
Using an Agent-Based Behavioral Model

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Abstract

System of Systems (SoS) development is a complex process that depends on the cooperation of various independent Systems. Each system has its own priorities and schedule which may not align with the SoS goals. The SoS manager has the difficult task of eliciting capabilities from the constituent systems within the deadlines required to support the overall SoS mission goals. This research uses an agent-based model to investigate the effects of system cooperation on the SoS development. Both SoS behavior and system behavior is represented in the model. The main goal of SoS development is providing capability to the warfighter in time to meet the up and coming threats. Quick deployment of capability to the warfighter is essential and depends on the time it takes to acquire the capabilities at the SoS level. Intuitively it would seem that the greater the cooperation of the constituent systems the shorter the SoS development cycle. The shorter the SoS development cycle, the sooner the capability is deployed to the warfighter. This research examines the effect of constituent systems' cooperation on the length of the development cycle. Is there some mix of cooperation among the constituent systems that would provide enough capability to the warfighter just in time to prevent the latest threat? This research provides an approach and an agent-based model that can be used to answer that question.

The agent-based model and approach used in this research is generic and can be applied to any domain. The model uses an open architecture so that different system behavior models or different SoS behavior models could be used.

Biography

Ms. Paulette Acheson is a systems engineering PhD student at Missouri University of Science and Technology (MS&T). She has a BA in math from California State University, Fresno; a BS in Biology from California State University, Fullerton; and an MS in applied math from University of Southern California. She has been a software engineer and systems engineer for over 30 years working for various government contractors. Ms. Acheson currently works as an engineer doing model based systems engineering and software engineering. Her research is in the area of model based systems engineering and agent-based modeling of systems of systems.