System of Systems Engineering
Collaborators Information Exchange (SoSECIE)

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System of Systems Engineering
Approach for Complex Deterministic and Nondeterministic Systems (ACDANS)
Presenter: Paul C. Hershey

As new commercial and military systems evolve, engineers face significant challenges that require solutions beyond traditional systems engineering. For example, military commanders recognize that in order to confront threats from high-tech adversaries, an advanced system of systems (SoS) is required to coordinate combat across multiple battlefield domains: land, sea, air, space, and cyberspace. System of Systems Engineering (SoSE), along with associated Modeling and Simulation (M&S) tools, can fill some of this need, especially for operational decision-support for complex multi-domain environments. Today's presentation describes a System of Systems Engineering Approach for Complex Deterministic and Nondeterministic Systems (ACDANS), based on Modeling and Simulation (M&S), to address some of the challenges identified above. The presentation illustrates the steps of this approach through a discussion of possible M&S-based solutions for three presently unresolved SoSE problems: 1. How to model and build a reliable system of systems if many of the subsystems are either deterministic or non-deterministic, 2. How to apply Machine Learning (ML) to support such systems, and 3. How to model and build these systems at scale in an era of Internet Battlefield of Things, particularly with open architectures and legacy components, including cyber physical systems. These solutions are presented through use cases and associated research that address specific SoS challenges for this set of complex decision-support challenges.

Biography

Paul Hershey works for Raytheon Technologies Company, where he is a Principal Engineering Fellow focusing on data analytics, autonomous systems, modeling and simulation, and cyber security. He has been a member of IEEE since 1980 and was elevated to IEEE Fellow in 2021. He received his Ph.D. and M.S. degrees in electrical engineering from the University of Maryland, College Park, MD, USA, and the A.B. degree in mathematics from the College of William and Mary, Williamsburg, VA, USA. Dr. Hershey has published 39 patents (granted) and over 60 peer-reviewed technical articles. Previously, he was an adjunct professor at George Washington University where he also served on the Curriculum Advisory Board. He presently serves on technical program committees for the IEEE International Systems Conference and the IEEE International System of Systems Engineering Conference. Dr. Hershey is a Distinguished Lecturer on data analytics for the IEEE Systems Council.