System of Systems Engineering Collaborators Information Exchange (SoSECIE)

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A Game Loop Architecture for the Modeling and Simulation of Mission Threads

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Abstract

Scenario-based methods are valuable analysis drivers in support of mission systems engineering. Mission threads in particular are extremely useful in the formative phases of a project. They can be crafted with relative ease providing an affordable means of spanning the mission space making them a key enabler of engineered flexibility. To this end, they are deliberately subjective in their content. They are essentially a narrative of events that reflect the actions taken by the participating entities and their effects subject to the fog and friction of war. Modeling and Simulation has a role supplementing the contributions of the mission threads with meaningful quantitative data. Currently the scope of coverage and difficulties in representing the phenomenological interactions that define the operational context limit the practicality of doing so. The impetus for this role is however growing as efforts to promote the use of mission threads in capturing quality attributes are gaining traction.

This presentation introduces and demonstrates a simulation architecture that accommodates the agility of the mission thread and a canonical representation of the highly interactive operational environment. The seminal feature of the architecture is a game loop construct which directs the actions and maintains the status of the participating entities. It also features a centralized adjudication cell that determines the outcome of all contested events including but not limited to observations and weapons effects. These features and the representations of the participating entities can be implemented as reusable modules with a reasonable effort. Subsequent to this initial investment, a wide variety of mission threads can be simulated by specifying the players, their starting positions and status, and their intentions by way of script files. The architecture promotes a seamless evolution of the simulation allowing the amortization of the initial investment over the life of the project.

Biography

Mr. Tanner received a BS in applied mathematics from the University of Wisconsin Stout in 1974, and a MS in applied mathematics from the University of Missouri at Rolla in 1978.

He has over 25 years experience in the operations and design of combat systems. As a surface warfare officer, he served on three different classes of combatant ships earning certification as anti submarine warfare evaluator, tactical action officer and chief engineer of a nuclear powered vessel. During his final tour ashore, he served as the lead mathematician and tactical advisor on a cutting edge sensor integration effort.

Upon retirement from the Navy, he has made significant contributions to modeling and simulation efforts supporting several projects in varying stages of maturity. His current interests are focused on improving the agility and the efficacy of mission systems effectiveness analysis.