



# SIE Grad Student Seminar

## Distributed Federation of Multi-paradigm Simulation and Decision Models for Planning and Control

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2:00-3:00 PM

ENGR 301

In this talk, we first discuss three major simulation modeling paradigms: 1) discrete event (DE), 2) agent-based (AB), and 3) system dynamics (SD). A product diffusion model is then used to prove that AB and SD models essentially represent the same system state via probability theory and solving differential equations. We then discuss innovative uses of multi-paradigm simulations to support planning and control decisions. First, we will discuss a simulation-based planning and control (SPC) approach, where a fast-running DE simulation is used to evaluate decision alternatives at the planning stage, and the same simulation model (running in real-time) is used as a task generator to drive a real system (e.g. shop floor system; border patrol system) at the control stage. We then discuss extension of the SPC approach to enterprise level activities (e.g. top floor). To handle computational complexity, both an aggregation approach involving SD models as well as federation of multiple DE models using web services technologies are discussed. Finally, we discuss a highly detailed AB model, where human behaviors (e.g. evacuation from factory fire; border trafficking behavior) are represented by an extended Belief-Desire-Intention (E-BDI) framework.

**Sponsored by the Dept. of Systems & Industrial Engineering**  
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