MASTER OF SCIENCE
IN
MODELING, VIRTUAL ENVIRONMENTS, AND SIMULATION

METHODOLOGY AND DESIGN OF ADAPTIVE AGENT-BASED SIMULATION ARCHITECTURES FOR BAMBOO OR VISUAL C++

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Zero-sum budgeting, downsizing, and increased mission requirements make it more challenging for U.S. Navy leaders to understand the short and long-term consequences of their decisions. An enterprise model of the Navy could provide decision-makers with a tool to study how their decisions might affect the Navy's ability to conduct worldwide operations. Agent-based simulation technology provides a flexible platform to model the complex relationships between the Navy's many components. Agent-based modeling uses software agents to define each relevant entity of the system. These agents have the ability to interact with their environment and learn or adapt their behaviors while trying to achieve their goals. The aggregate of these interactions results in identifiable behavior patterns known as emergent behaviors. This thesis looks at two methods of designing the underlying architecture for a simple agent-based simulation. A classic predator-prey relationship is modeled using a Windows/C++ implementation and a dynamically extensible Bamboo implementation. While the Windows/C++ implementation is straightforward, it requires definition of all agents before run-time. Bamboo is more challenging to implement, but allows the introduction of agents "on-the-fly," and can easily be extended for distributed implementation. Both appear to be viable implementation architectures for an enterprise model of the Navy.

DoD KEY TECHNOLOGY AREAS: Modeling and Simulation, Computing and Software

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