Seminar Series
Comp. Sci. Dept.

Intelligent Agent Applications in Virtual Experimentation

Grant Degenhardt, The Boeing Company

Feb 25th Thursday, 12:30 to 1:30pm

Venue – Carver-Turner Room – Havener Center

Abstract - Advances in technology have sparked the expectation of modeling the real world with much greater fidelity and accuracy. The military and corporate industries see the need to use these "emulations of the real world" to perform predictions and analysis of alternatives much better than ever before and ultimately improve their business or service. But to attain these "emulations of the real world" many challenges in modeling and simulation will need to be overcome that have yet to be considered due to the nature of complex adaptive systems.

This presentation addresses the needs and challenges inherent in creating, managing and evaluating complex adaptive systems in the context of virtual experimentation with a focus on how intelligent agents that learn and adapt are a major part of the solution.

Intelligent agents that learn and adapt are ideal for evaluating complex adaptive systems because they are modeled after humans, who successfully traverse and navigate the real world; the largest complex adaptive system. These adaptive intelligent agents do not need to be logically complete or consistent. Families of agents that are each different, but all similar, will be "bootstrapped" with rules and strategies obtained from subject matter experts (SMEs). Agents will learn and adapt to the environment to optimize attainment of goals and satisfaction of other metrics.

The generic inference framework needed to develop and train intelligent agents that behave and learn much like humans will also be discussed. This architecture, which utilizes a hybrid of computational and connectionist frameworks and standard mechanisms of artificial intelligence, possesses both the power of rule-based logic programming systems and the flexibility and adaptability of machine learning systems. Elements of the generic inference framework will be described: the multi-hypothesis algorithm, the distributed agent architecture, the Hoare rule system, and more. The Predicate Constraint Language (PCL), a general purpose development language and a hybrid of relational database, functional programming and logic programming on which the architecture is constructed will also be introduced along with its essential features for learning and adaptation.

Brief Bio - Grant Degenhardt graduated from the University of Missouri – Rolla in 1988 with a B.S. in Electrical Engineering. He worked 15 years for Dynetics, Inc., a defense contractor in Huntsville, AL where he specialized in the software development of real-time and engagement level models of foreign surface-to-air missile (SAM) systems. Grant received his M.S. in Electrical Engineering from the University of Alabama – Huntsville in 2001. Grant returned home to St. Louis, MO in 2002 to accept a job at The Boeing Company where he is currently the Manager for the Advanced Simulation Technologies group at the Virtual Warfare Center whose development is focused on advanced information management systems, human behavior modeling and intelligent agent technologies.