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Research Areas

Real-time three-dimensional (3D) computer graphics, distributed interactive simulation (DIS), entity control and behavior, combat modeling, and terrain databases.

Research Description

Real-time (3D) computer graphics workstations have progressed to a point where they can be used for Out The Window (OTW) visual simulation systems. The key to the development of these systems is the underlying software. As with most leading edge technologies, the construction of the required software is a black art. As such, the focus of the research has been the development, documentation, and distribution of workstation based OTW visual display systems. A major component of this research is the distribution of the simulation across the network. This allows multiple users to interact with each other in a virtual environment. This is one of the key premises of DIS, inserting humans into the virtual environment where they can "free-play" different scenarios. While this sounds simple, the problems of networks, human/computer interfaces, and data management are significant research topics. While the humans in the virtual environment comprise an integral component of the system, there are not enough manned simulators to sufficiently populate the world. To provide the additional entities, we are conducting research in the use of traditional constructive combat models and autonomous agents to populate the world. By providing an interface to the traditional models, we can leverage off the work that has been done before in combat modeling. This, combined with the research on autonomous agents, provides a mechanism to provide friendly and opposing forces to complement the manned simulators. One of the key components of a military virtual environment is the geometric description of the terrain database. To address the importance of the terrain database, we have active research projects in the areas of terrain modifications, culling, and polygon reduction. In addition

to research projects, NPS is quickly becoming one of the leading organizations within DoD for the understanding and conversion of terrain database formats.

Relevance to DoD/DoN

As the defense budget continues to shrink, there will be an increasing reliance on the use of Networked Simulation to train, test, and develop all facets of military training, doctrine, and equipment. The work being done at the Naval Postgraduate School places it at the technological forefront in use of Commercial Off The Shelf (COTS) workstations as visualization platforms in a DIS environment. Officially, our work has been distributed to over seventy DoD, contractor, academic, and industry organizations to aid in the development of their systems. Unofficially, there are over one hundred users of our systems. This results in significant cost savings and reduced development times.

Recent Publications

Pratt, David R., Walter, Jon C., Warren, Patrick T. and Zyda, Michael J. NPSNET: JANUS-3D - Providing Three-Dimensional Displays for a Two Dimensional Combat Model. Proc. 1993 AI, Simulation, and Planning in High Autonomy Systems Conference, September, 1993.

D. Pratt et al, Insertion of an Articulated Human into a Networked Virtual Environment, Proc. 1994 AI, Simulation, and Planning Conference, December 1994.

M. Zyda, D. Pratt, J. Falby, C. Lombardo, and K. Kelleher, The Software Required for the Computer Generation of Virtual Environments. *Presence*, 2, 2, Spring 1993.

M. Zyda, D. Pratt, J. Falby, P. Barham, and K. Kelleher, NPSNET and the Naval Postgraduate School Graphics and Video Laboratory. *Presence*, 2, 3, Summer 1994, pp. 244-258.

D. Pratt, P. Barham, J. Falby, and J. Locke, NPSNET: Four User Interface Paradigms for Entity Control in a Virtual World. *Journal of Intelligent Systems*, 5, 2-4, 1995.

D. Pratt, H. Mohn, and R. McGhee, Implementation of a Tactical Order Generator for Computer Generated Forces. Proc. Fifth Conf. on Computer Generated Forces and Behavior Representation. Orlando, FL, May 1995.