DATE: November 1, 2001

FROM: Ronald D. Kriz

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CC: Lance Arsenault, John Kelso, Fernando das Neves, and Chris Logie

SUBJECT: NAVCIITI Quarterly Report

RE: - Project 2.0   Visualization HCI and Collaboration
          - Task 2.1:   Command and Control Visualization
   SOW 2.1a.3: Design NUWC CONRAY model on OpenGL API, October, 01

Background: Our objective is to provide a distributed collaborative network of graphical and device independent tools in a shared virtual environment, which can be used by Command and Control (C&C) personnel to gain a strategic advantage. Specifically we focus on the mission critical C&C interpretation of acoustic undersea data from towed arrays for the Naval Undersea Weapons Center (NUWC) using the CONRAY simulation models. These simulation models can be extended to "real-time" data acquisition systems. Under the direction of personnel from NUWC and the Naval Research Laboratory (NRL) we have identified a working prototype which we have successfully incorporated into our Device Independent Virtual Environment Reconfigurable-Scalable-Extensible (DIVERSE) tool that works in stereo in the (C)AVE Automated Virtual Environment (CAVE), Immersive Work Bench (IWB), Immersive Desk (I-Desk), desktop workstation simulator, and Head Mounted Display (HMD) systems at the Virginia Tech Center for Virtual Environments and Visualization (CVEV). This effort has evolved and become part of the 3D Visualization Project called SUBV. A Web site for SUBV has been established: http://ait.nrl.navy.mil/people/dmaxwell/subv/

Activities redefined during previous quarter: On February 5, 2001 NUWC, NRL and VT agreed to coordinate efforts in a task break down which was described in the previous quarterly report #16. This effort has now evolved into the 3D Visualization project called SUBV. The SUBV Team is NUWC: K. Lima, R. Shell, S. Aguiar, Todd Drury, NRL: L. Rosenblum, D. Maxwell, VT: F. das Neves, C. Logie, L. Arsenault, J. Kelso. The "core" SUBV Team members (Shell, Maxwell, Kelso, das Neves, Logie) has met every two months at NRL, NUWC, or VT campus and participated in conference phone calls every two weeks.

Discoveries, Accomplishments, and Test Results as they relate to NAVCIITI SOW 2.1a.3

- Extensive comparison of merits and drawbacks of different publicly available scene graphs were studied. VT in particular carried a detailed comparison between Open Inventor and OpenSG, which was suggested as another possible scene graph candidate. Since as of today the final platform where SUBV will run has not been decided, a final discussion and agreement between NUWC, NRL and VT accepted to use SGI's OpenInventor as the scene graph for SUBV, since it offers the highest probability of portability across platforms, including Linux and HP/UX. It was decided that compatibility with current TAC-4 was an important issue. However nobody had enough experience in that platform to assess the problems and feasibility of TAC-4 as a graphics platform.
- Evaluation of TAC-4 running HP/UX 10.20 as deployment and graphics platform for SUBV. After an extended time while we (VT) didn't have access to the platform, we got access to one thanks to the generous donation by NUWC of a TAC-4, where they even helped us by transporting it to Washington DC. It was soon discovered that there was some problems since it ran only on a very proprietary and old version of Unix (HP/UX 10.20), with APIs that significantly differ from most other Unix operating systems. Furthermore the graphics board did not support any kind of useful 3D acceleration or even OpenGL, giving 3-4 fps on Mesa (a free OpenGL implementation). During a whole month attempts where made to compile and run Open Inventor on HP/UX 10.20, despite the differences that prevented even a successful compilation. After significant time studying the source code, several modifications in the Open Inventor's source code, and many patches to the code building scripts, we managed to compile it successfully. The final decision was to discard TAC-4 as the platform due to the fundamental dependence of OpenInventor on the dlopen() API for handling shared libraries, for which

there is no direct equivalent in HP/UX. Making OpenInventor to work on HP/UX 10.20 would imply a rewrite of a fundamental section of OpenInventor's type handling to work is HP's proprietary shared library API, which was deemed not of enough value to invest even more time on it. TAC-5 running HP/UX 11.0 with the dlopen() patch is still considered a potential platform (subject to final evaluation by NUWC).

- Project responsibilities divided between NRL, NUWC and VT. VT became the integrator for the first prototype, due January 31, and will adapt/rewrite code from the past prototype to run in Open Inventor, modifying it to be self-consistent, adaptable to accept data from ICE when available in the future, and working with variable number of contacts and time steps.

Plans for Next Quarter:
- *Demostrate NUWC CONRAY model*, **February 02** which is consistent with the SUBV plan Scenegraph implemented in OpenGL DIVERSE (01 Feb 02)

NUWC will coordinate NUWC and NRL efforts and interact with VT as required. VT will maintain regular communications with NUWC regarding the development of these new subtasks.

Outstanding Issues: CONRAY is now referred to as SUBV.