Archive - Potential NGI Applications

Chesapeake Bay Virtual Environment (CBVE):
Sponsored by the National Science Foundation

Categories

Environment, Collaboration, Remote Operations

Vision

To enable scientists at dispersed sites to study the Chesapeake Bay and other marine environments using real time control of the simulation and multimodal presentation.

Why NGI?

With today's Internet capabilities, a single researcher can use a remote supercomputer to run complex simulations of the Chesapeake Bay and view the results using a one-wall Immersadesk. With the NGI infrastructure and technology, the simulation can be presented to researchers at several institutions using the three wall and ceiling environment of the CAVE Automatic Virtual Environment (CAVE). The simulations can be much richer and more accurate, with finer granularity of many more variables, and with sound as well as visual depictions.

Description

This research tool is a combination of the CAVE software, coupled with the Vis5D scientific visualization package and the Vanilla Sound Server to place ensonified modeled data into an interactive navigable virtual environment. It will incorporate runtime computational steering, interactive visualization, data sonification and wide area information dissemination to enable geographically distributed users to interact multimodally in real time across a high speed network. The numerical simulation will be run on a remote supercomputer by an oceanographer at her/his institution, and can be observed by other researchers at their institutions. To maximize the effectiveness of this tool, all researchers should be able to steer the

simulated environment as the technology improves. Further, the three wall and ceiling environment of the CAVE provides the optimum environment for research; the one-wall Immersadesk, using today's Internet without special high performance connections, currently provides a glimpse of the power of this research tool.

Rationale

The United States is surrounded by estuarine environments, many of which are severely threatened by pollution, overbuilding on adjacent wetlands, and other natural and man-made hazards. They are important as a source of water and seafood as well as for recreation, and as the basis for income for associated industries. This project will enable researchers from several disciplines to achieve more rapid and thorough understanding of phenomena and potential solutions to problems. Better understanding of these environments can lead to more informed decisions on their use, as well as contribute to research on other marine environments.

Requirements

Frame rates of at least 20 frames per second are the minimum acceptable for useful interaction with temporally varying data. A low resolution 3D CBVE domain consists of 100x200x15 gridpoints and a simple, stripped-down CBVE configuration is 2 horizontal slice positions, 2 lateral vertical slice locations and 2 longitudinal vertical slice locations. Each slice location must combine at least 5 separate variables, i.e., salinity, temperature and 3D velocity. A simple 6 slice low resolution CBVE presentation on the Immersadesk requires a bandwidth of approximately 40 Mbps. The inclusion of other variables at each slice location or an increase in data resolution will require ordinately higher bandwidth approaching 155 Mbps. Such variables could include turbulence quantities (kinetic energy, length scale and dissipation rates) and biological variables such as larval fish densities.

Partners and Potential Partners

Present partners include Old Dominion University, National Center for Supercomputing Applications and the University of Wisconsin-Madison. Identified potential additional partners include the San Diego Supercomputing Center and Virginia Tech.

URL:

http://www.ccpo.odu.edu/~wheless