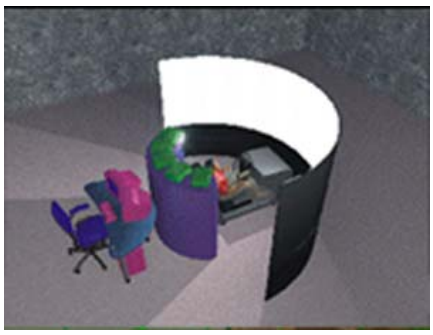
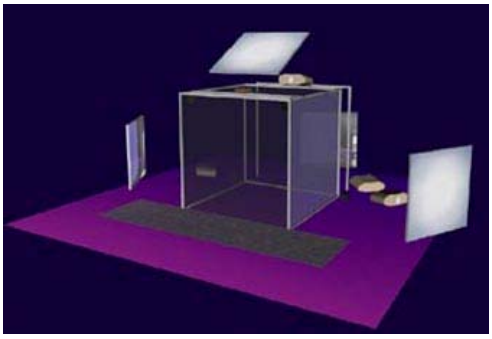
A Spatially Immersive Environment for the University of Arizona

The Center for Computing and Information Technology is looking into procuring a spatially immersive display environment through a sealed competitive bid process. This environment is intended to provide an advanced, collaborative visualization solution with high resolution, stereoscopic display for users of the CCIT Scientific Visualization Lab. The environment would consist of one or more projectors and displays capable of immersing all the viewers into the same virtual world at the same time.





Details of the Immersive Environment

A room with dimensions 26' wide x 23.5' deep x 10.5' high should accommodate an audience of 6 to 10 people.

One or more projectors and displays are used to fill the field-of-view of the users, creating a sense of immersion in a virtual environment.

The projection system will be capable of active stereoscopic viewing by everyone present in the environment. Active stereoscopic eyewear will be available for all viewers in the environment.

The environment will contain a tracker capable of tracking a handheld input device and tracking the movement of a single user's head. The interactive input devices will be capable of 6 degrees of freedom for navigation and virtual movement within the environment.

An audio system and speakers will be attached to the computer system in order to provide compelling audio within the environment.

The projection systems will be driven by the Scientific Visualization Lab's existing SGI Onyx2 InfiniteReality2 computer or the SGI Onyx4 UltimateVision computer. Each computer has 4 processors, at least 3GB of memory, and the ability to drive 4 separate projectors.

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Proposal for a Spatially Immersive Environment for the University of Arizona

Project description:

A spatially immersive display environment is an advanced visualization environment that combines high-resolution stereo projection technology and 3-D computer graphics that immerses the user in a virtual world. It is a room sized environment which allows researchers to share their visualizations with multiple other users while immersing themselves fully in the same virtual environment at the same time.

Background:

The Scientific Visualization Lab, a resource managed by the Research Computing Support group in CCIT, provides support for researchers who want to create graphical representations from the results of their computations, simulations and measurements. Its main objective is to assist researchers in developing a deeper understanding of their data and to provide new insights that rely on the human's powerful visual system. Support for scientific visualization techniques is also provided to teaching faculty, helping them incorporate visualization into their courses. An immersive environment will enhance our present resources and create a visual display environment that also makes use of existing resources. This is in line with the main mission and commitment of the University with respect to both instruction and research.

Projected users:

An immersive display environment can be easily used as a multidisciplinary tool providing an ideal environment for visualizing data from a large number of research fields including medical imaging, biotech research, manufacturing and design, computational fluid dynamics, and any other field with complex data visualization requirements. Non-scientific environments can also be created and explored, allowing users to experience virtual worlds and communities that don't actually exist or existed in the past. People in theatre arts, graphic arts, architecture, archeology, and historians can explore virtual worlds in the immersive environment.

Support:

The Research Computing Support group will be actively involved in acquiring, installing and developing this resource. The RCS group will facilitate the creation of 3D interfaces for researchers and faculty members, based on previous experience in scientific visualization. From these experiences, we see the potential for our group to establish collaborations with research groups to synergistically investigate complex physical phenomena related to complex 3D scientific structures. Therefore, this environment will not only provide a basis for fundamental scientific investigation but also provide an important link between research and education. The same visualization tools that provide insight (new knowledge) to a particular research problem can also effectively be used by the researcher to educate students in the classroom.

Plan of Action:

Initially, there will be a period needed to setup the environment, and work on small projects and demos. Later on, training and work on more demanding projects will be feasible depending on the amount of funding available.

Project examples:

There are several existing virtual reality projects on campus being developed or displayed in the CCIT Scientific Visualization that would easily be adapted to the immersive environment. These projects include the English and Humanities department's Virtual Harlem project, collective game-based learning project, and a virtual environment rapid prototyping project. The Media Arts department uses a large screen display in their virtual works classes and exhibitions, and their projects would easily be ported to run in the immersive environment. The Materials Science and Engineering department uses a virtual reality approach for teaching molecular dynamics and only a few minor changes to the code would allow it to run in the immersive environment. The Architecture department has also expressed interest in doing virtual building walkthroughs, the Lunar and Planetary Labs have an interest in virtual Mars flyovers, and the Astronomy department in exploring and interacting with fully three dimensional simulations of supernovas.

The web pages below demonstrate the wide variety of fields that are using immersive environments in other research institutions around the world. These links illustrate just a small sample of research projects from design and manufacturing, astronomy, molecular dynamics, archaeology, medical imaging, fine arts, information visualization, and collaborative visualization over high speed networks.

Visualization and Modeling of the Phantom II Human-Powered Submarine
www.sv.vt.edu/classes/ESM4714/Student_Proj/class97/beres_mattingly/design/index.html

Virtual Universe Project
www.phys.vt.edu/~dennison/vu/

Molecular Dynamics Simulation
www.cs.vu.nl/~renambot/vr/cases/mol.htm

The ARCHAVE System
www.cs.brown.edu/research/graphics/research/sciviz/archaeology/archave/index.html

Improving Cancer Radiotherapy
www.fakespace.com/hull.htm

Visualization of Smart Gels
math.nist.gov/mcsd/savg/vis/gel/index.html

Diffusion Tensor MRI Brain Visualization
www.cs.brown.edu/research/graphics/research/sciviz/brain/brain.html

Molar Root Canal Measuring
www.cs.vu.nl/~renambot/vr/cases/acta.htm

CavePainting
www.cs.brown.edu/research/graphics/research/sciviz/cavepainting/cavepainting.html

CAVE Research Network
www.evl.uic.edu/research/res_project.php3?indi=9