Welcome to The Tiled Display Wall

Welcome to NCSA's Tiled Display Wall at the Beckman Institute

The National Center for Supercomputing Applications welcomes you to its Tiled Display Wall. This state-of-the-art scientific visualization facility is used by NCSA's Visualization and Virtual Environments Group to explore large-scale extremely high resolution scientific visualizations. Located on the third floor of the Beckman Institute for Advanced Science and Technology in Urbana, Illinois, it is the newest of NCSA's visualization facilities. Using an eight by five grid of off-the-shelf Liquid Crystal Display (LCD) projectors powered by an equal number of commodity computers, it provides a total of 31,457,280 pixels in a 214 by 102.5 inch display.

WHAT EXACTLY IS IT?

A Tiled Display Wall is a large-scale high-resolution display. It is composed of multiple projectors whose images are projected side-by-side to create a tiled mosaic of imagery. For some situations, an application runs on a single machine and a software or hardware distribution system divides up the screen image and distributes it out to the individual projectors, so that the resulting image appears as a single cohesive display. In others, a copy of the application runs on each machine, generating the imagery for the corresponding tile.

NCSA's tiled display wall uses an eight by five grid of LCD projectors mounted in a custom metal framework that allows extremely precise control over their position and orientation relative to the screen. Each projector is carefully aligned using this framework to minimize the visible gap between the edges of the projected images.

To power its tiled display wall, NCSA uses a software package developed by Stanford University called WireGL, which takes care of distributing the screen imagery properly across the mass of projectors. NCSA has made several upgrades to the package including adding support for playing large scale movies on the wall. To do this, the movies are predistributed across the wall and then cached on each of the machines.

The computers that run NCSA's tiled display wall are commodity workstation computers running the popular operating system Linux. Each machine powers a corresponding projector, so that the computation of displaying the wall's imagery can be distributed as well. Specialized high-speed networking is used to connect the machines together, enabling them to collectively handle the task of generating the wall's imagery.

WHAT IS IT GOOD FOR?

Virtual reality systems like the CAVE™ and ImmersaDesk2™ provide an ideal environment for applications which require advanced depth perception, six-degree-of-freedom tracking, and physical immersion. They do not excel at providing large viewing areas or high resolution images.

To address applications with these needs, multiple projectors must be used to generate a tiled mosaic of imagery. Scalability can be achieved by adding additional projectors to increase screen size and resolution. Cost-of-ownership can be drastically reduced by utilizing commodity projectors and computers.

Many applications in fields of science like astronomy deal with the display of extremely large, high resolution imagery. These images are traditionally displayed on a workstation screen, where they must be continually panned about. With the display wall, the entire image may be viewed at once, at its native resolution.

FUTURE DIRECTIONS

NCSA's tiled display wall is built entirely from commodity parts. The projectors are off-the-shelf LCD projectors commonly used for presentations. As such, they are not manufactured to the same rigorous standards that specialty high-end projectors are. Even when purchasing all of the projectors from a single batch, each projector's color response is slightly different. In addition, the projectors are currently manually aligned to minimize the gap between the edge of each projected image. Future development on NCSA's tiled display wall will focus on automated techniques to perfectly blend the tiles together.

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The textual content of this pamphlet was developed by Kalev Leetaru. Images courtesy NCSA.