CAVERN: The CAVE Research Network

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Presentation Abstract

The Electronic Visualization Laboratory (EVL) at the University of Illinois at Chicago has developed an aggressive program over the past decade to partner with dozens of computational scientists and engineers worldwide. The focus of this effort has been to create visualization and virtual reality devices and applications for collaborative exploration of scientific and engineering data over national and global high speed networks—an effort EVL calls "tele-immersion." [http://www.evl.uic.edu/cavern]

Tele-immersion is defined as collaborative virtual reality over networks, an extension of the "human/computer interaction" paradigm to "human/computer/human collaboration," with the computer providing real-time data in shared, collaborative environments, to enable computational science and engineering researchers to interact with each other (the "tele-conferencing" paradigm) as well as their computational models, over distance.

Current tele-immersion research focuses on providing easy access to today's "computational grids." In the research community, a "computational grid" is the aggregate hardware and software resources that scientists require to solve extremely complex problems. On the hardware front, a computational grid is a collection of geographically-distributed resources: networks, computers, data stores, and visualization/virtual-reality displays. On the software front, it is the "middleware" necessary to integrate this ensemble so that its many and varied pieces operate as if they were one. We know this type of distributed computing can work on individual heroic projects—the challenge is to make it work seamlessly, efficiently, and routinely, independent of geographical boundaries, so that it becomes as ubiquitous and encompassing as the electrical power grid is today. [1]

EVL developed the CAVE™, a room-sized virtual reality device, in 1991, and, over the past six years, has enhanced CAVE technology, created derivative projection-based virtual reality devices, developed a robust and virtual-reality-device-independent CAVE software library, and deployed CAVEs throughout the world. EVL continues to work with other CAVE owners and researchers, connected via the CAVE Research Network (CAVERN), to develop useful and usable tools and techniques.

EVL has fostered virtual reality in select communities of users, and is now creating the teams, tools, hardware, system software, and human-interface models to enable international-scale, multi-site collaborations to facilitate solutions to Grand Challenge problems. [2] EVL's goal is to move tele-immersion from the laboratory to the Next Generation Internet. Scientists are, in 1999, just starting to get access to high-speed networks to retrieve information from remote datasets (whether large disk farms, scientific instrumentation, or satellites), analyze that information using remote supercomputers, and use virtual reality to collaborate with distant colleagues.

Various tele-immersive applications will be reviewed. In particular, global collaborations that were part of the International Grid (iGrid) testbed [http://www.startap.net/igrid] at SuperComputing (SC) '98 in Orlando, Florida, will be discussed.

References

[1] I. Foster and C. Kesselman (eds.), The Grid: A Blueprint for a New Computing Infrastructure, Morgan Kaufmann Publishers, 1999 [http://www.mkp.com/grids].

[2] Jason Leigh, Andrew Johnson, Tom DeFanti, Maxine Brown, Mohammed Ali, Stuart Bailey, Andy Banerjee, Pat Banerjee, Jim Chen, Kevin Curry, Jim Curtis, Fred Dech, Brian Dodds, Ian Foster, Sara Fraser, Kartik Ganeshan, Dennis Glen, Robert Grossman, Randy Heiland, John Hicks, Alan Hudson, Tomoko Imai, Mohammed Khan, Abhinav Kapoor, Robert Kenyon, John Kelso, Ron Kriz, Cathy Lascara, Xiaoyan Liu, Yalu

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