Collaborative Immersive Virtual Environments

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Advanced Biomedical Collaboratory

Synchronous participation among biomedical professionals in complex environments (at distributed locations)

Key area of focus for us: Convergence of visualization and networking technologies in biomedicine
Team Members & Collaborative Partners

• ABC Laboratory
• Chicago/Argonne Computation Institute
• University of Chicago Hospitals
• Departments of Surgery, Anesthesia, Medicine, and Radiology
• General Devices
• International Emergency Medicine Disaster Specialists
• Rhode Island Hospital Medical Simulation Center
• Northwestern University, University of Illinois at Chicago
Funding

• National Library of Medicine / National Institutes of Health
• University of Chicago and University of Chicago Hospitals
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What is (Immersive) Virtual Reality?

• Computer generated environment
• Involving 3-dimensional objects
• Interactive
• +/- Immersive
• Sufficient field of view
• Stereo rendering
• +/- Viewer-centered perspective
• Other types of realism (sound, haptics, etc...)
Immersive Hepatic Surgery Educational Environment (IHSEE)
Liver Quiz Results


P<0.02
Results – Survey Data

1 = Strongly Disagree, 5= Strongly Agree

- I found the instructor easy to understand 4.0
- I found the Tele-Immersive technology an enjoyable way to learn this material 4.4
- The Tele-Immersive technology helped me to better master the subject material 4.3
- I feel that I know more about the material from using this technology than I would have under traditional methods 4.0
- The Tele-Immersive technology is an efficient way to learn the subject matter 4.0
- I would like to take additional courses using this technology Yes = 45, No = 4

Results - Exam Data (Diffs)

Group Performance Comparisons

Average Minutes of VR/Student 21.7

All statistical tests paired, two-tailed

Tele-Volume Rendering - Scenario

- Shared Distributed Volume Radiology Drivers
- Complex care among multiple teams
- Massive datasets now being sampled rather than being used in entirety
- Complete virtualization is possible
- Desire for subtle illustration in the hands of Physicians, not just techs
- Surgical Rehearsal
Considerations of Applications, Middleware and Network Infrastructure to Support Medicine

- Adherence to Open Standards - Many Entities Participating
- On-Demand Bandwidth with Massive Capacity - Highly Variable, but Immediate, Real-Time Needs
- High Reliability / Redundancy - Zero Tolerance for Error
- Secure Channels (auditable?) - Privacy is Paramount
- Auto and Manual Bandwidth Throttles - Wireless Design Points