Advanced Visualization Applications in the Immersive Cabin

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The 5-wall Immersive Cabin (IC)
- 21x21 ft. installation, diagonal placement
- 29” automatic door on rear projection screen
- 11 Projectors
  - 4 projector pairs in corners (Hitachi CP-SX1350 SXGA+ 3LCD)
  - 1 floor projector pair (Hitachi CP-SX1350 SXGA+ 3LCD)
  - 1 table stereo projector (DepthQ WXGA 3D projector)

Active Stereo Projection
- 5 Active Synchronization systems
  - 2 projectors each
  - Alignment platform
  - IR emitter
- Users wear wireless lcd stereo glasses

Projection screens
- 9.67 x 7.25 ft. for front, back, left and right
- Acrylic rear projection screens
- 9.67 x 9.67 ft. for floor area
- Epoxy flooring, front projection screen
- Foldable wooden table

The Visual Computing Cluster
- 66 high-end workstations
  - Infiniband network, Gigabit frontend
  - 34 machines with dual Intel Xeon CPUs, 2.5GB Ram
    - Nvidia Geforce FX5800, Terrarecon VolumePro 1000
  - 32 machines with dual Intel Xeon CPUs, 2GB Ram
    - Nvidia Quadro FX4500
- Projectors driven by the Visual Computing Cluster
  - Using 10 display nodes with Nvidia G-Sync boards

Interactive Tools
- Logitech Cordless Gamepad
- 3DConnexion SpaceNavigator 3D mouse

Reference

Large-scale immersive rendering
- Nvidia ScenIX scene graph management
- Asset management using COLLADA files
- Support for high-quality antialiasing and shaders
- Added support for cluster-based rendering for IC, PowerWall, etc.

Smoke Simulation and Volume Rendering
- Hybrid-Thermal Lattice Boltzmann Method (HTLBM)
- Interactive single-pass raycasting on the GPU

Screen-space Ambient Occlusions (SSAO)
- Provide important spatial cues
- Dynamic per-frame generation (no pre-computation)

Off-line Rendering
- Nvidia Gelato (GPU accelerated)
- Renderman Interface

Applications
- Urban planning and large-scale urban visualization
- Immersive visualization of medical datasets
- Virtual colonoscopy
- 3D medical scans
- Architectural pre-visualization
  - The Stony Brook Advanced Energy Research & Technology Center (AERTC)
  - The Stony Brook Simon's Center for Geometry and Physics

Future Work and Advanced Applications
- Real-time Raytracing
  - Raytracing engine through Nvidia OptiX
  - Integrates with our IC rendering software

- Wireless Optical Tracking
  - Minimal hardware in the IC
  - Gesture-based user interface

- Advanced Applications
  - Immersive exploration of massive medical datasets
  - Research related to fear response and rehabilitation
  - Immersive motion education (e.g. dance, sports)