Introduction to Virtual Reality
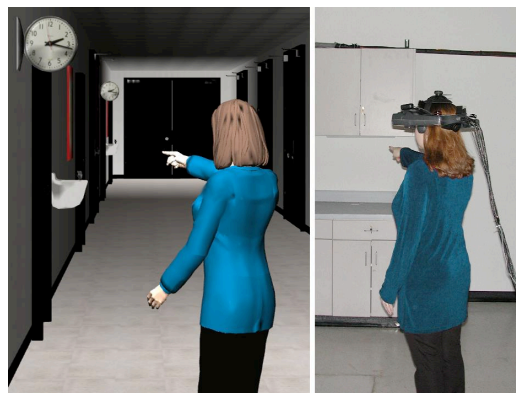
Amy Gooch

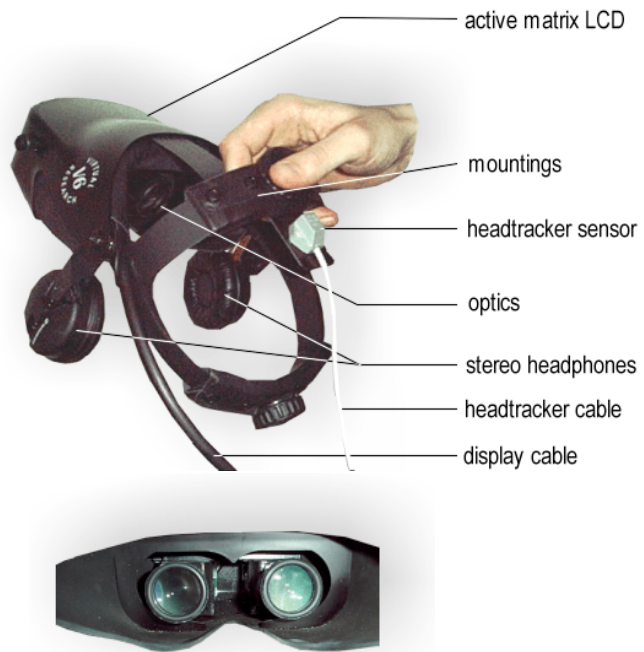CS395: Advanced Computer Graphics

February 21, 2004

Terminology

- "Virtual Reality" coined by Jaron Lanier, founder of VPL Research (1989)
- Artificial Realty (Myron Krueger, 1970s)
- Cyberspace (William Gibson, 1984)
- More recently
  - Virtual worlds
  - Virtual Environments
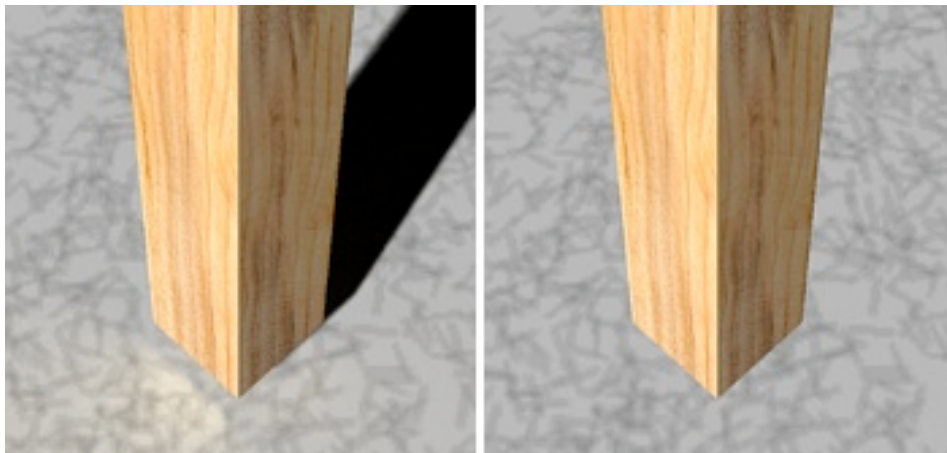 - Immersive Environments

Head-Mounted Displays (HMD)

- Creation
  - Sutherland 1965
  - Next system VPL commerically available HMD: EyePhone (1989)
- Physical Device
  - Two miniature display screens
  - Optical system presents images
- Intrusive, sometimes uncomfortable

active matrix LCD

mountings

headtracker sensor

optics

stereo headphones

headtracker cable

display cable

Perception and HMDs

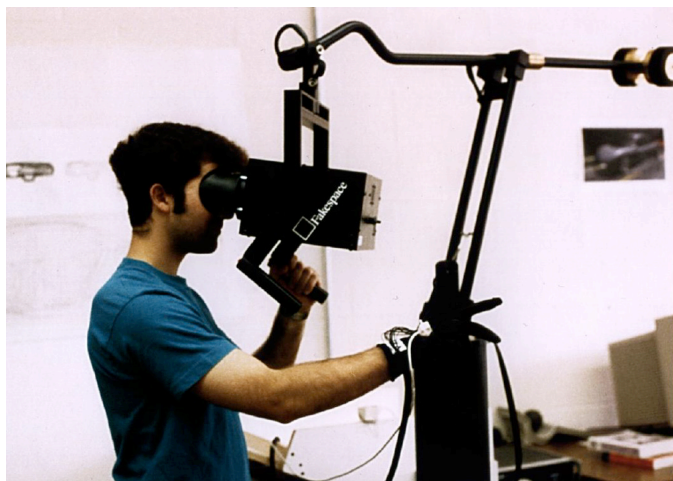- Interreflections, Shadows, …

Perception and HMDs

Visual Cues for Imminent Object Contact in Realistic Virtual Environments
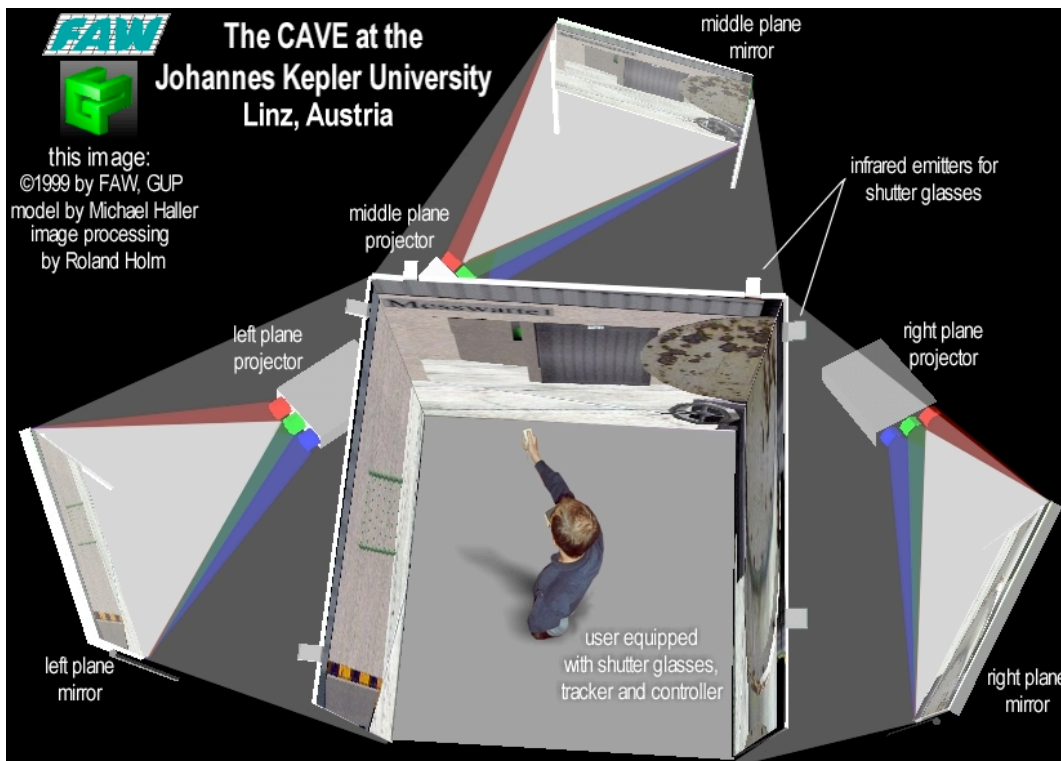
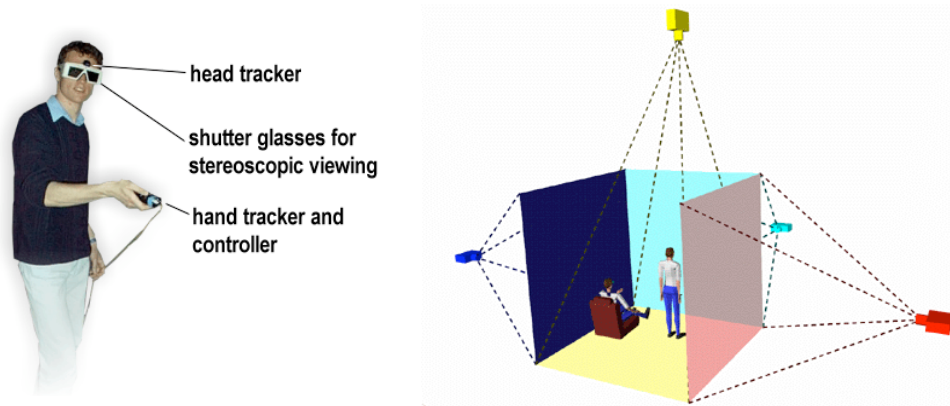# Boom (Binocular Omni-Orientation Monitor)

- By Fakespace (http://www.fakespace.com/)
- Screen & Optical System attached to a multi-link arm

Cave
(Cave Automatic Virtual Environment)

- Developed at University of Illinois at Chicago (http://www.evl.uic.edu/intro.php3)
- Immersion by projecting stereo images on wall, floor of room sized cube

The CAVE at the Johannes Kepler University Linz, Austria

this image: ©1999 by FAW, GUP model by Michael Haller image processing by Roland Holm

Input Devices

- Position Sensors & Trackers
- Motion Capture
- Input Devices: Data Glove

Space Mouse

The Ideal…

Example of current tech

- Treadport at University of Utah
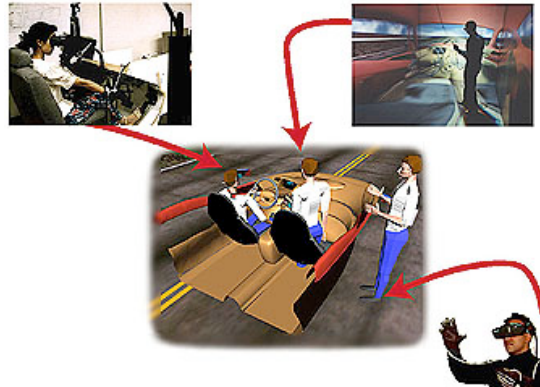

Example of current tech…

Immersive VR

- Visual
- Other Senses
    - Haptic, auditory, etc
- Interaction (shared VR)

Non-immersive VR

- Fish Tank VR
    - Monitor with stereoscopic 3D image looks like a fishtank

- QuickTime VR
   - http://www.apple.com/quicktime/gallery/cubicvr/
    - http://www.louvre.or.jp/louvre/QTVR/anglais/index.htm

Non Immersive

Applications

- Operations in dangerous environments
- Scientific Visualization
- Medicine
- Rehabilitation & help disabled people
- Psychiatry
- Architectural Visualization
- Design
- Education & Traning
- Simulation and ergonomy
- Computer supported cooperative work
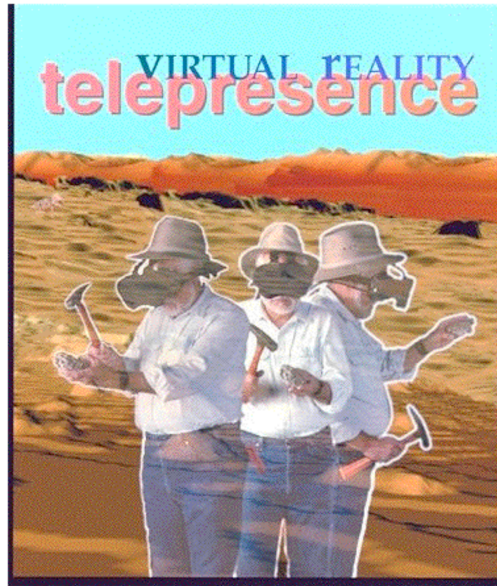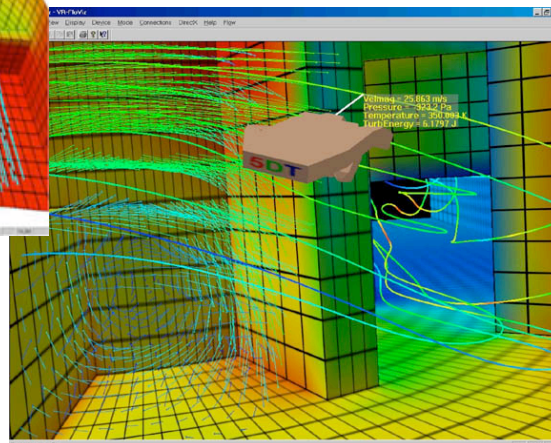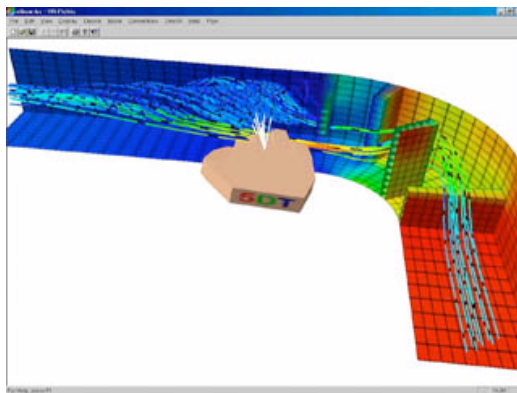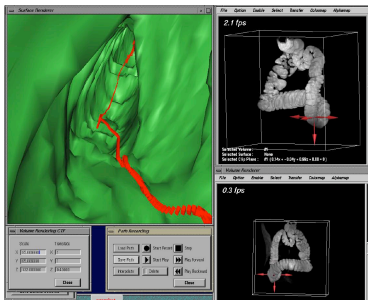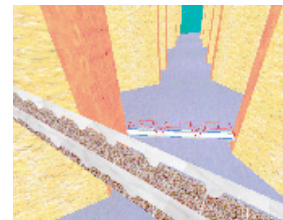- Entertainment

Operations in dangerous environments

- http://www.5dt.com/products/pivb.html

Battlefield simulation
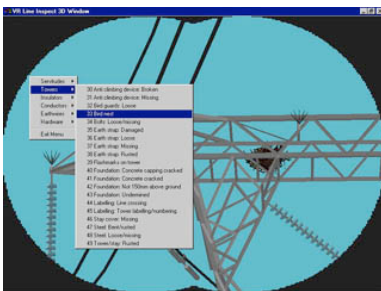
High Voltage Line Inspection
Training Simulator

Scientific Visualization

- Flow Visualization

http://www.5dt.com/products/ifloviz08.html

Medicine

em

Rehabilitation &
help disabled people

Psychiatry

http://www.irexonline.com/irex.htm

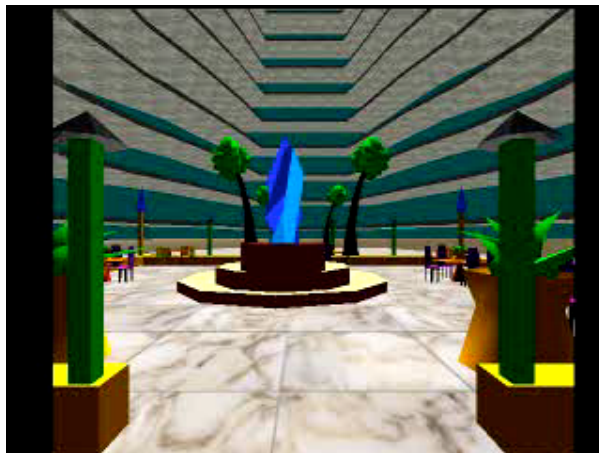# Psychiatry

http://www.cc.gatech.edu/gvu/virtual/Phobia/phobia.html
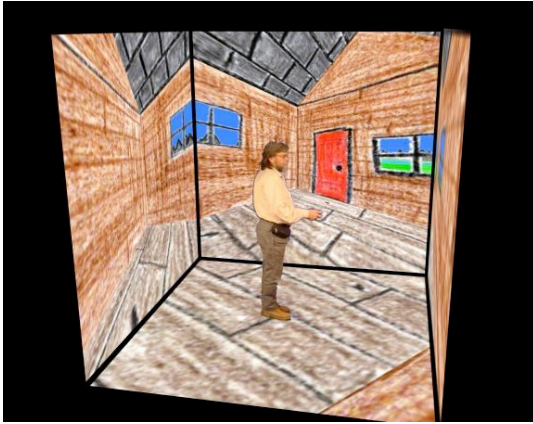
Architectural Visualization
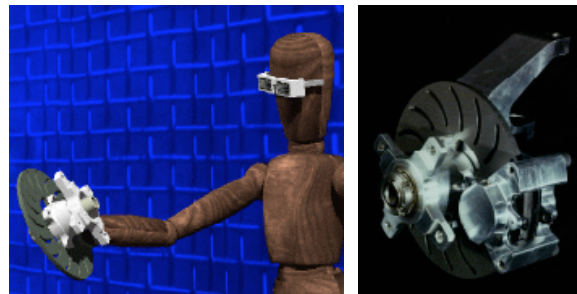

Design & Virtual Prototyping
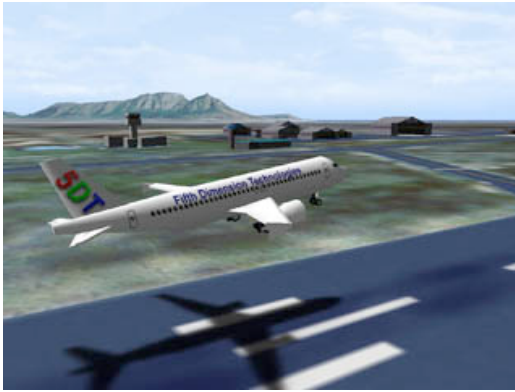
- Automotive Interiors

- CAD/CAM

Education & Traning

- Air Traffic Control (ATC) Training Simulator

Simulation and ergonomy

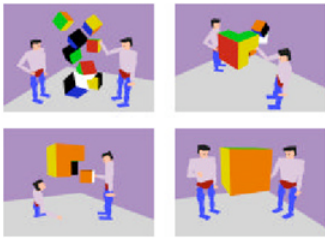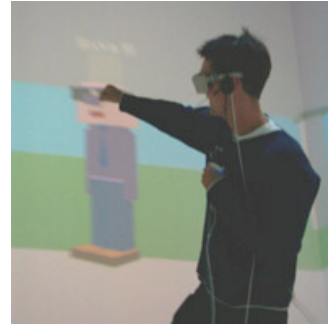# Computer supported cooperative work

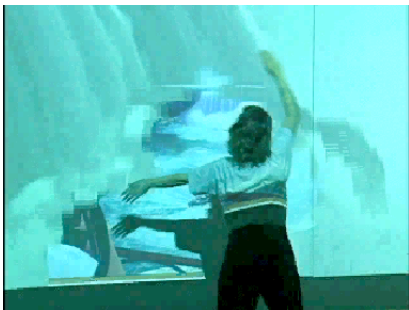Figure 1: Two participants completing the 3D cube puzzle

Entertainment

Art

Art

"Falling Over You" Interactive Wall
Dave Pape, Josephine Anstey
University at Buffalo
in conjunction with
Kathy Gaye Shiroki, Rich Cherry
Albright–Knox Art Gallery

Credits

- http://www.faw.uni-linz.ac.at/save/hardware/fishtank2.html
- http://www-vrl.umich.edu/intro/
- http://resumbrae.com/talks/vassar/page27.html