



CS-525V:
Building Effective
Virtual Worlds

Presence and the Senses

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Plan for Tonight

- More definitions
- Key issues for effective VR
- VR as a medium
- Field trip to HIVE
- Project ideas

Some Definitions/Thoughts

□ From the book:

- **1.** An imaginary space often manifested through a medium.
- **2.** A description of a collection of objects in a space and the rules and relationships governing those objects.

□ My definition of VR

- "Fooling the senses into believing they are experiencing something they are not actually experiencing." [Lindeman, 1999]

Anatomy of a VR System

Virtual reality systems consist of

- ❑ Content: The description of the world
- ❑ Graphical/audio/haptic/... rendering
- ❑ Tracking of people and objects
- ❑ Collision detection
- ❑ Interaction techniques
- ❑ Optional, but common:
 - Networking
 - Autonomous agents

Some Keys to Success

- High fidelity (or realism)
 - Graphics, audio, haptics, behaviors, etc.

- Low latency
 - Tracking
 - Collision detection
 - Rendering
 - Networking

- Ease of use
 - Low cumber for users
 - Easy integration for programmers

- Compelling Content

Key Elements

- ❑ The ***Virtual World*** itself
- ❑ ***Immersive nature*** of the experience
- ❑ ***Sensory feedback*** provided
- ❑ ***Interactivity*** supported

The Virtual World

- Where does the "Virtual World" exist?

Immersion and Presence

What is *immersion*?

- Physical vs. mental immersion

- Physical

- Stuff I wear that feeds my senses

- Is this objective?

- Mental

- How engaged am I?

- Is this subjective?

What is *presence*?

- "Being there" in the environment

More On Presence

- Presence is a complex phenomenon
 - Expectation
 - Realism
 - Feeling of non-mediation
 - Can change over time
 - Can change with events
 - Behavioral
 - Physiological

The Senses

- All the senses?
- Which ones?
- How much is enough?

The Senses (cont.)

- See (Visual Sense):
 - Visuals are excellent!
- Hear (Aural Sense):
 - Spatialized audio is also very good!
- Smell (Olfactory Sense):
 - Very hard! Too many types of receptors.
- Touch (Haptic Sense):
 - Application specific and cumbersome
- Taste (Gustatory Sense):
 - We know the base tastes, but that is it!

See

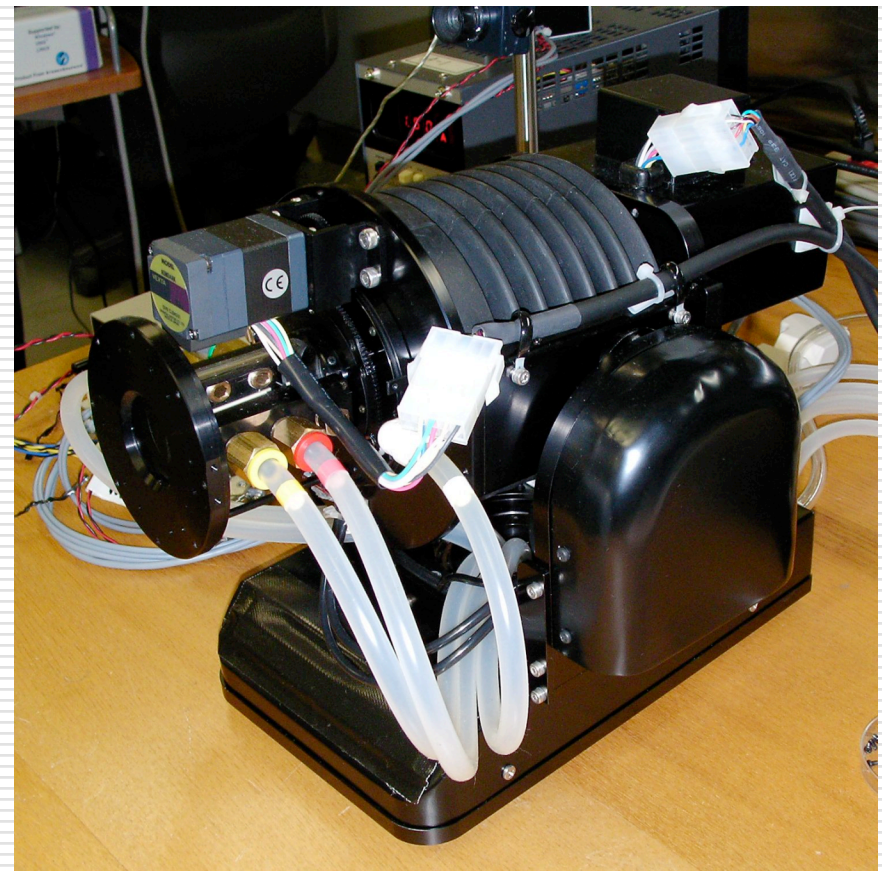
- Head-mounted displays
- Surround screens
- Fishtank
- Domes
- Stereo/mono
- Captured graphics
- Rendered graphics
- Hybrids, e.g., Augmented Reality

Hear

- Headphones
- Speaker arrays
- Bone conduction
- Spatialized sound
- Rendered sound
 - Sound tracing
- Synthesized
- Captured/sampled

Smell

- Difficult technologically and physiologically
- Two main problems
 - Scent generation
 - Scent delivery



Touch

- Haptic sense is complex in nature
- Kinesthetic
 - Proprioception
- Cutaneous
 - Vibration
 - Pressure
 - Temperature
- Pain
- Cumbersome technology

Taste

- Relies on getting smell right
 - Try yogurt or jellybeans with your nose plugged
- Five basic tastes
 - Sweet
 - Sour
 - Bitter
 - Salty
 - Umami (Japanese for "savory")
 - It's why MSG works!
- Receptors on the tongue specialized for each
- Without saliva, we don't taste

Interaction

- Tight coupling between action and reaction
 - Low latency
 - "Expected" response
- Virtual nature of content requires using interface tools
 - Combination of virtual and physical attributes
- We will cover this a lot more later!

From HCI

- The "best" system for a VR application will take into account
 - The ***Target User***
 - The ***Task*** being performed, and
 - The ***Physical Environment*** where the activity will take place.

- We should too!