

Interaction: System Control and Social Interaction

CS 6334 Virtual Reality

Professor Yu Xiang

The University of Texas at Dallas

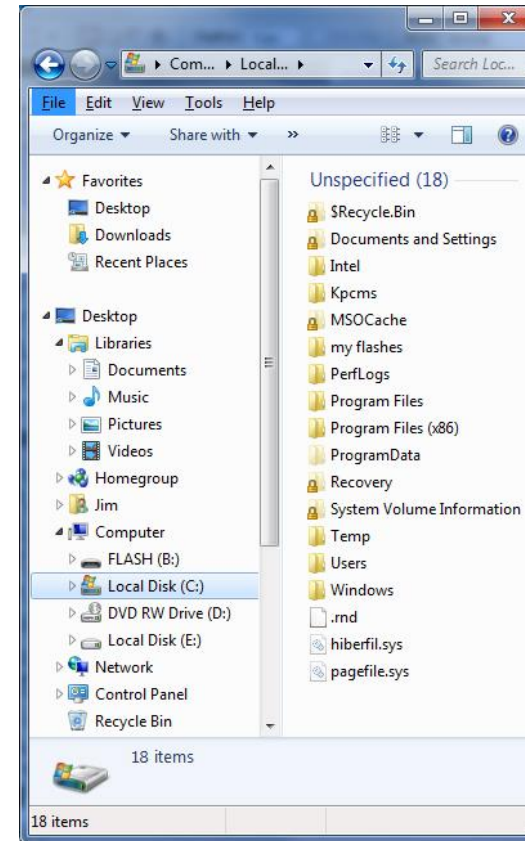
Some slides of this lecture are courtesy Jin Ryong Kim

System Control

- Issuing commands to the system



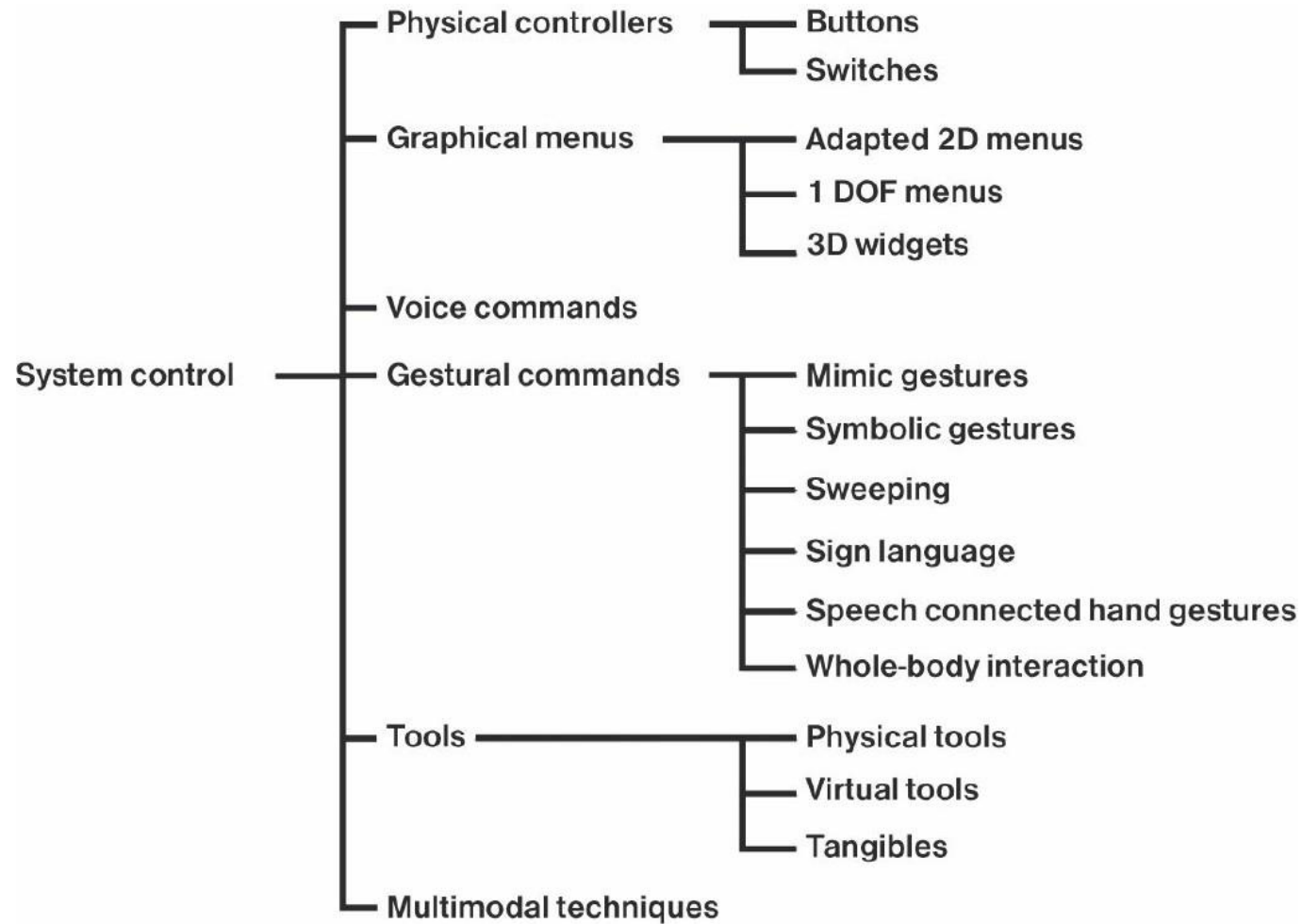
Windows 10



System Control Tasks

- Commands
 - Instruct the system to perform a particular function
- Modes
 - Instruct the system to change the mode of interaction
- Parameters
 - Instruct the system to change a parameter of its state

System Control Decomposition



Physical Controllers

- Offer a lightweight solution for performing system control
- Examples
 - Buttons
 - Switches
- Issue
 - Accessibility



A Thrustmaster flight joystick

Graphical Menus

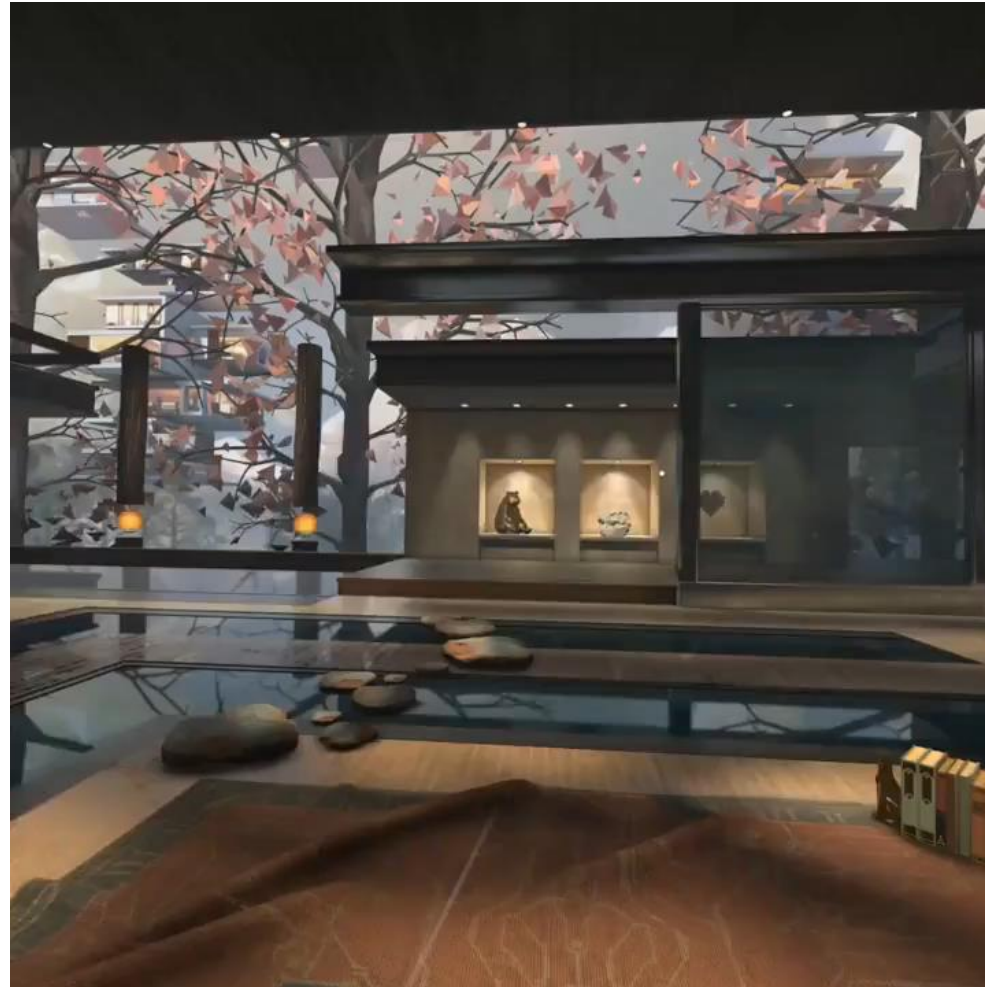
- Provide 3D objects for the user to select commands and parameters from
- Examples
 - Floating menu
 - Ring menu
 - TULIP menu
 - 3D widgets

Floating Menu

- A 2D menu adapted to 3D space
- Usually interacted with a pointing technique
- Can be used with different placement styles
- Familiar to most users
- Facilitates a breadth and depth of commands
- Issues
 - Occludes the world
 - Accuracy problem



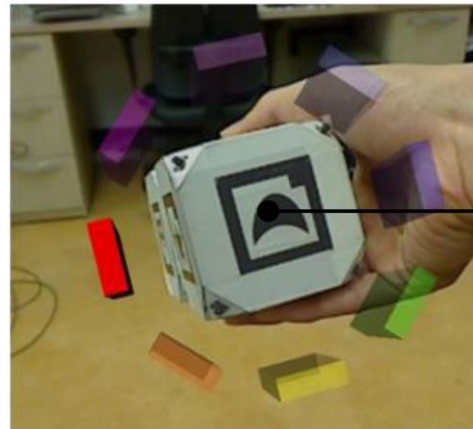
Floating Menu



Oculus Home on Gear VR

Ring Menu

- A 1-DOF menu attached to the user's hand
- The user rotates his hand for selection



An algorithm of item placement worked well in our prototype case, and it reserved a little room for the user's hand.

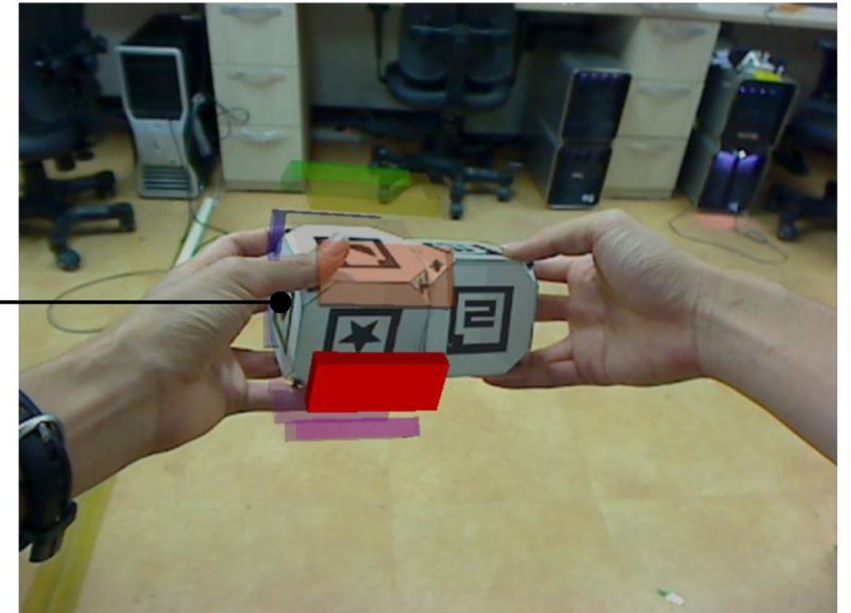
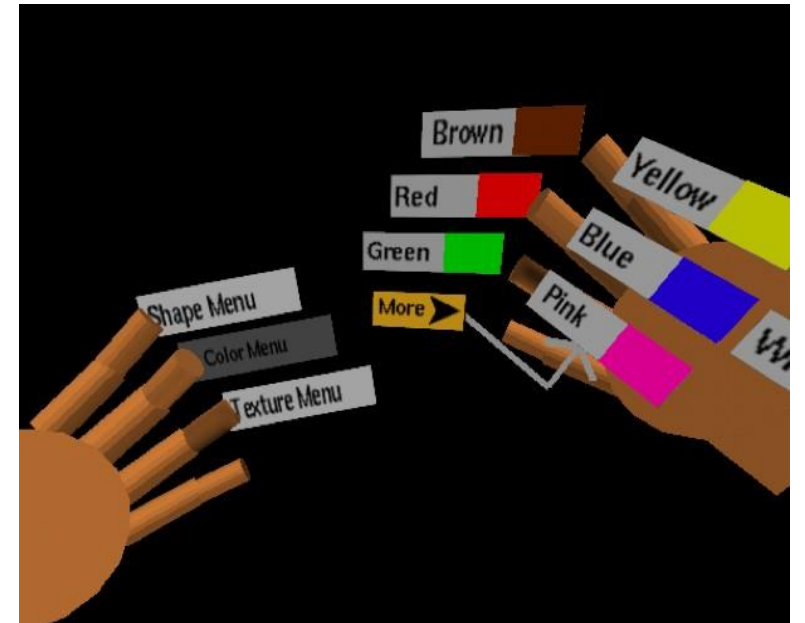


figure 6: A simple 3D ring menu application that has 8 items around the TSC

Tangible Spin Cube for 3D Ring Menu in Real Space. Lee and Woo, CHI'10.

TULIP Menu

- Three-Up, Labels In Palm (TULIP) Menu
- Attaches menu items to the user's fingers and displays other items in the user's palm
- An item is selected by touching the thumb and corresponding finger of a worn pinch glove
- Less likely to occlude the world
- Facilitates a depth of commands
- Does not facilitate large breadth of commands



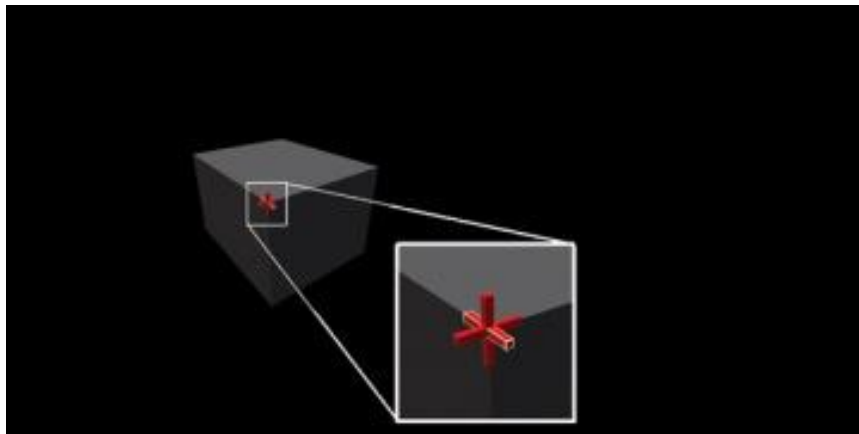
TULIP Menu



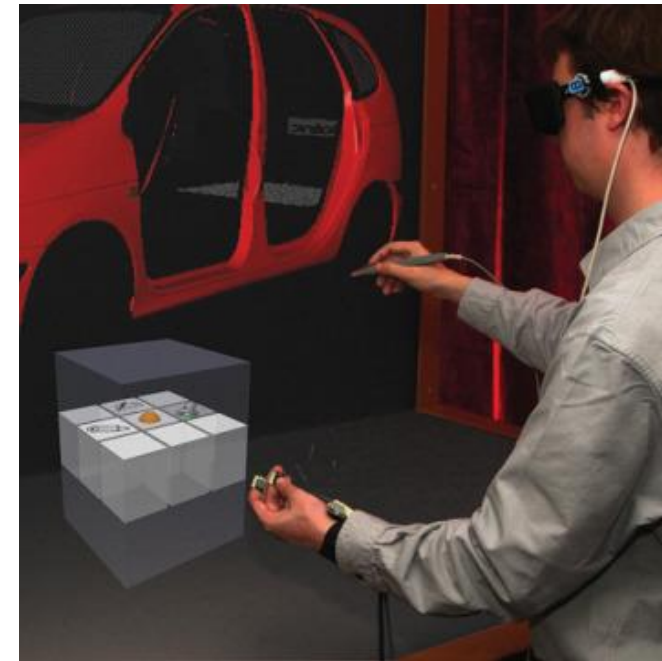
Hovercast VR Menu

3D Widgets

- Widgets as “the combination of geometry and behavior”
- Examples



A 3D collocated widget for scaling an object.



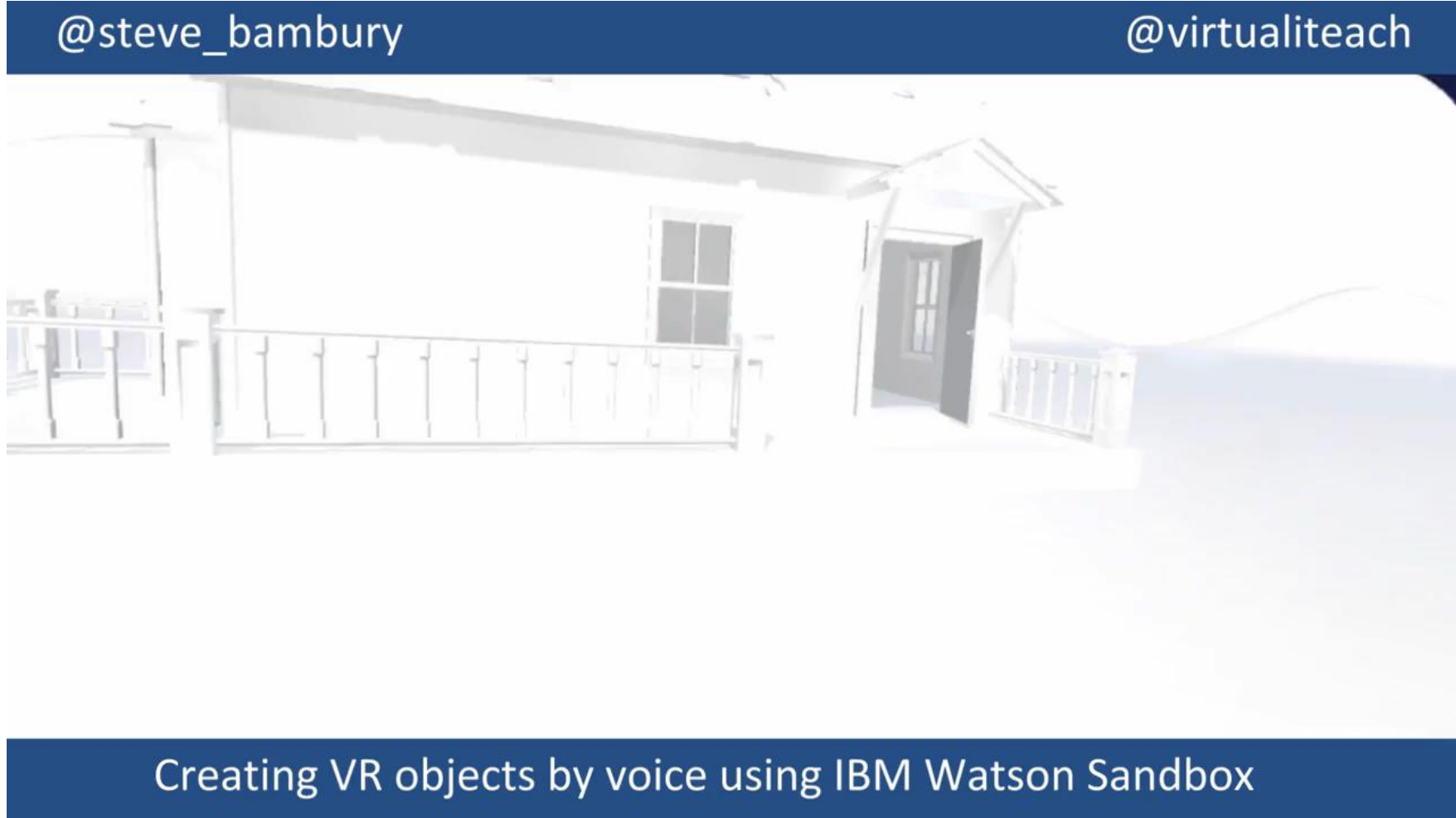
The command and control cube

<https://www.informit.com/articles/article.aspx?p=2780580&seqNum=5>

Voice Commands

- Natural method of issuing commands
- Permit spoken interaction between the user and the system
- Rely on a speech recognition engine
- Afford hands-free interaction
- Normally invisible to the user
- Issues
 - Recognition errors
 - Cannot facilitate large breadths and depths of commands

Voice Commands



Gestural Commands

- Use bodily actions to communicate commands and parameters to the system
- Two types:
 - Postures: static configurations of the hand or body
 - Gestures: dynamic movements of the hand or body
- Pros
 - Natural and intuitive
 - Easy to learn
- Cons
 - Recognition errors
 - Do not facilitate large breadths or depths of commands
 - Unintentional commands may be an issue



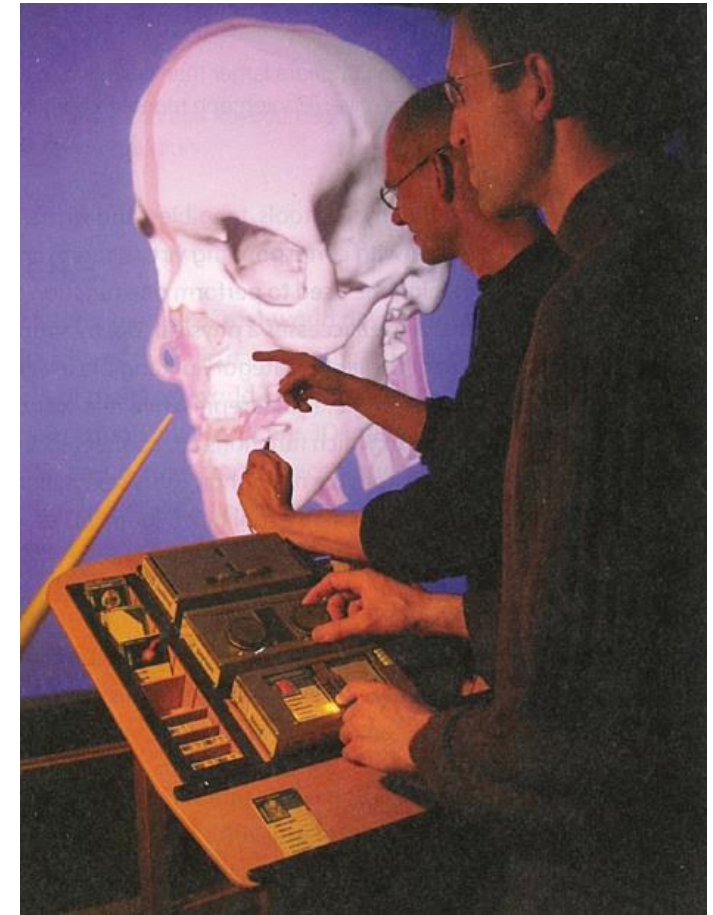
Gestural Commands



MageVR - Gesture based casting for Skyrim VR

Tools

- Use a familiar device to provide direct interactions
 - Tangible user interfaces (real tools)
 - Virtual tools (3D objects)
- Intuitive for changing modes of interaction
- Do not facilitate large breadths or depths of commands



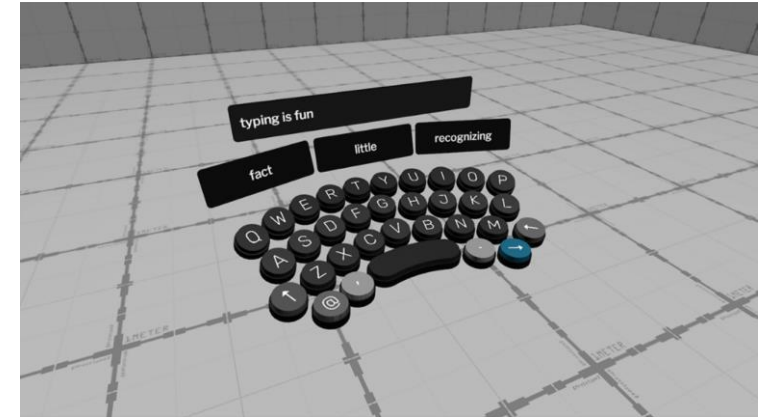
Tangible interface for CAVE

Symbolic Input

- Allows the user to communicate symbolic information (e.g., text, numbers, etc.)
- Examples
 - Keyboard-based
 - Pen-based
 - Gesture-based
 - Speech-based

Keyboard-based Symbolic Input

- Allows the user to key characters and symbols using either a physical or virtual keyboard



Keyboard-based Symbolic Input

PinchType: Text Entry for Virtual and Augmented Reality
Using Comfortable Thumb to Fingertip Pinches



Jacqui Fashimpaur, Kenrick Kin, Matt Longest
Facebook Reality Labs

Design Guidelines for System Control

- Avoid mode errors (feedback)
- Consider using multimodal input
- Prevent unnecessary focus and context switching
- 3D is not always the best solution – consider hybrid interfaces
- Think about usability issues

Social Interaction

- Social VR
- Connecting humans together is one of the greatest potentials for VR technology

User Representations

- Avatars

- Anonymity
- Other forms of embodiment



Figure 10.14: A collection of starter avatars offered by Second Life.

- 3D reconstruction



Figure 10.15: Holographic communication research from Microsoft in 2016. A 3D representation of a person is extracted in real time and superimposed in the world, as seen through augmented reality glasses (Hololens).

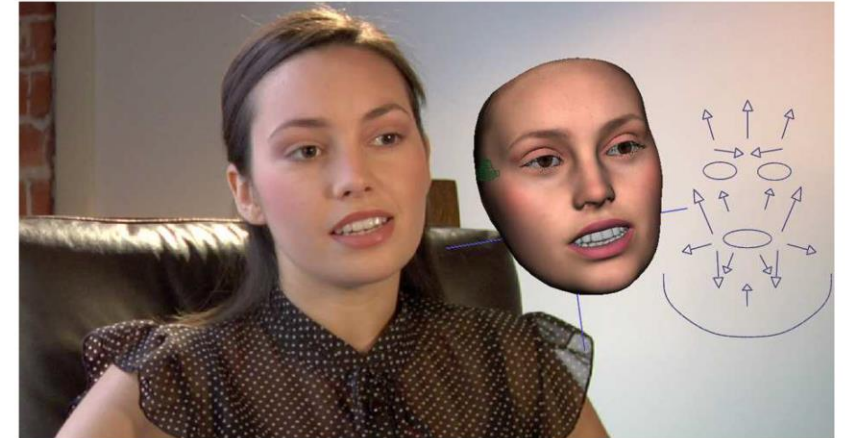
User Representations

- Avatars

- Visual appearance
- Auditory appearance
- Behavioral appearance



(a)



(b)

Figure 10.16: The Digital Emily project from 2009: (a) A real person is imaged. (b) Geometric models are animated along with sophisticated rendering techniques to produce realistic facial movement.

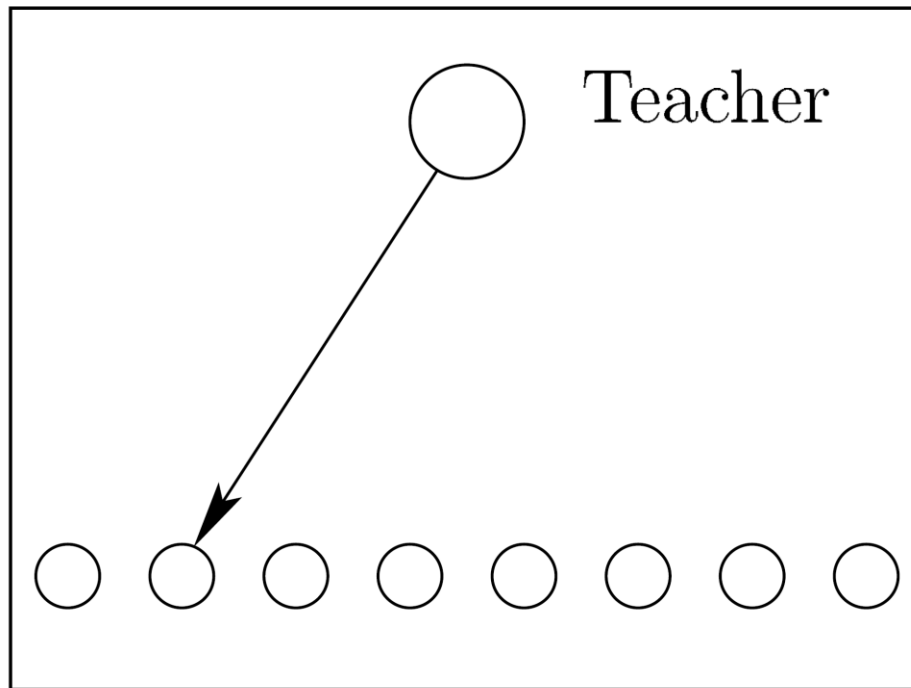
User Representations



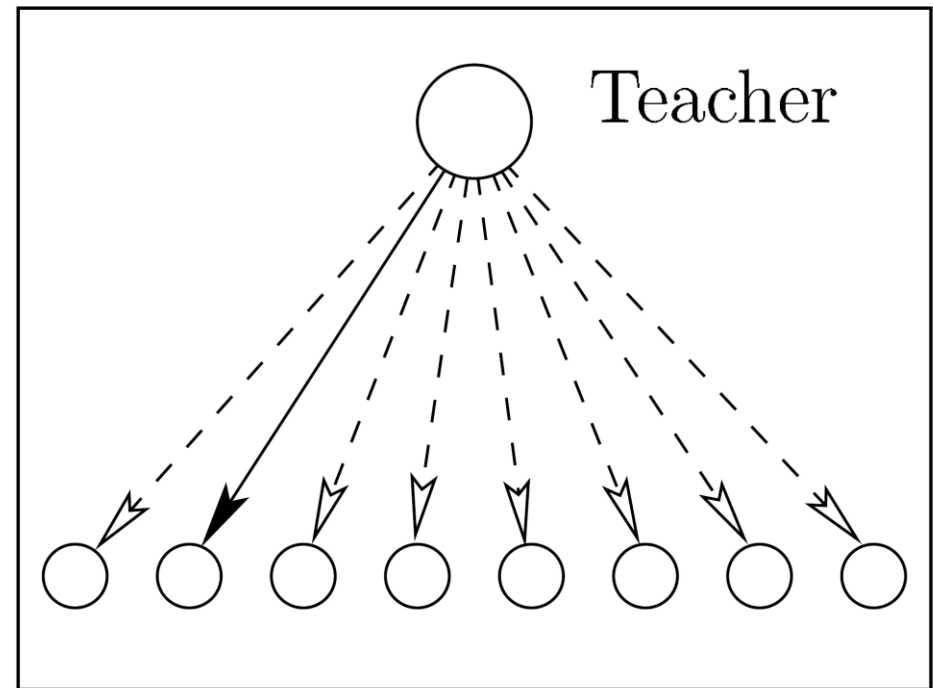
<https://vgl.ict.usc.edu/Research/DigitalEmily/>

Transformed Social Interaction

- VR can produce experiences that are better than reality



Real-world classroom



VR classroom

Further Reading

- Section 10.4, 10.5, Virtual Reality, Steven LaValle
- Chapter 9, 3D User Interfaces: Theory and Practice, LaViola et al.