

Interaction: System Control and Social Interaction

CS 6334 Virtual Reality

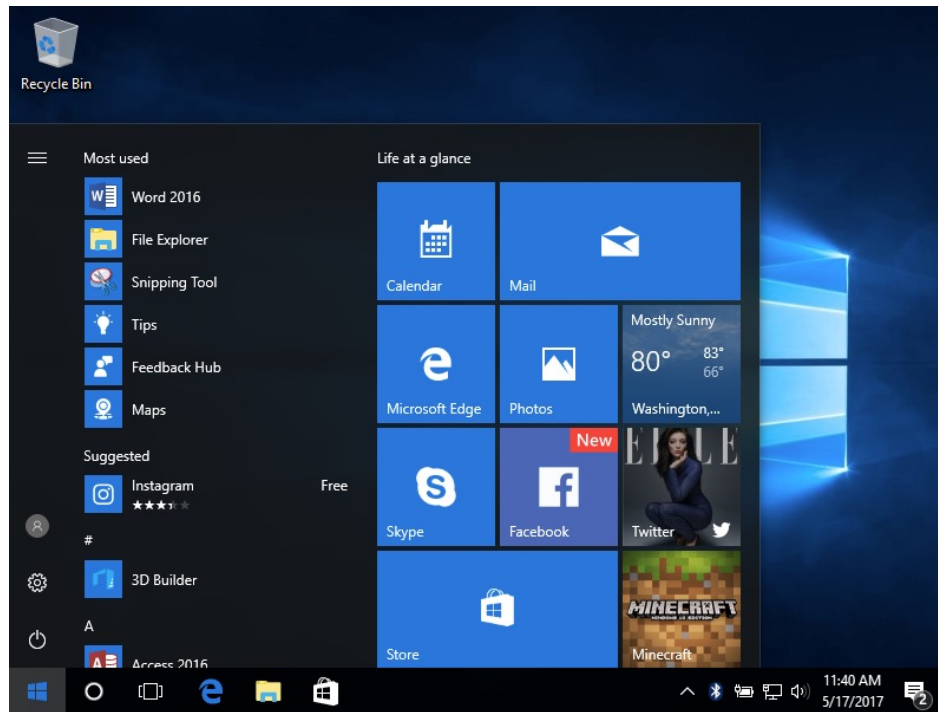
Professor Yapeng Tian

The University of Texas at Dallas

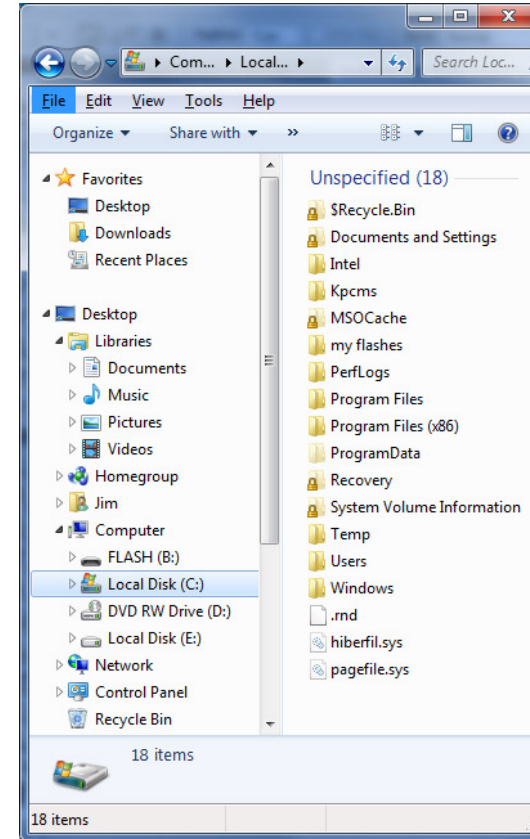
Some slides of this lecture are courtesy Jin Ryong Kim and Yu Xiang

System Control

- Issuing commands to the system



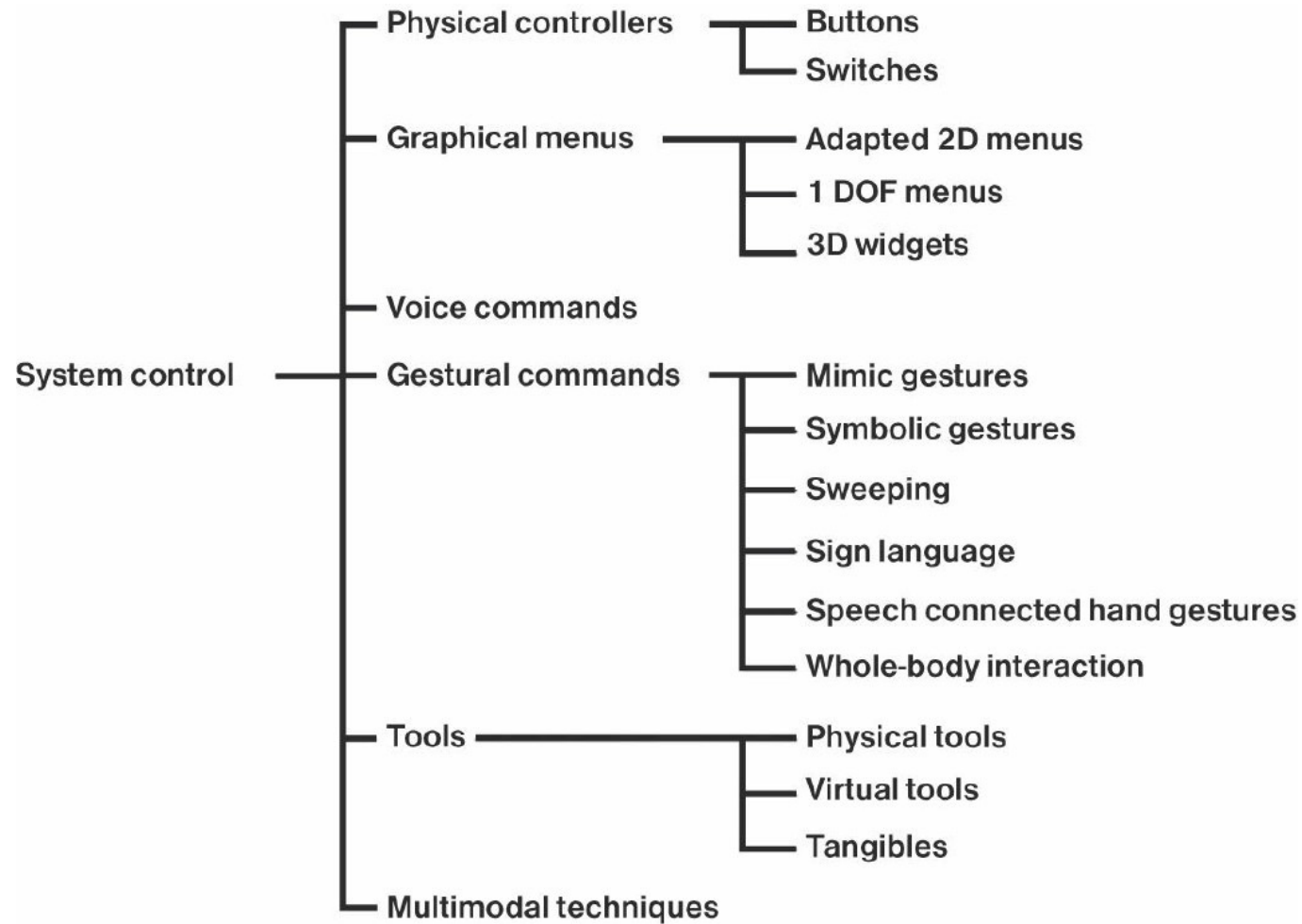
Windows 10



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

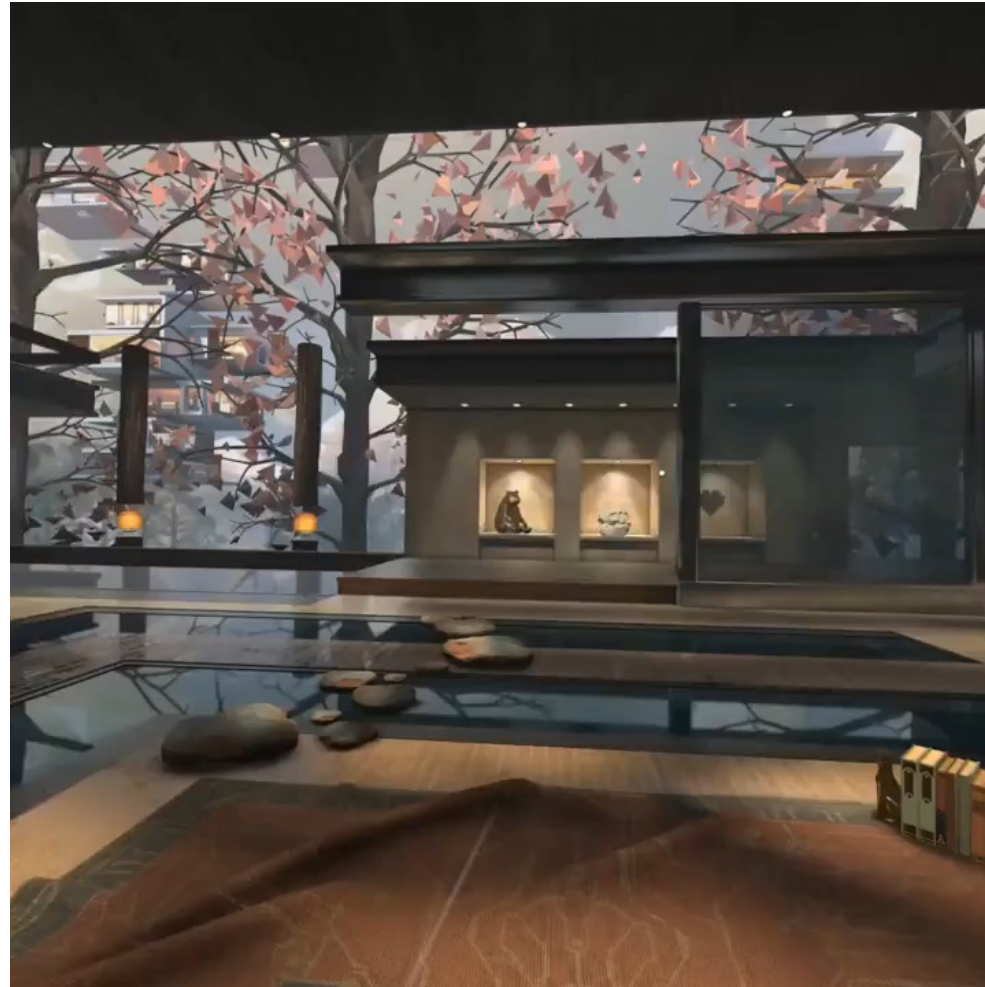
- Provide 3D objects for the user to select commands and parameters from
- Examples
 - Floating menu
 - Ring menu
 - TULIP menu
 - ...

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
- Issue
 - Occludes the world



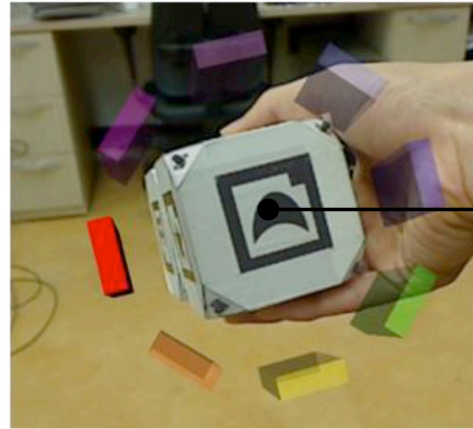
Floating Menu



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.

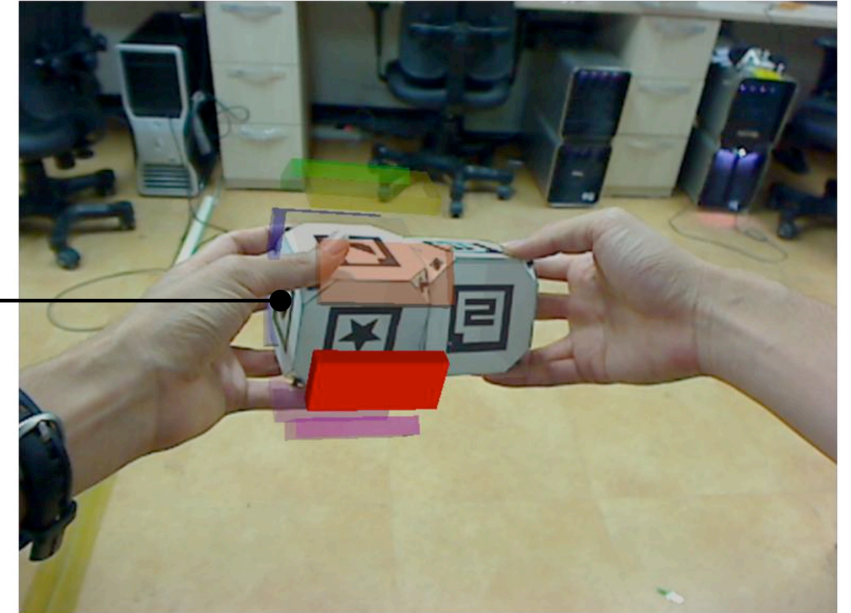
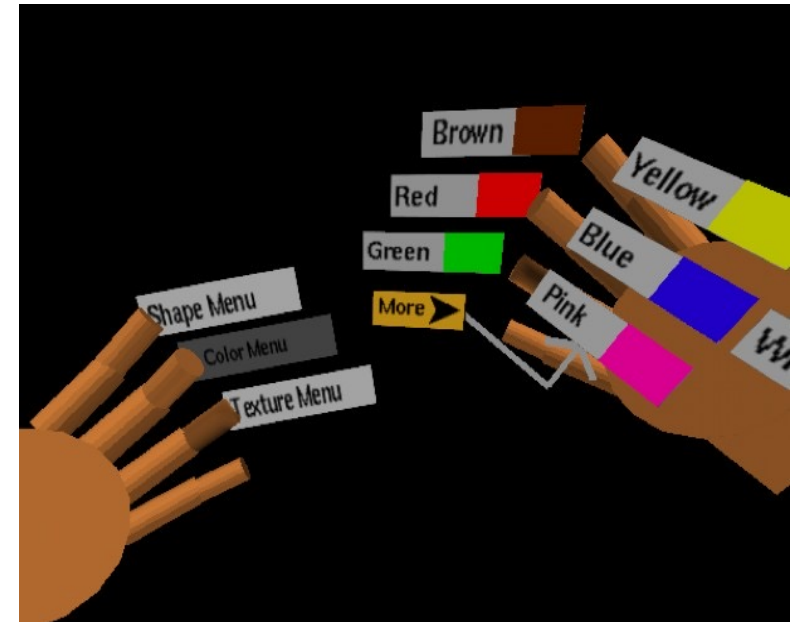


figure 6: A simple 3D ring menu application that has 8 items around the TSC

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

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

@steve_bambury

@virtualiteach



Creating VR objects by voice using IBM Watson Sandbox

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



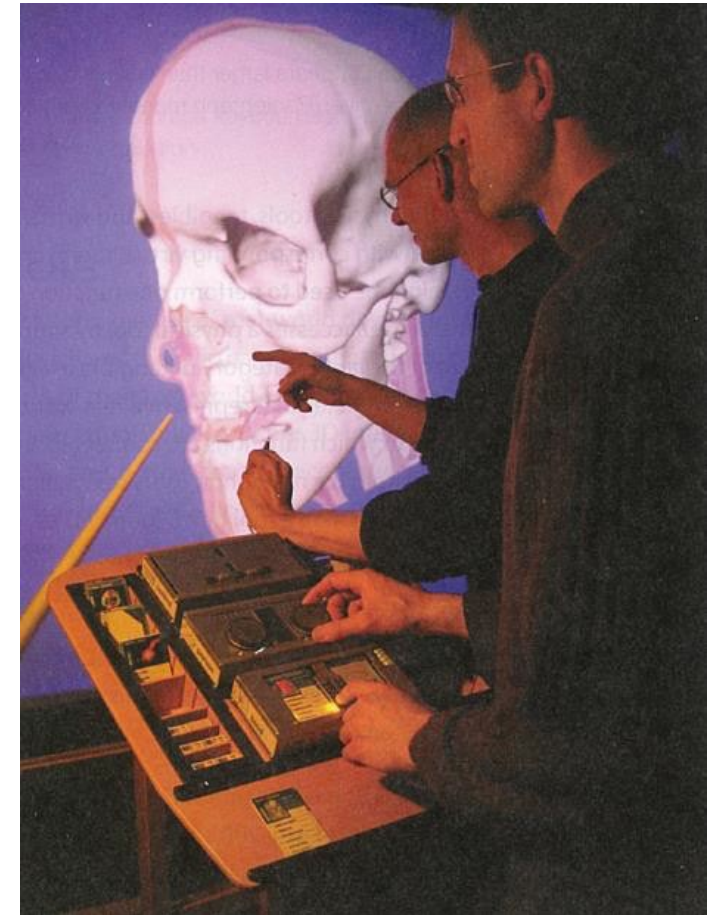
Gestural Commands



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



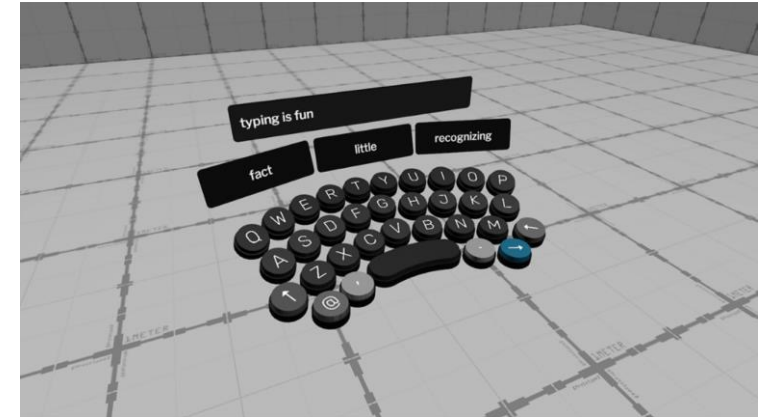
Tangible interface for CAVE

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 tap 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
- 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).

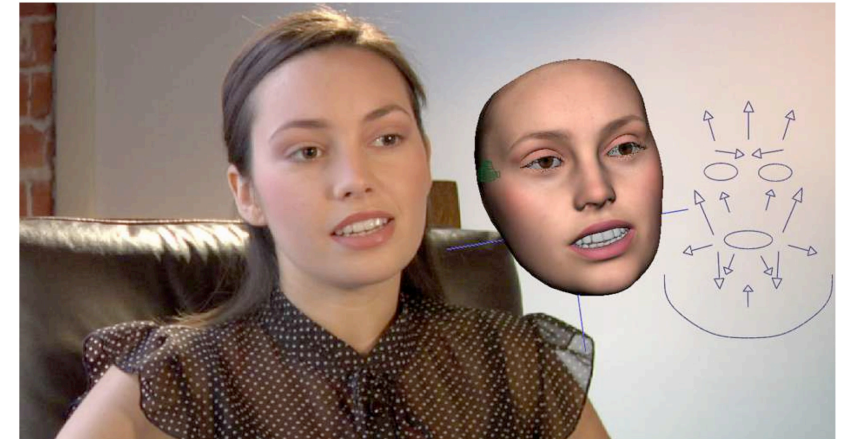
User Representations

- Avatars

- Visual appearance
- Auditory appearance
- Behavioral appearance



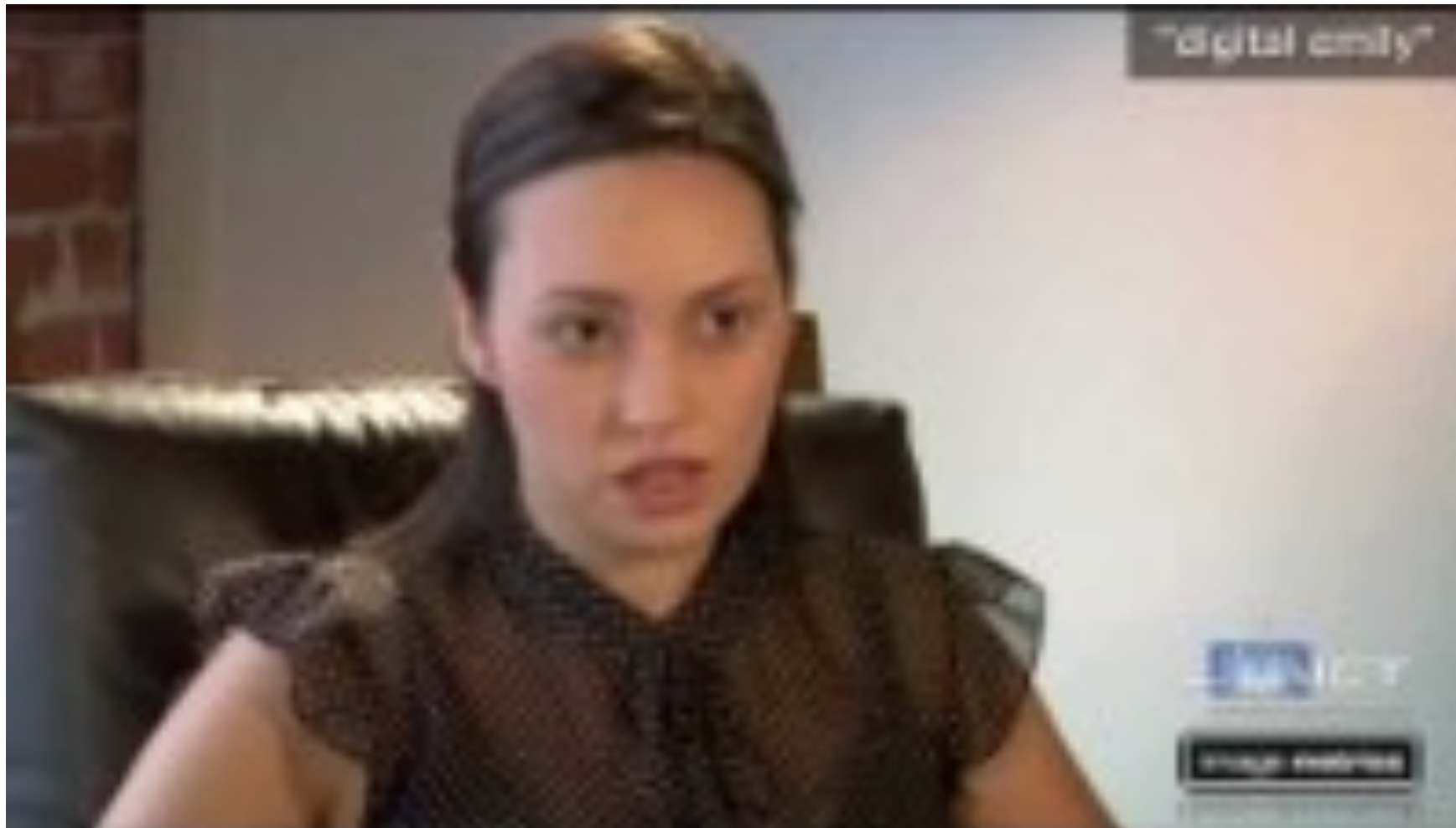
(a)



(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.

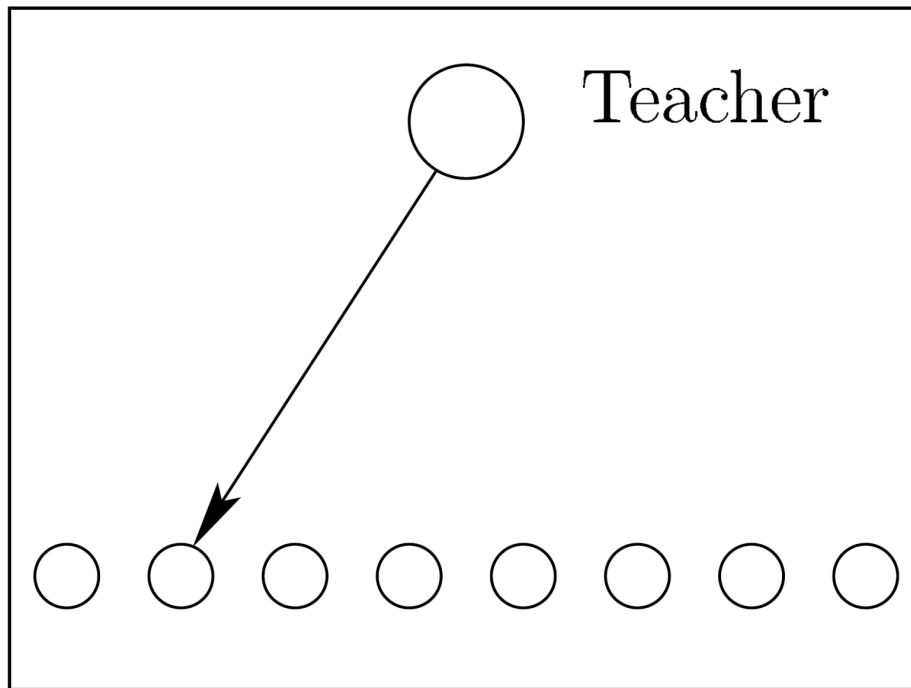
User Representations



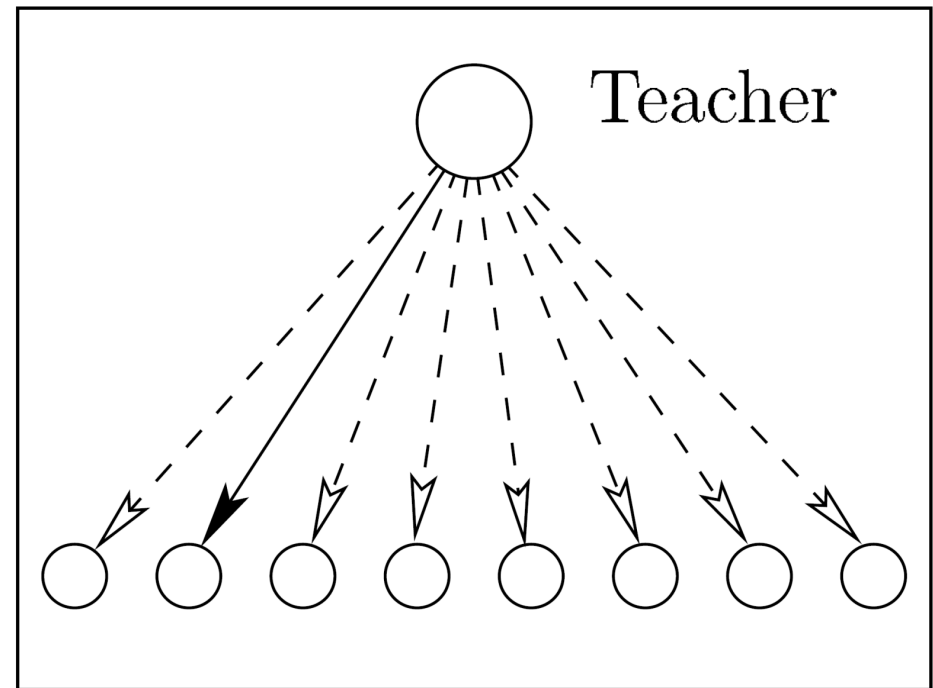
<https://vgl.ict.usc.edu/Research/DigitalEmily/>

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.