

CSE 165: 3D User Interaction

Lecture #11: System Control

Announcements

- Sunday, February 14th at 11:59pm:
 - Homework project 2 late deadline
- No discussion on Monday, February 15th
- Sunday, February 21st at 11:59pm:
 - Homework project 3 due
- Project 3: set up Oculus Quest first

3D UI Presentations

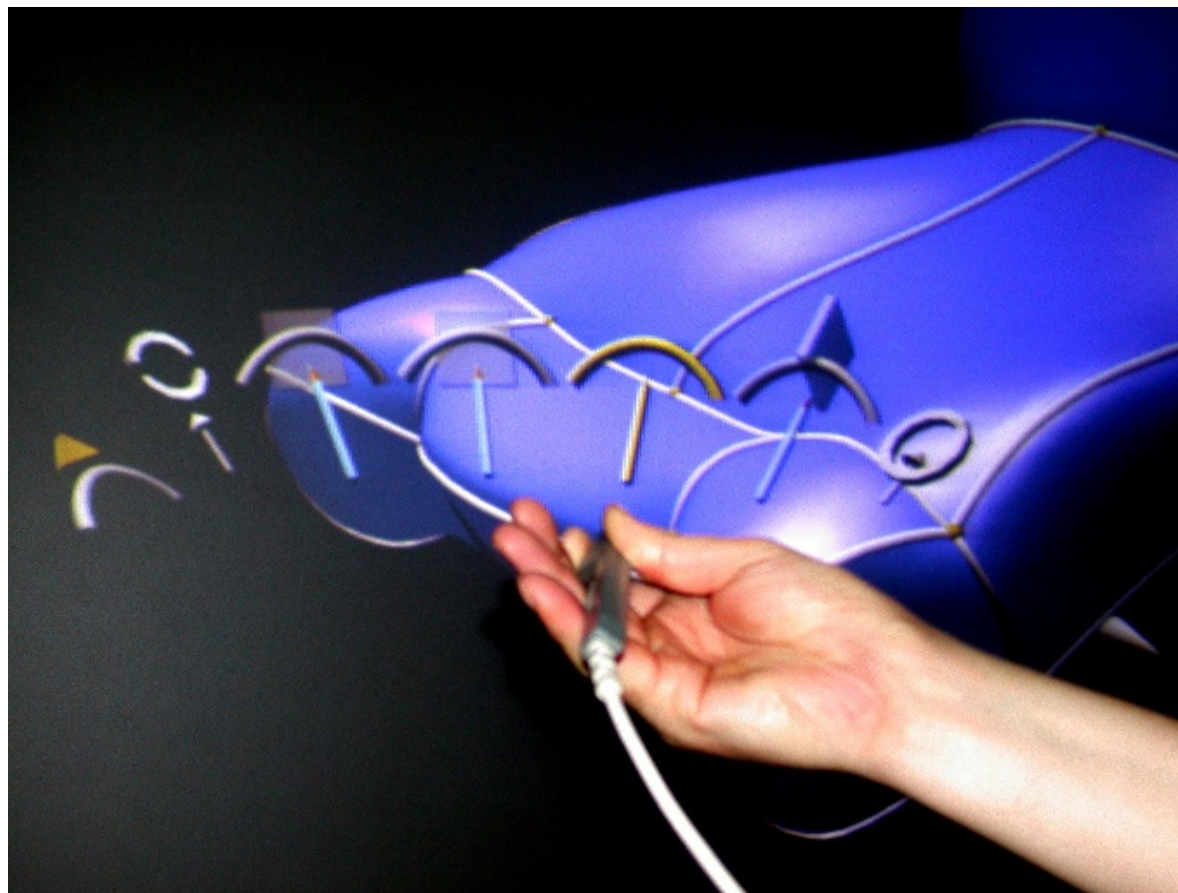
- Weijia Zeng:
 - NextMind VR Demo
- James Cor:
 - NaviSeat and NaviBoard
- Jeremy Lin:
 - Multidevice Interactions in Augmented Reality (Megereality)

System Control

Graphical Menus – Adapted 2D Menus

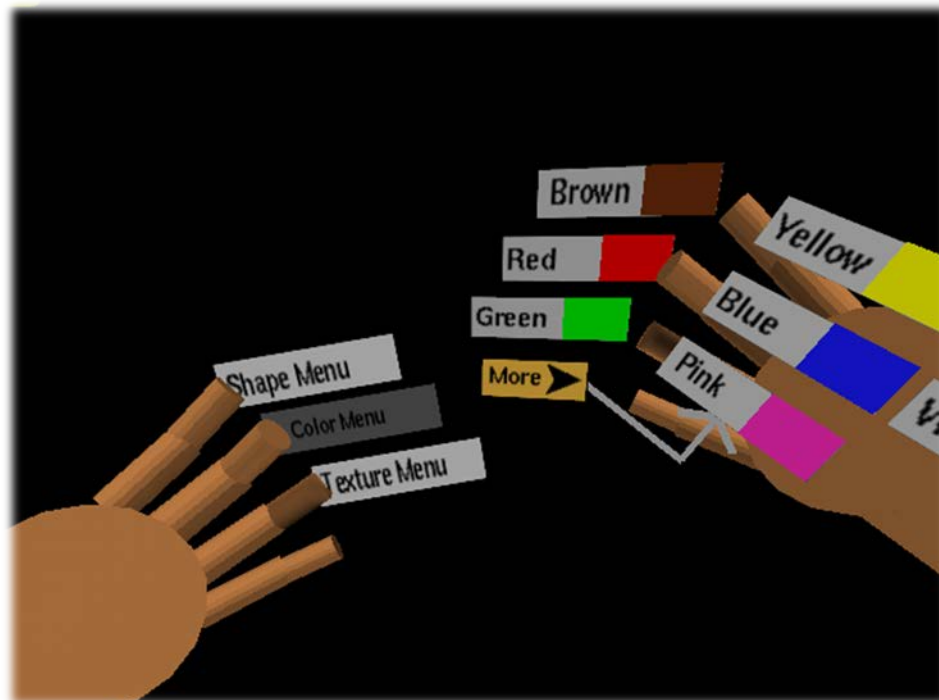


Graphical Menus – 1-DOF Menus



Graphical Menus – TULIP

- Uses pinch gloves
- Limited to 16 menu items
 - 8 per hand
- More than 16 menu items possible with “more” option on pinky finger



Bowman, Wingrave 2001

Arm Widget for Leap Motion



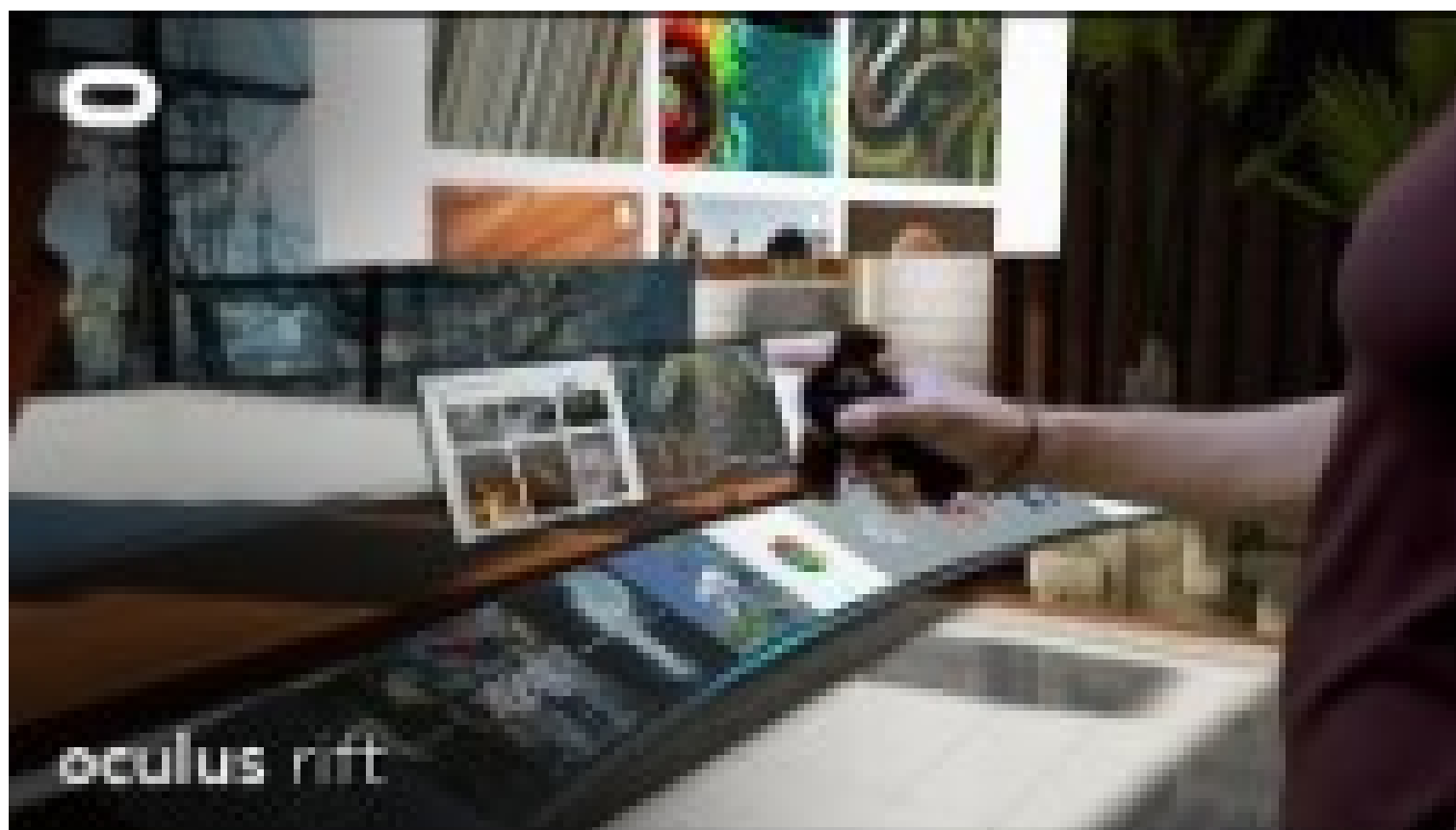
Controller-Space Widgets in Tilt Brush



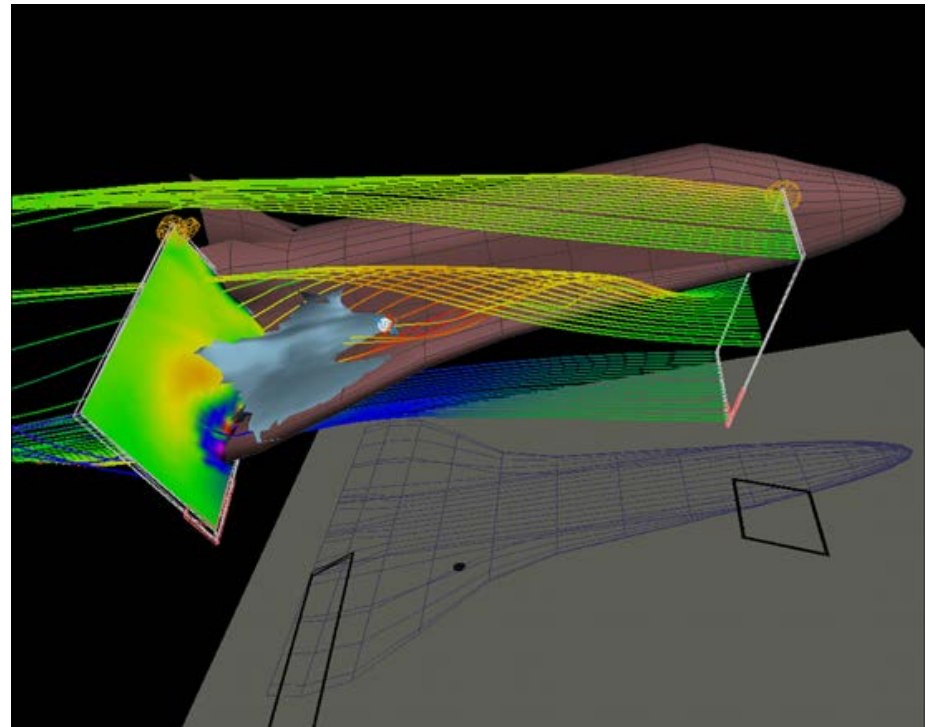
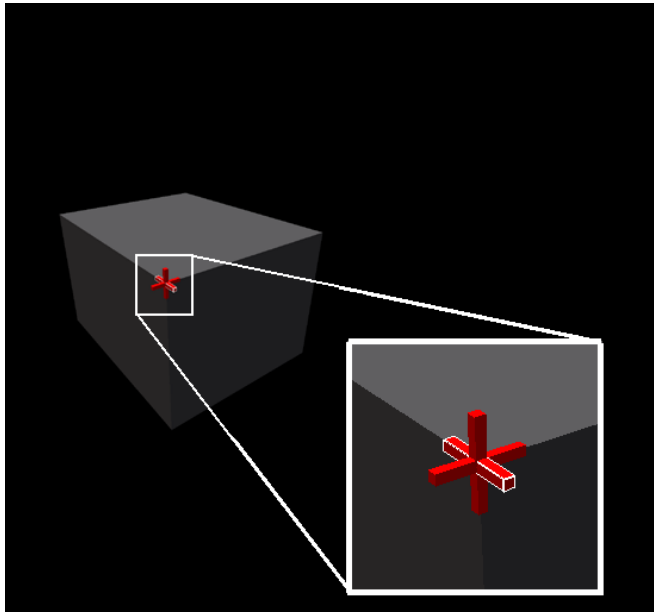
Hovercast VR Menu (2015)



Oculus Dash

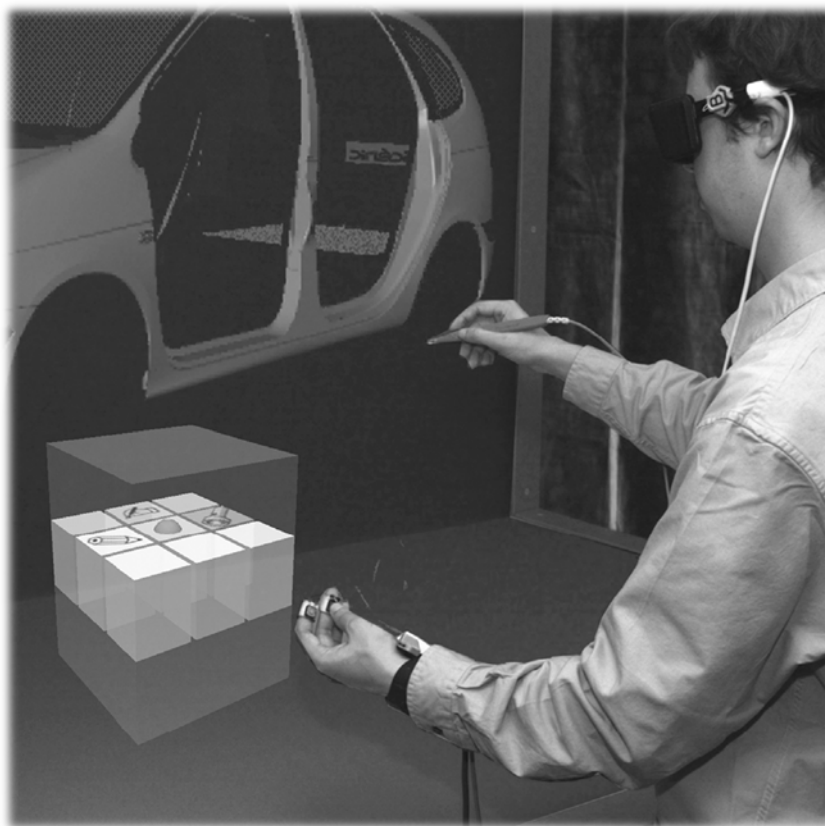


Graphical Menus – 3D Widgets (1)



Graphical Menus – 3D Widgets (2)

Command and Control Cube



Grosjean, Coquillart 2001

Graphical Menus – Design

- Placement
 - world-referenced (freely in world)
 - object-referenced (centered to object in world)
 - head-referenced (view centered)
 - body-referenced
 - device-centered
- Selection
 - Degrees of freedom, constraints
- Representation and structure
 - form, size, space
 - hierarchy: functional and semantic grouping, context sensitivity, control coding

Voice Commands

- Speech recognition
- Spoken dialogue techniques
- Requires
 - speech recognition engine
 - speaker dependent vs. independent
 - varying vocabulary size
 - good microphone
- Invisible to the user
- Push to talk

Gestural Commands

- One of the first system control techniques
- Posture – static hand configuration
- Gesture – dynamic movement



Speech Recognition

- Natural language processing
- For example: Microsoft Cortana API

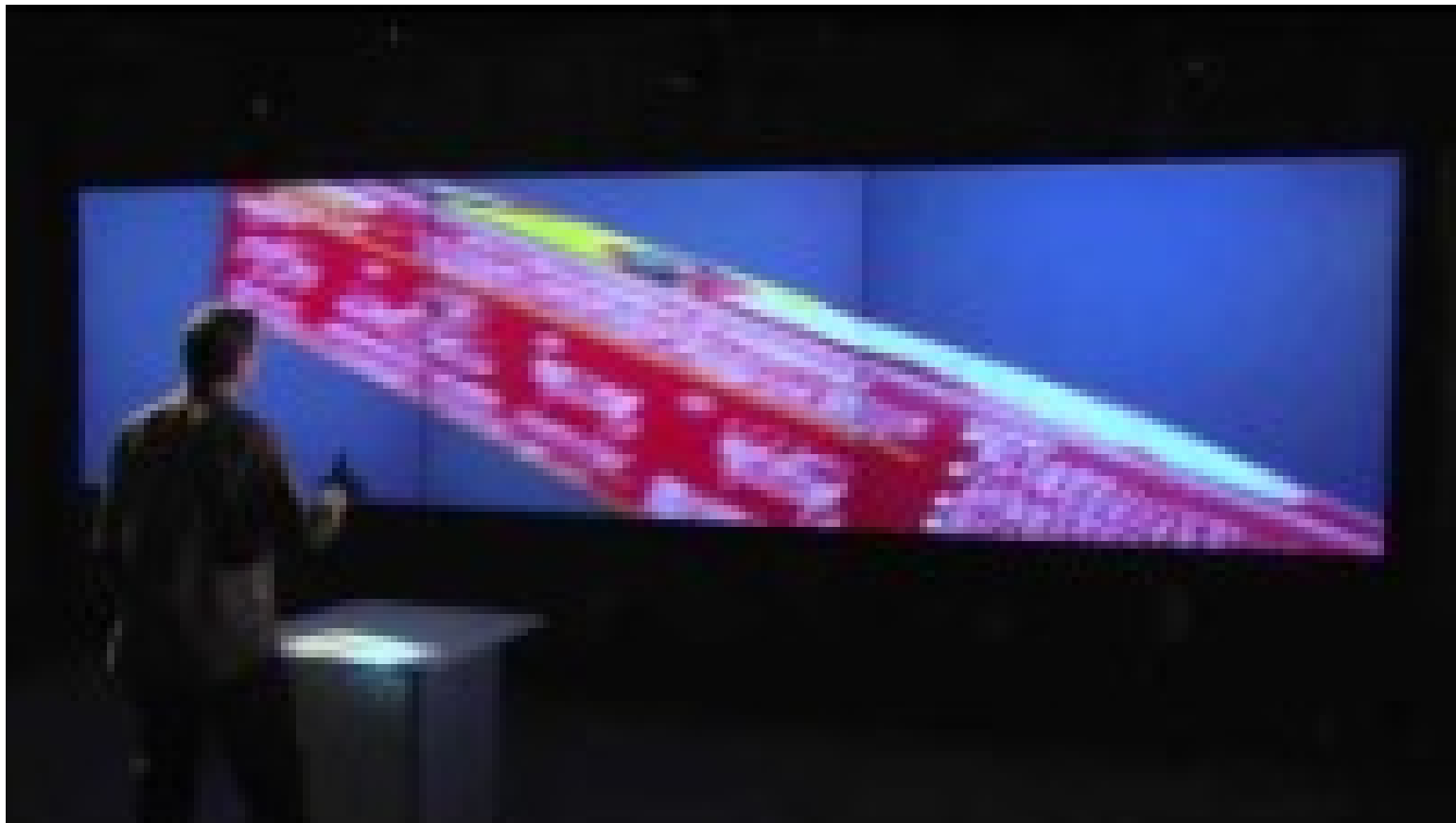


Gesture Command Types

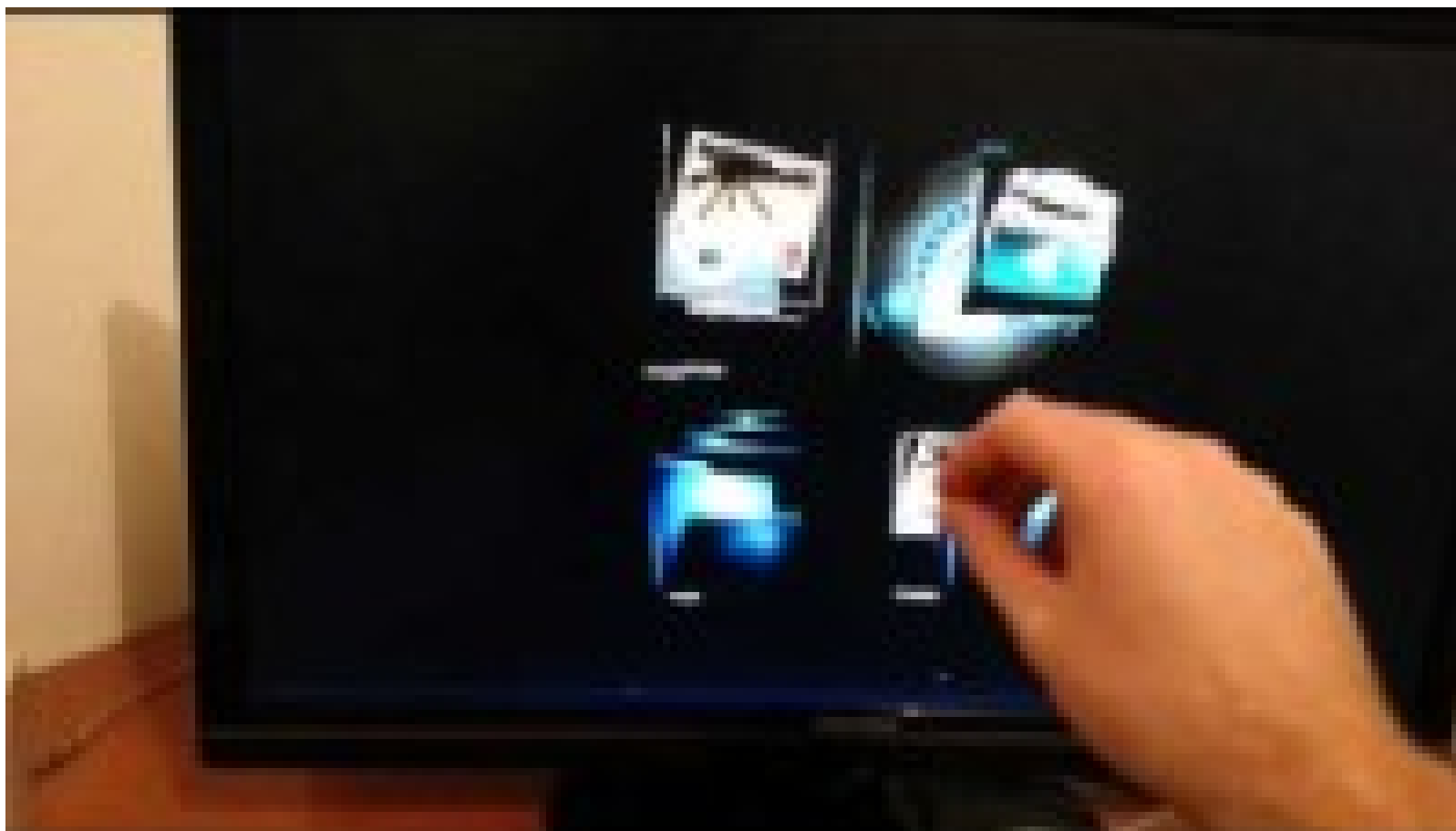
- Speech connected gestures: spontaneous gesticulation while talking
- Mimic gestures: directly describe a concept
- Symbolic: e.g., thumbs up
- Sign language: artificial vocabulary



Oblong Industries: G-Speak



Holotouch File Browser



Tools

- Provide directness of interaction
- Familiar (real-world derived)
- Physical tools
 - real physical objects (props)
 - may have graphical representation
- Virtual tools



*CavePainting
(Keefe 2001)*

Virtual Tool belt

- Rendered in user space around waist
- Doesn't block the view
- User looks down to see items
- Supports proprioception: with practice user will find menu items without looking down



Tangible User Interfaces



Retractable



Multimodal System Control

- More than one input modality (speech, gesture, facial expression, etc...)
- Allows decoupling of interaction modes
 - Avoids switching between, e.g., navigation and other interaction mode
- Reduces errors through redundant input
- Flexibility through complementary behavior

Multimodal Interaction



Hand gestures and speech [Van Dam et al. 2000]