



CSE 165: 3D User Interaction

Lecture #12: System Control

Announcements

- Homework Assignment #3
 - Due Friday at 2pm
- Midterm exam next Thursday, March 1
- Hackathon in VR lab this weekend

System Control

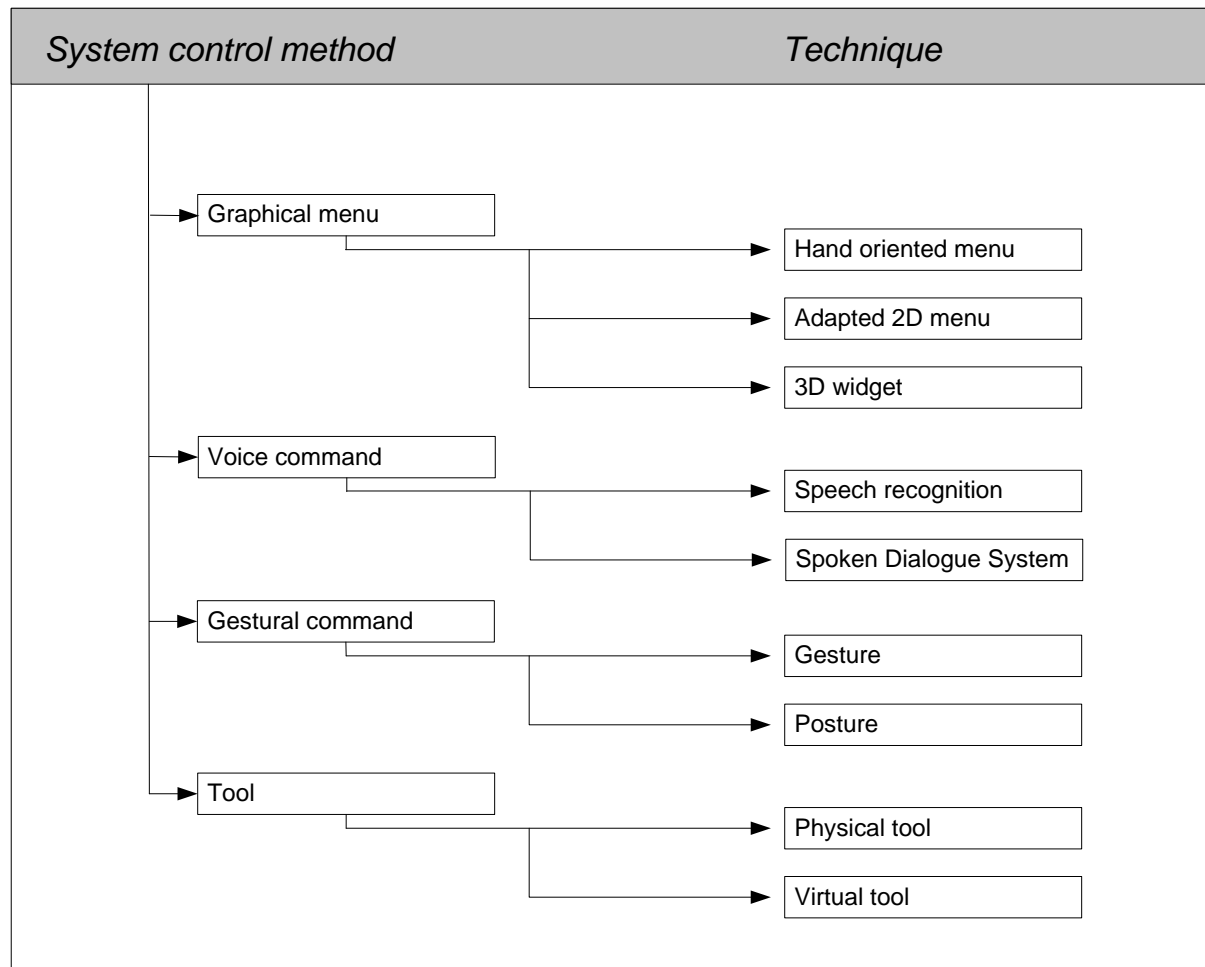
Universal 3D Interaction Tasks

- Selection
- Manipulation
- Navigation
- **System control**
- Symbolic input

System Control

- Often considered glue of 3D UI
- Commands are issued to
 - request system to perform a particular function
 - change interaction mode
 - change system state

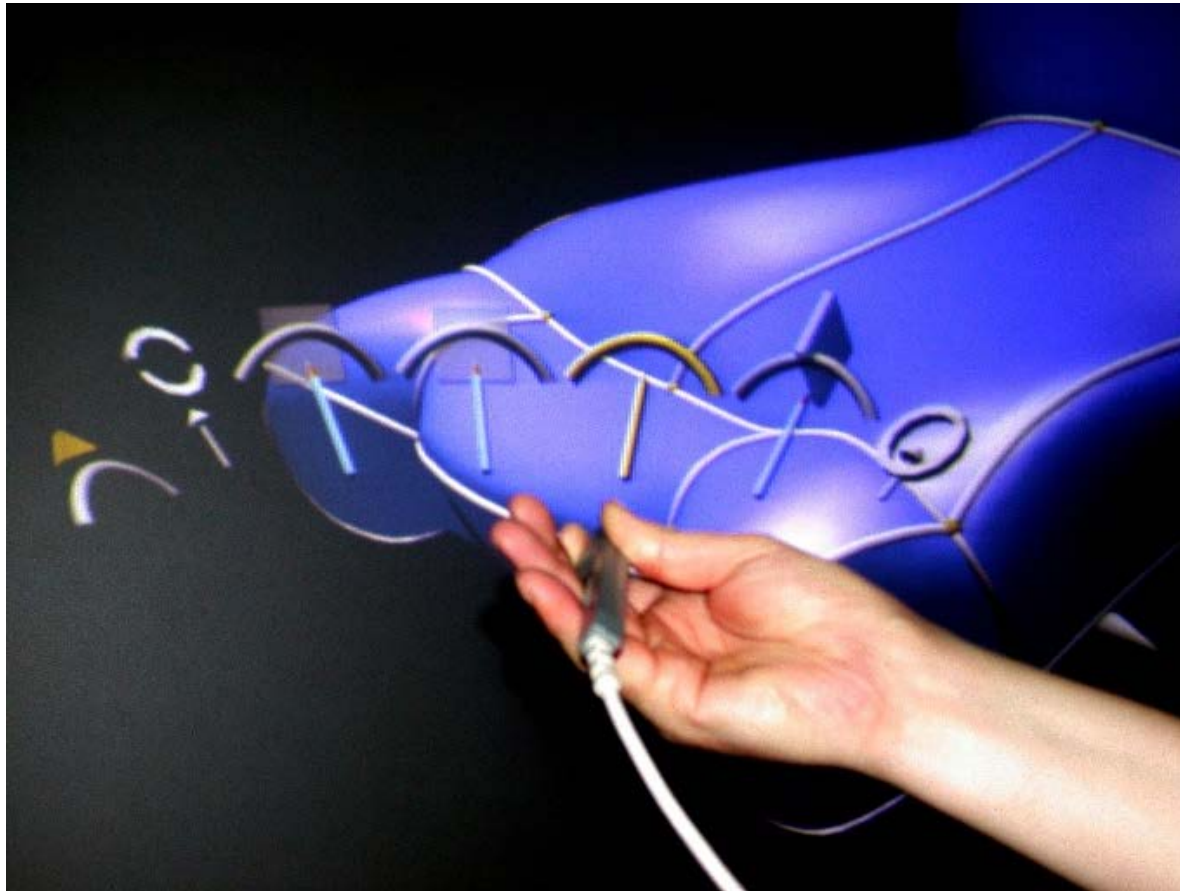
Classification



Graphical Menus – Adapted 2D Menus

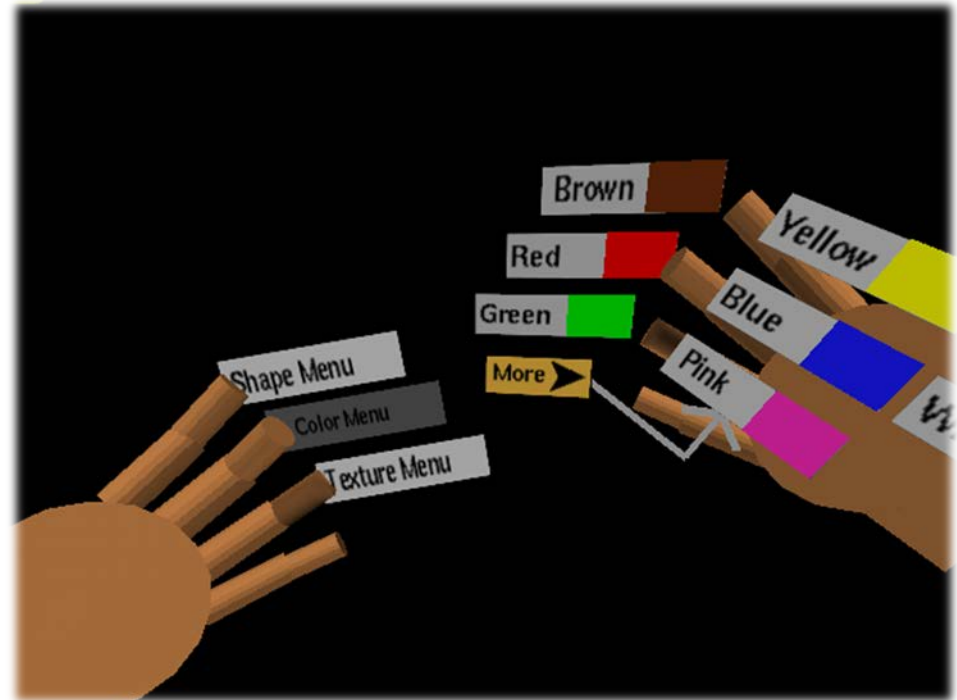


Graphical Menus – 1-DOF Menus



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



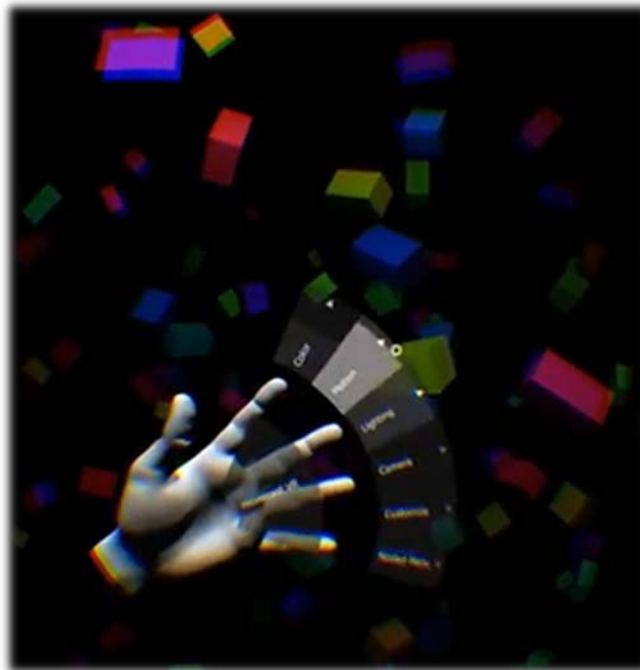
Bowman, Wingrave 2001

Arm Widget for Leap Motion



Hovercast VR Menu (2015)

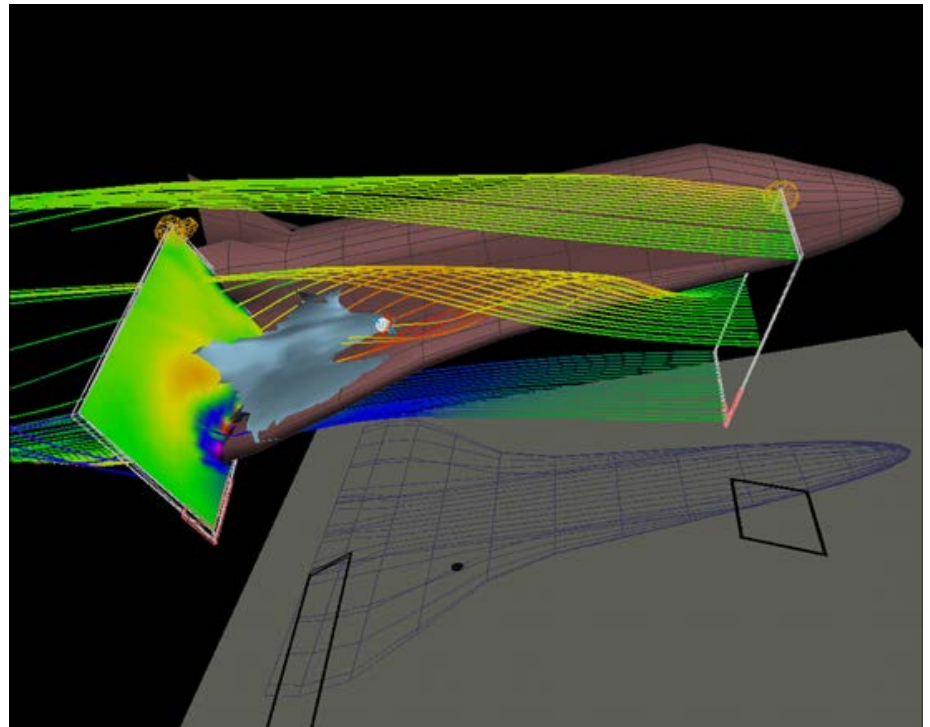
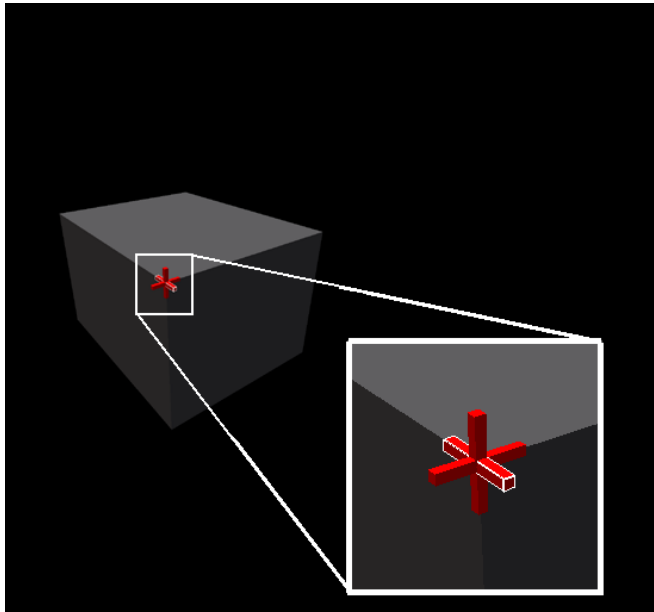
- <https://www.youtube.com/watch?v=Phn3lx-YxPA>



Oculus Dash

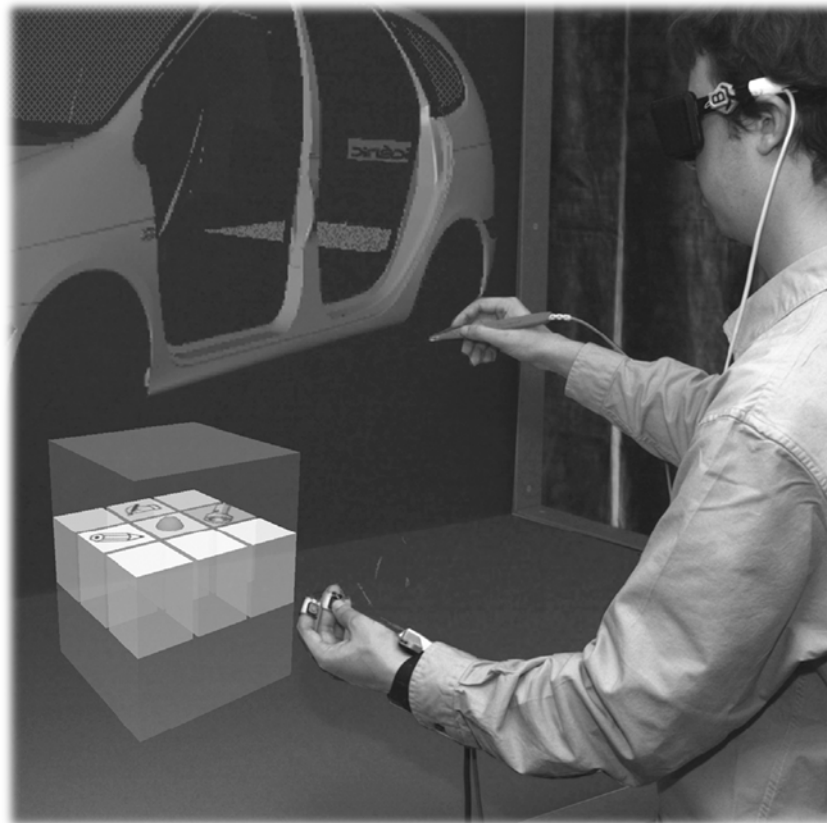


Graphical Menus – 3D Widgets (1)



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

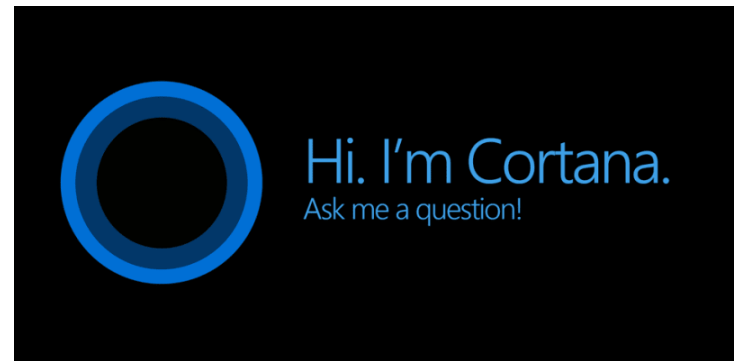
Gestural Commands

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



Speech Recognition

- Natural language processing
- For example: Microsoft Cortana API



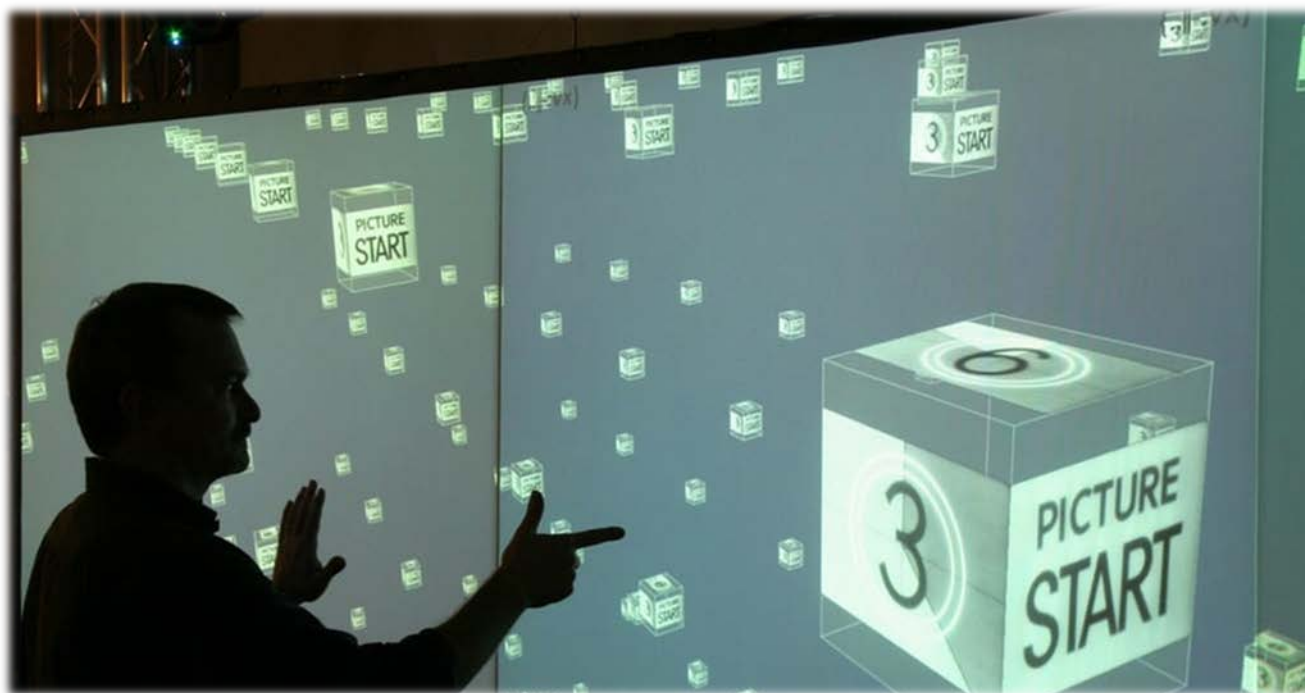
Gesture Command Types

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



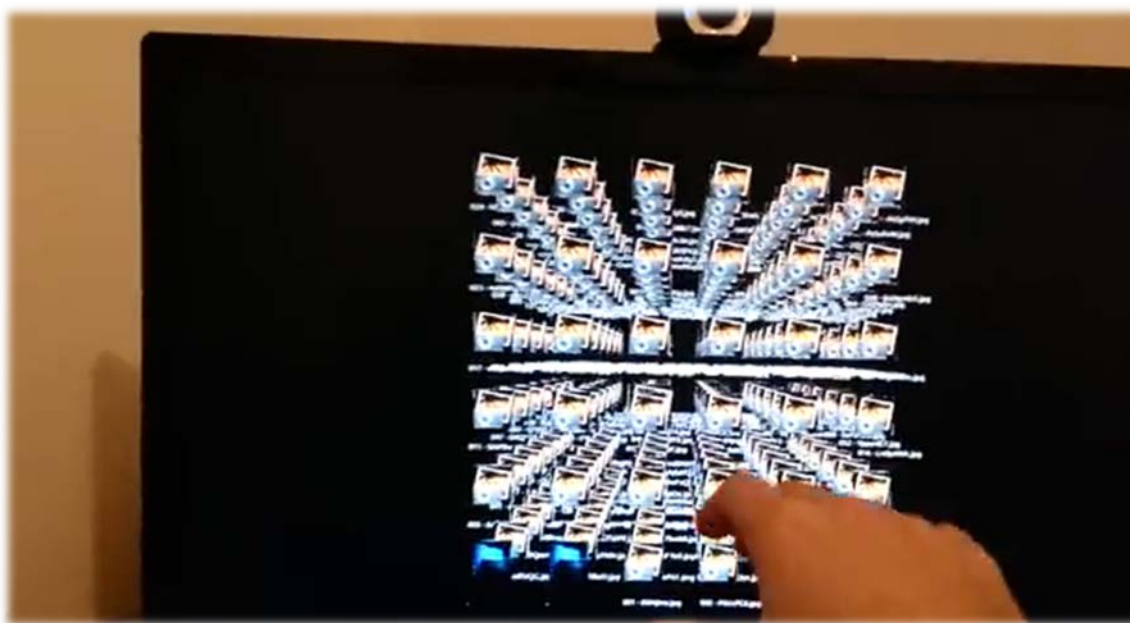
Oblong Industries: G-Speak

- <https://vimeo.com/2229299>



Holotouch File Browser

- <http://www.youtube.com/watch?v=mPKdTMmdQ9A>



Devehat 2014

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



Reactable (Jorda et al., 2005)



Video:

<https://www.youtube.com/watch?v=tgcpyZlqvT8>

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]