



CSE 190: 3D User Interaction

Lecture #11: System Control
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Announcements

- Homework assignment #3 due Friday, February 22nd at 1pm in Sequoia lab 142
 - Grading starts at 12:30
- Homework assignment #4 comes out this weekend: will use Kinect
 - Sign out Kinect in my office starting Friday afternoon
- Calit2 undergraduate scholarship
 - Application deadline March 11
 - <http://ucsdstudents.calit2.net>

Paper Presentations Next Lecture

- Kit: CaveUDK: a VR game engine middleware
- Spencer: TBD
- Ken: TBD

Paper Presentations Today

- Think: 3D Multi-view Autostereoscopic Display and Its Key Technologie
- Suman: Real-time Panoramic Mapping and Tracking on Mobile Phones
- Stephen: An experimental analysis of the impact of Touch Screen Interaction techniques for 3-D positioning tasks

System Control

Universal 3D Interaction Tasks

- Selection
- Manipulation
- Navigation
 - Wayfinding – cognitive component
 - Travel – motor component
- System control
- Symbolic input

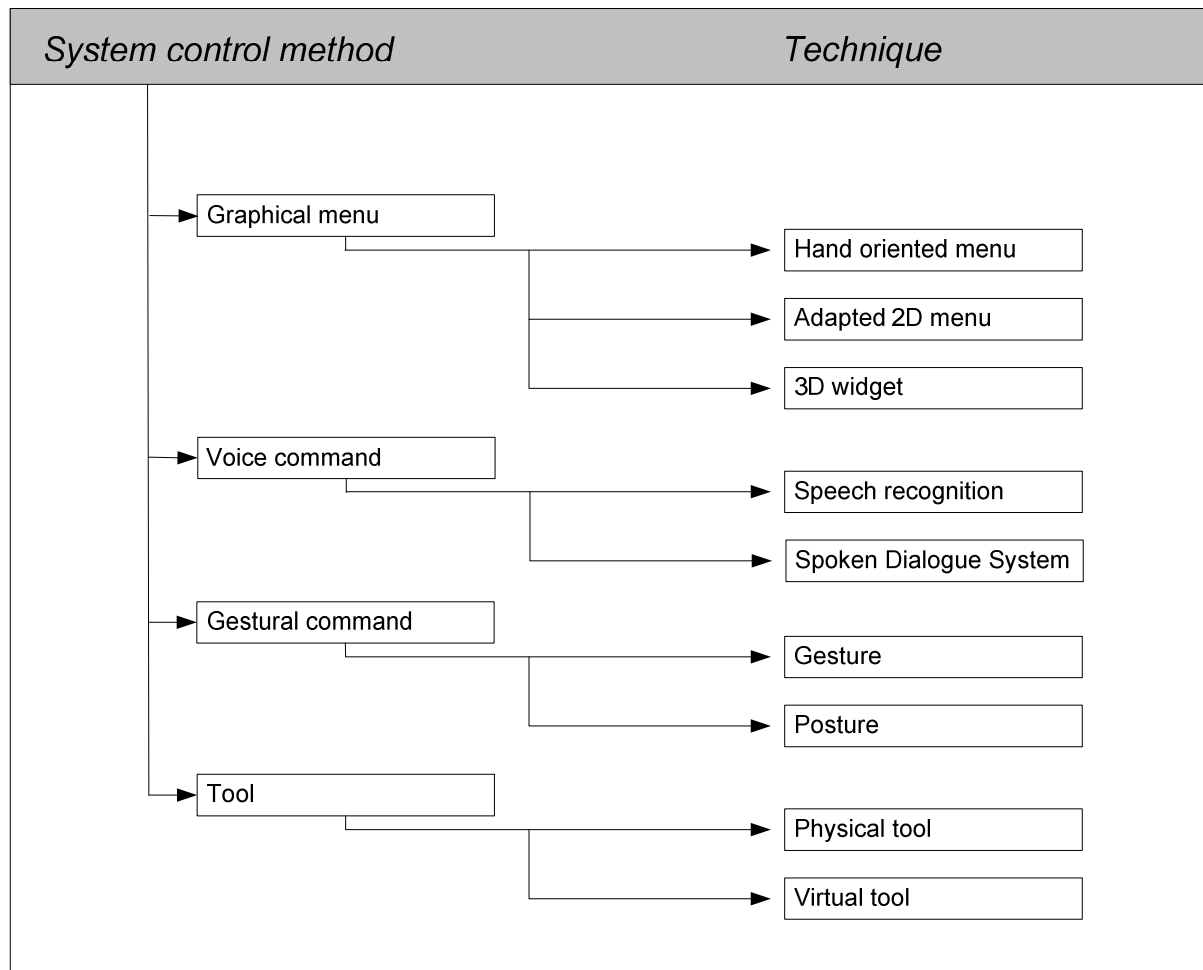
System Control

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

Human Factors and System Control

- Learn from mechanical systems
 - Transfer of mechanical energy or information to a system for performing control actions
 - Control-body linkage:
 - interaction between control device and human body
- Effectiveness of control-body linkage
 - human experience, training
 - shape and size of control
 - visual representation and labeling
 - methods of selection

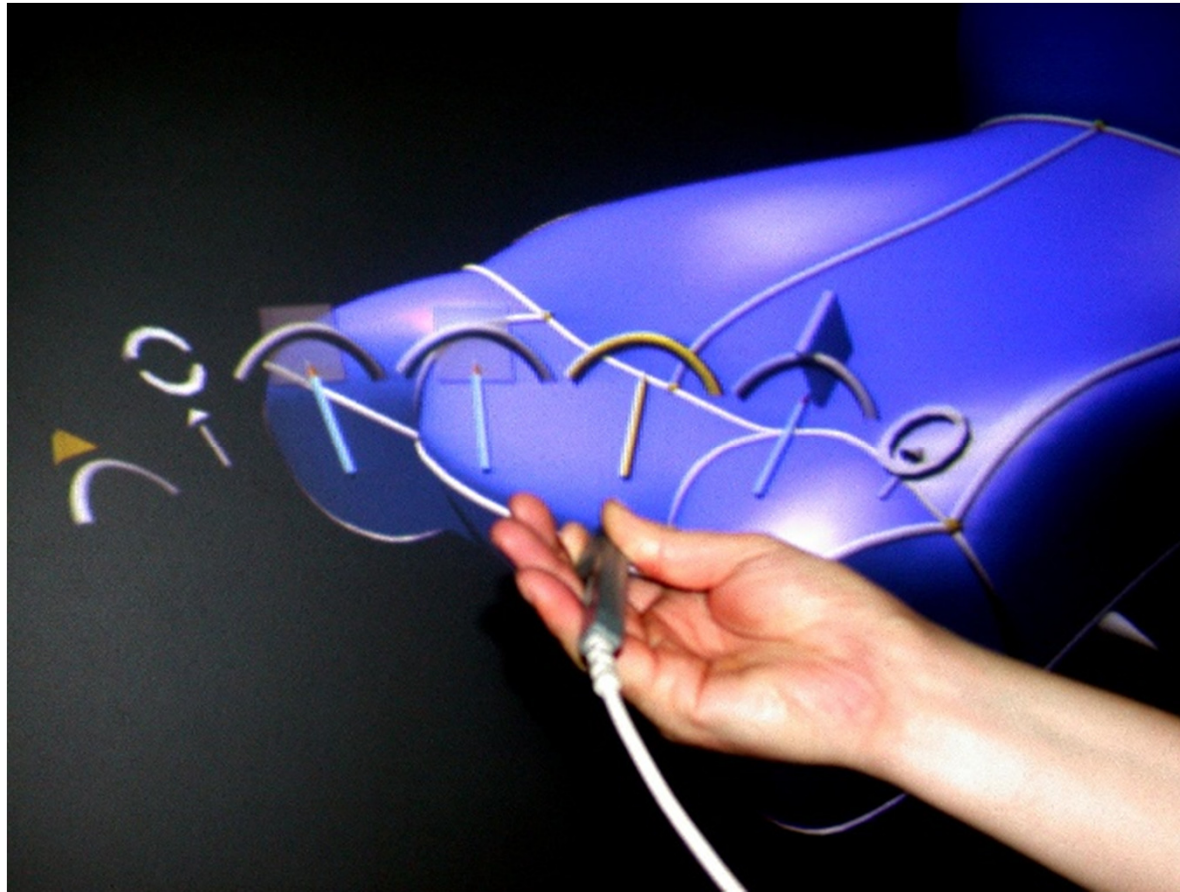
Classification



Graphical Menus – Adapted 2D Menus

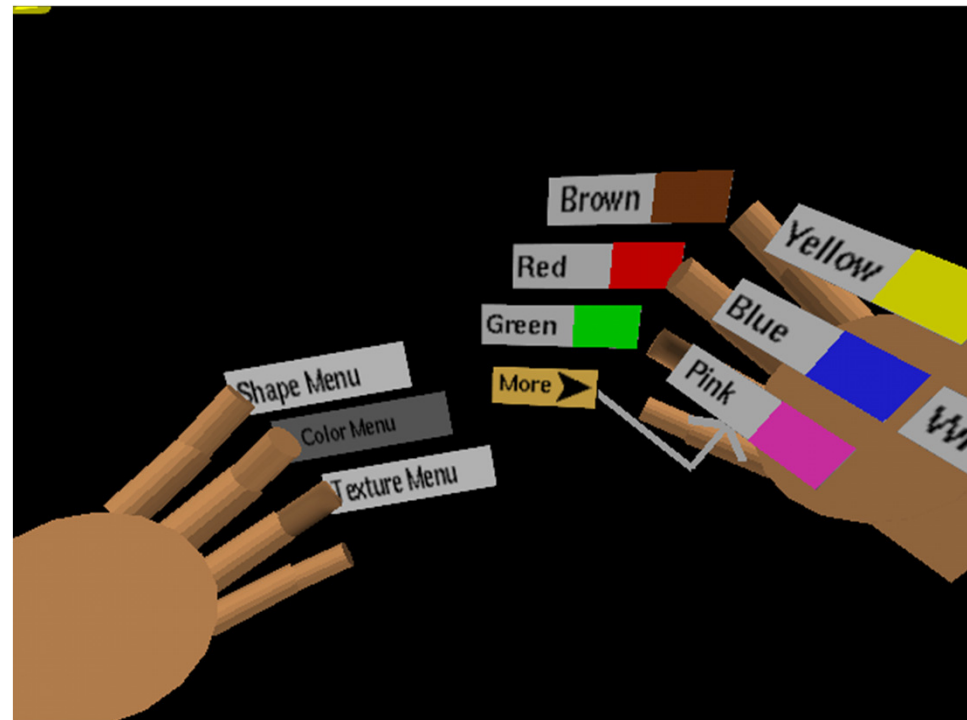


Graphical Menus – 1-DOF Menus

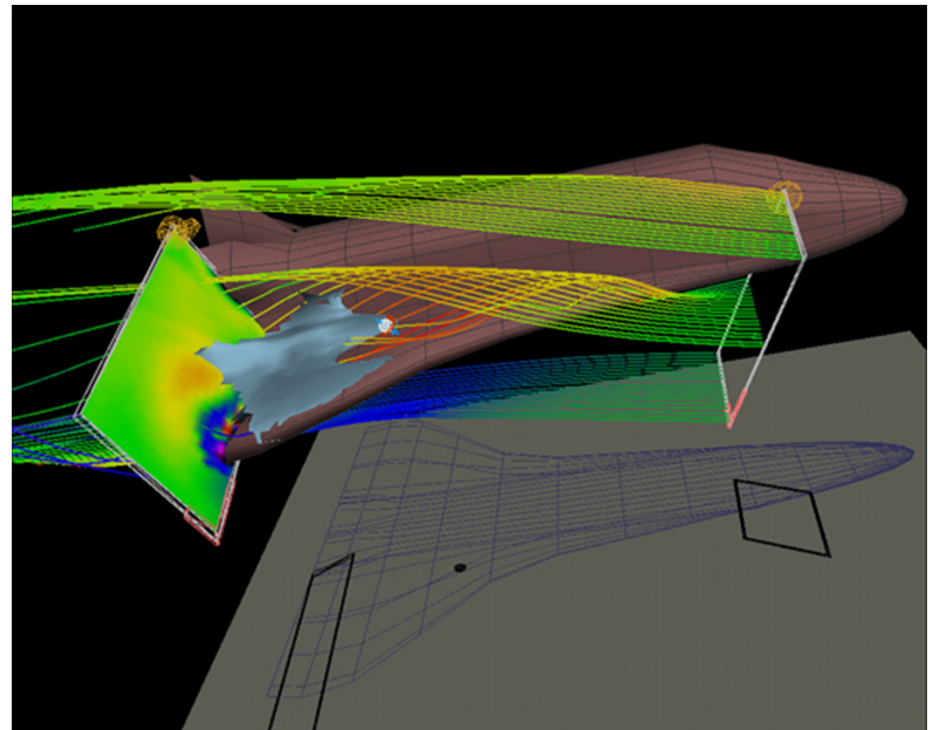
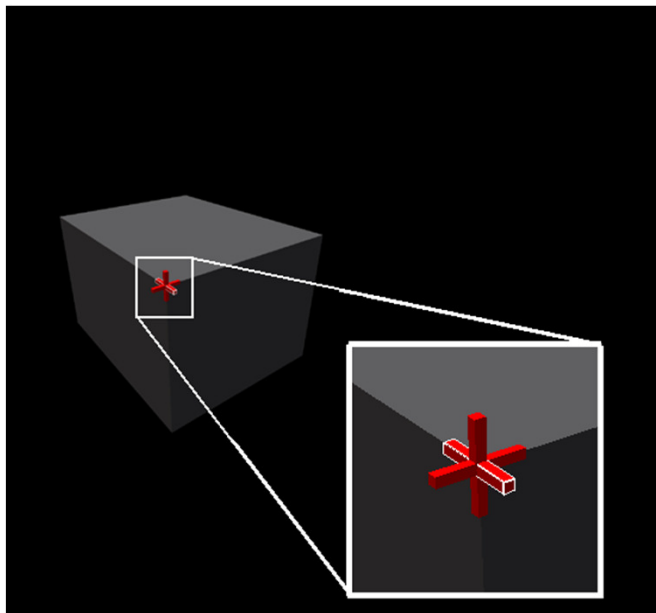


Graphical Menus – TULIP

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

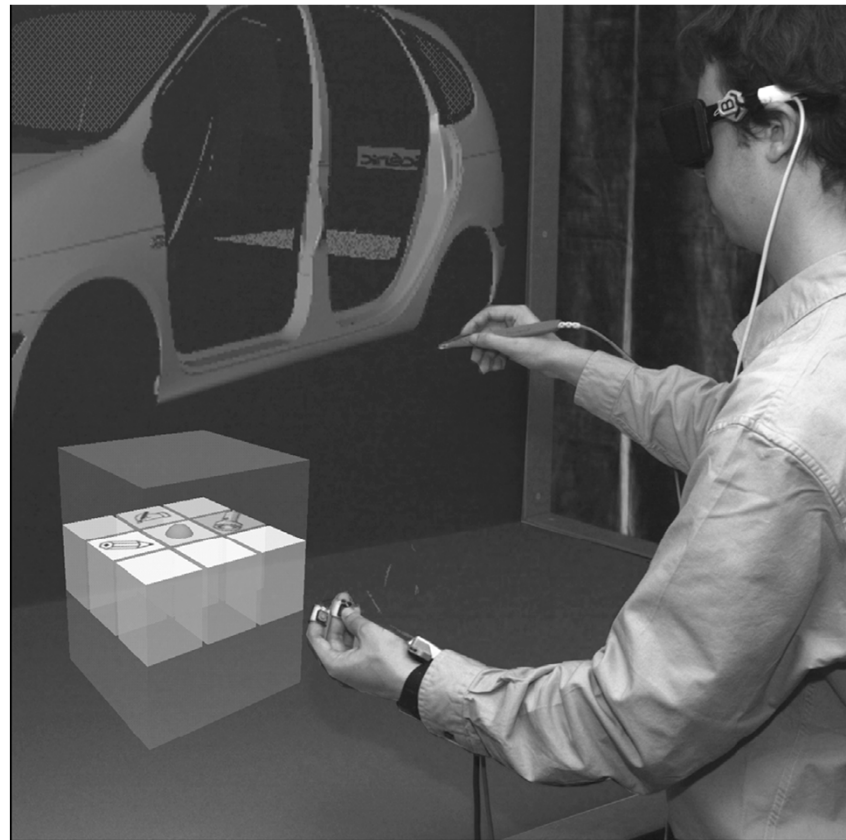


Graphical Menus – 3D Widgets (1)



Graphical Menus – 3D Widgets (2)

Command and Control Cube



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



Gesture Command Types

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



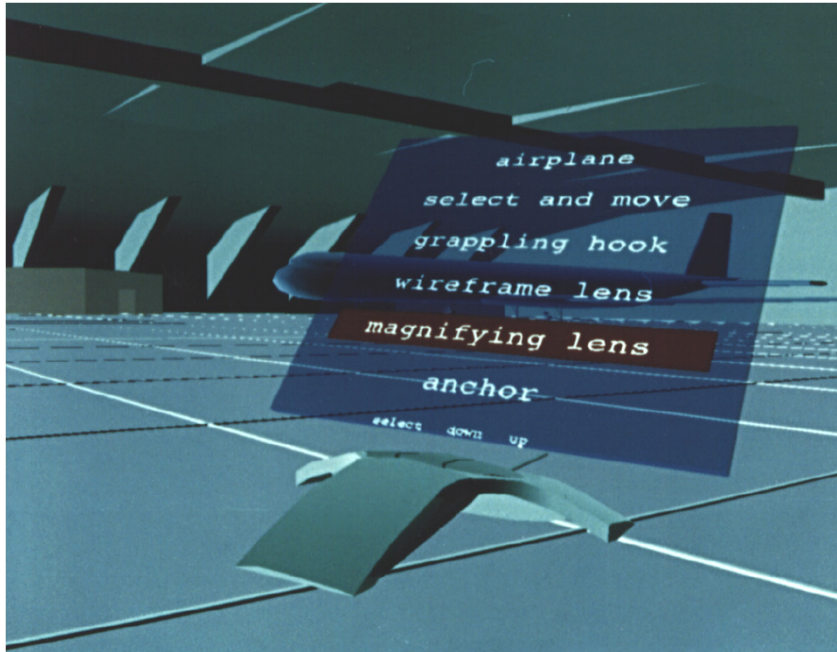
Tools

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

Tools – Virtual Tool belt



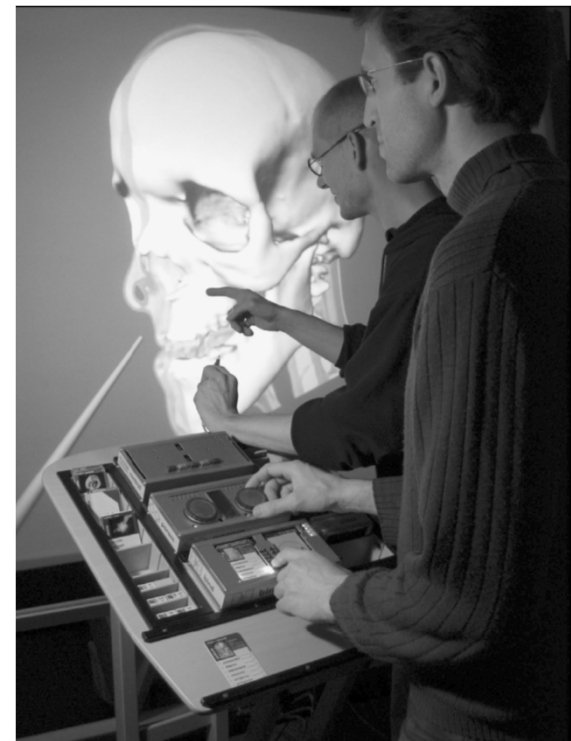
Tools – Tricorder



- Physical input device has virtual representation
- Functionality changes according to selected tool

Tools – TUI

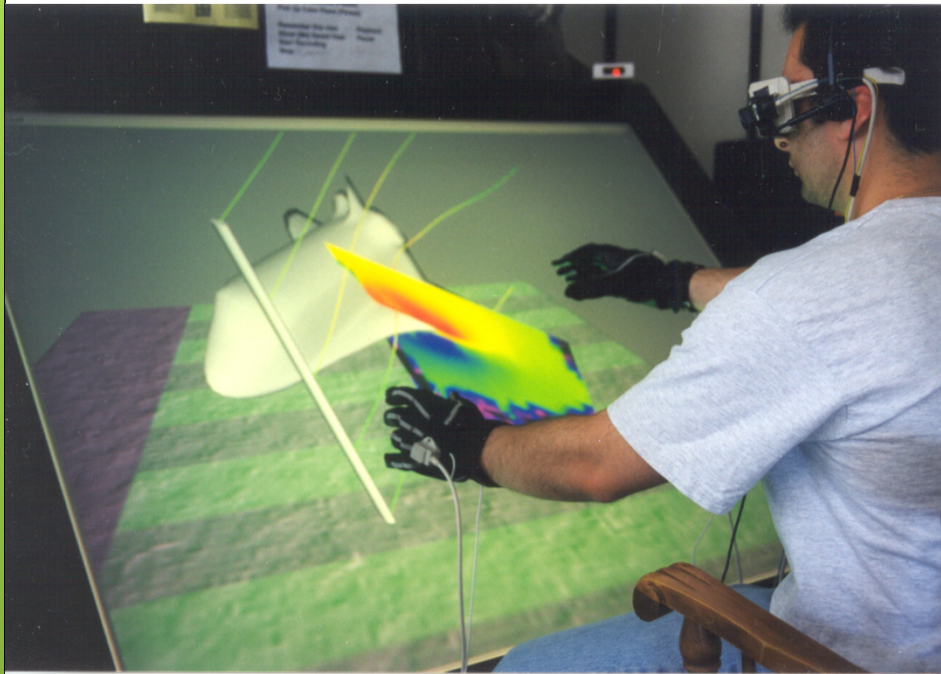
- Tangible User Interface



Multimodal System Control

- More than one input modality (speech, gesture, facial expression, etc...)
- Advantages
 - Decoupling
 - Error reduction and correction
 - Flexibility and complementary behavior
 - Control of mental resources: reduce cognitive load

Multimodal Interaction – Examples



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