CSE 165: 3D User Interaction

Lecture #12: Travel

Jürgen Schulze

Paper Presentations Today

- Dylan Mccarthy
  - Efficient Selection of Multiple Objects on a Large Scale
- Rex West
  - iAR: an exploratory augmented reality system for mobile devices
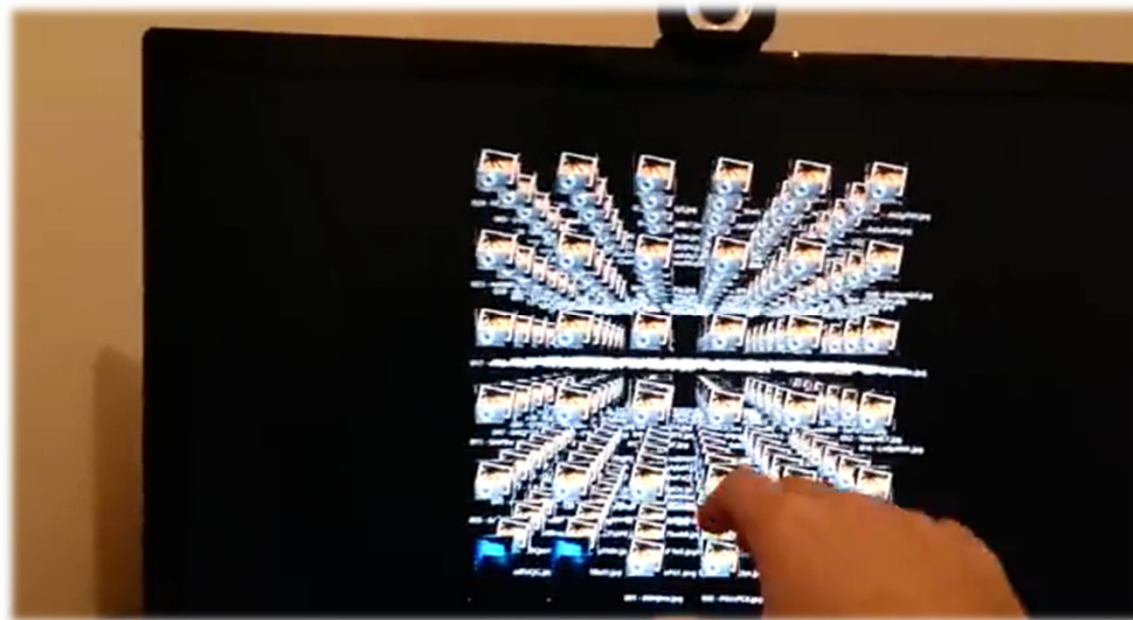
Paper Presentations Next Lecture

- Kevin Waite
  - Optimizing the Performances of a P300-Based Brain–Computer Interface in Ambulatory Condition
- Eric Wong
  - Latency and avatars in Virtual Environments and the effects on gait for persons with mobility impairments

Announcements

- Homework assignment #3
  - Due Friday Feb 21st at 1:30pm in CSE lab 260

Holotouch File Browser

- http://www.youtube.com/watch?v=mPKdTMmdQ9A
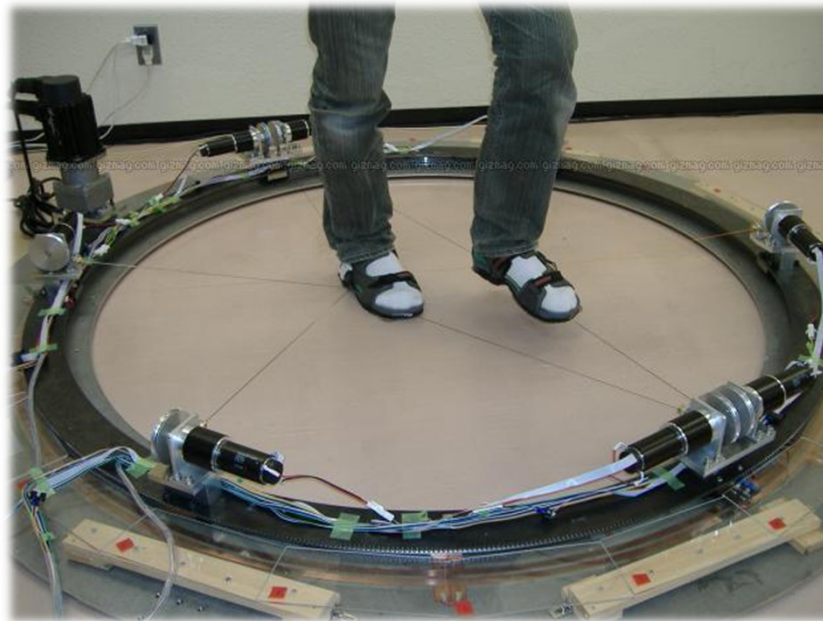
Travel Continued

Gait Master

- Video
  - http://www.youtube.com/watch?v=RDDH1iqoDzU

String Walker

- Video from Emerging Technologies, SIGGRAPH 2007
  - http://www.youtube.com/watch?v=hyLKjyL-Dw8

Steering Techniques

- Continuous specification of direction of motion
  - gaze-directed
  - pointing
  - torso-directed
  - camera-in-hand
  - physical device (steering wheel, flight stick)

Steering – Gaze-Directed

- Move viewpoint in direction of "gaze"
- Gaze direction determined from head tracker
- Cognitively simple
- Doesn't allow user to look to the side while traveling

Pointing Technique

- Also a steering technique
- Use hand tracker instead of head tracker
- Slightly more complex, cognitively
- Allows travel and gaze in different directions – good for relative motion

Pointing Implementation

- Each frame while moving:
  - Get hand tracker information
  - Do exactly the same calculations as in gaze-directed steering, only use hand coordinates instead of head coordinates

Route-Planning

- One-time specification of path
  - draw path
  - points along path
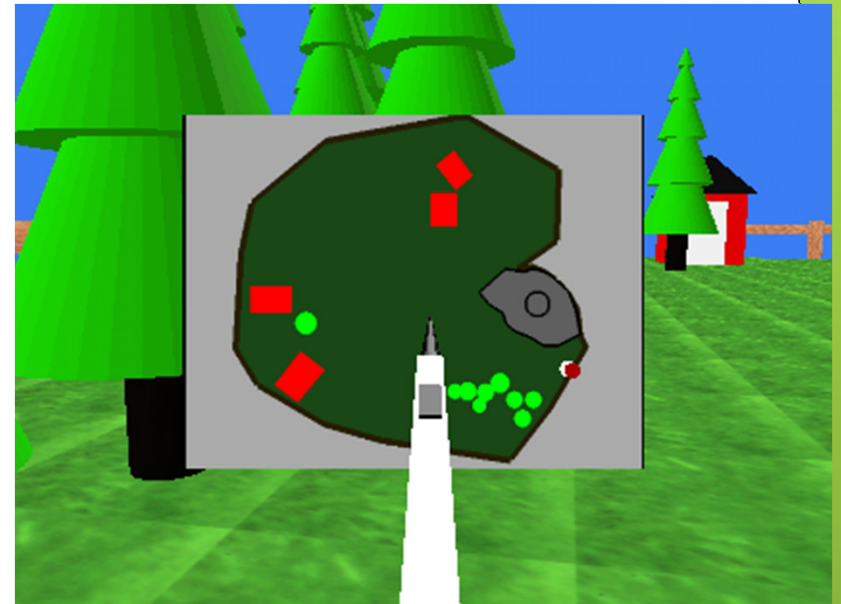 - manipulating user representation
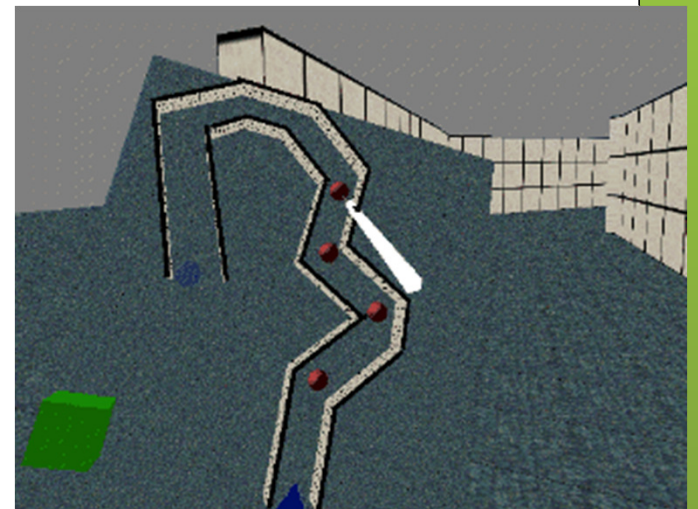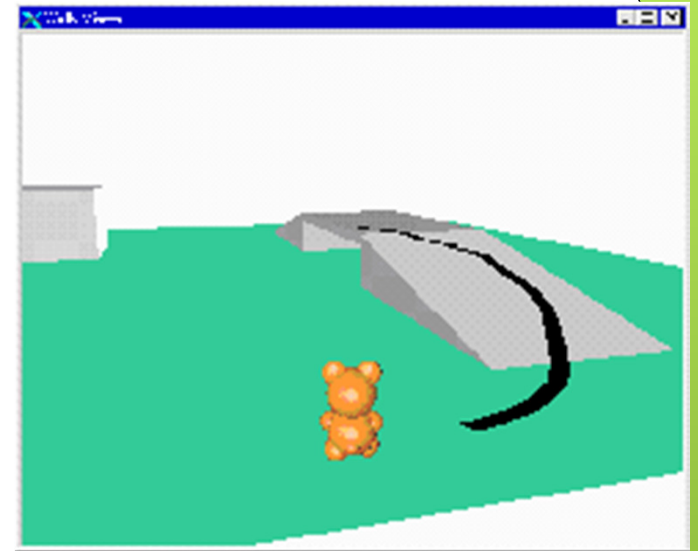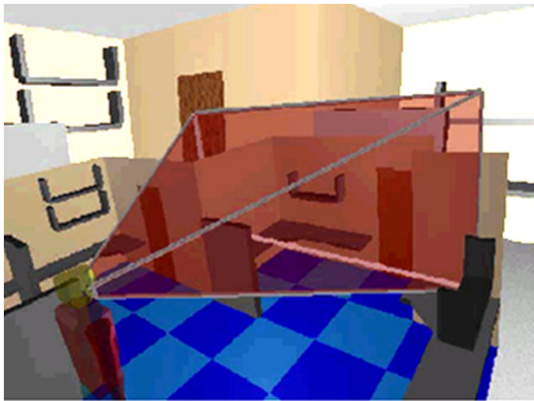
Target-Based Techniques

- Discrete specification of goal
  - point at object
  - choose from list
  - enter coordinates
- Map/WIM-based target specification

Map-Based Travel Techniques

- User represented by icon on 2D map
- Drag icon with stylus to new location on map
- When released, viewpoint animated smoothly to new location

Manual Manipulation – Grabbing the Air Technique

- Use hand gestures to move yourself through the world

- Metaphor of pulling a rope

- Can be 1-handed, but often a 2-handed technique

- Works well with Pinch Gloves or Hydra controllers

Viewpoint Orientation Techniques

- Head tracking
- Orbital viewing
- Non-isomorphic rotation
- Virtual sphere

CastAR Kickstarter Project

- https://www.kickstarter.com/projects/technicalillusions/castar-the-most-versatile-ar-and-vr-system

System Control

Universal 3D Interaction Tasks

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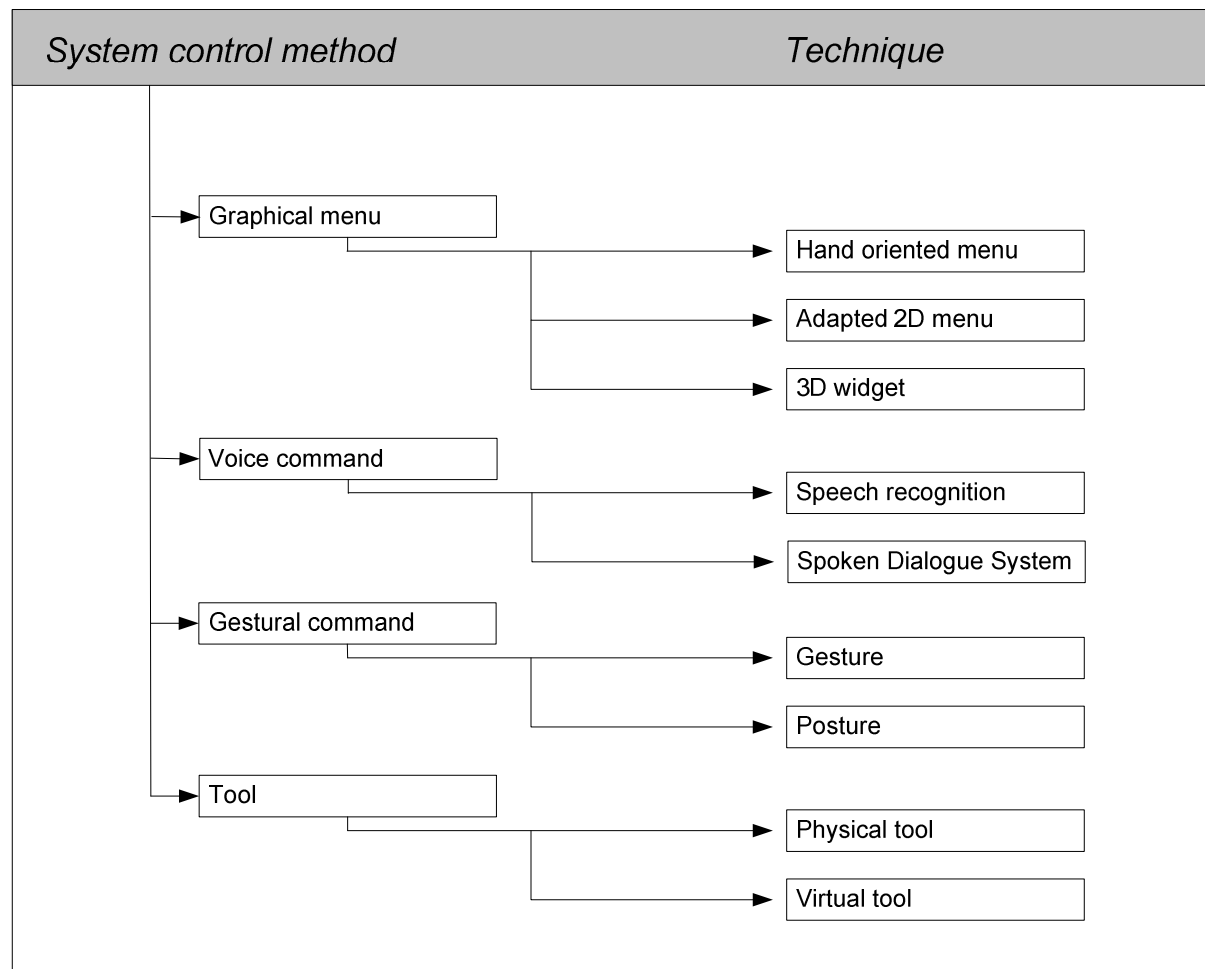- System control
- Symbolic input

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

System control method	Technique

- Graphical menu
  - Hand oriented menu
  - Adapted 2D menu
  - 3D widget
- Voice command
  - Speech recognition
  - Spoken Dialogue System
- Gestural command
  - Gesture
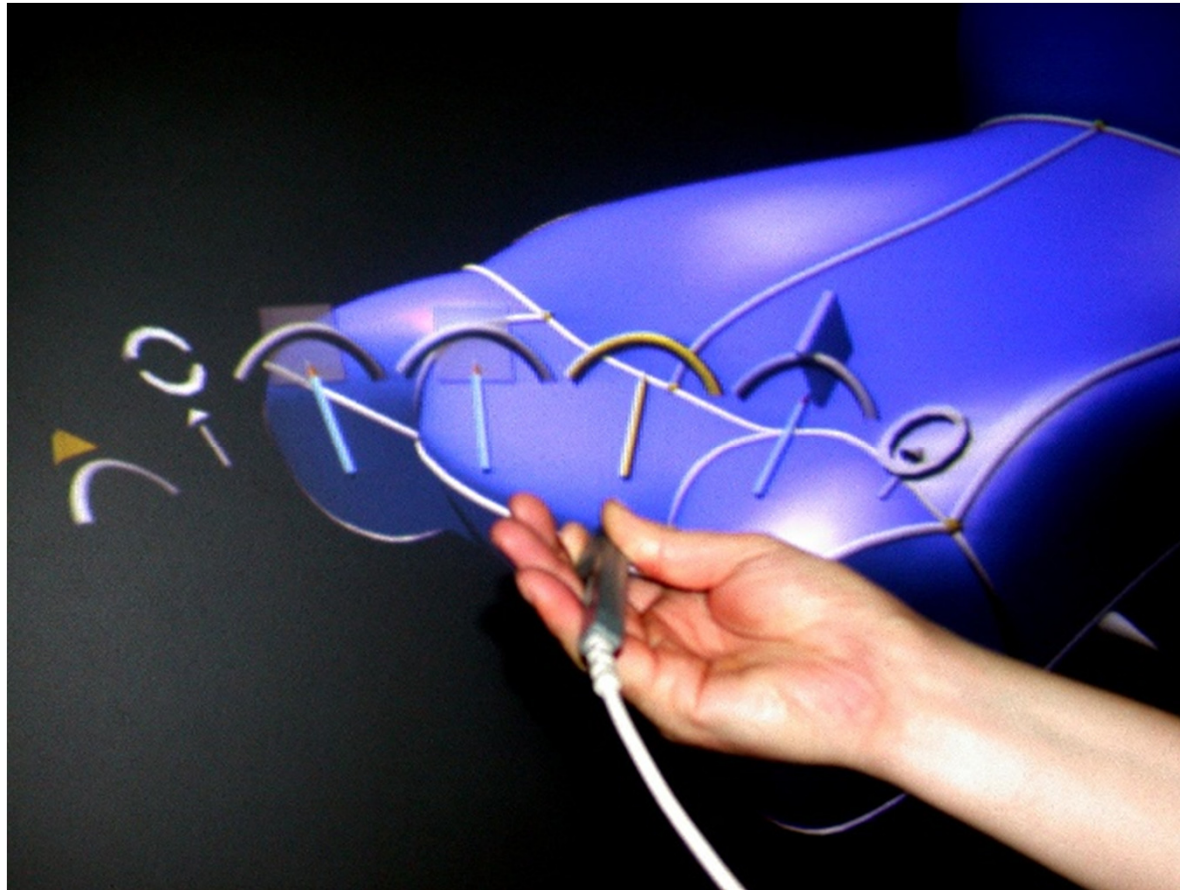 - Posture
- Tool
  - Physical tool
  - Virtual tool
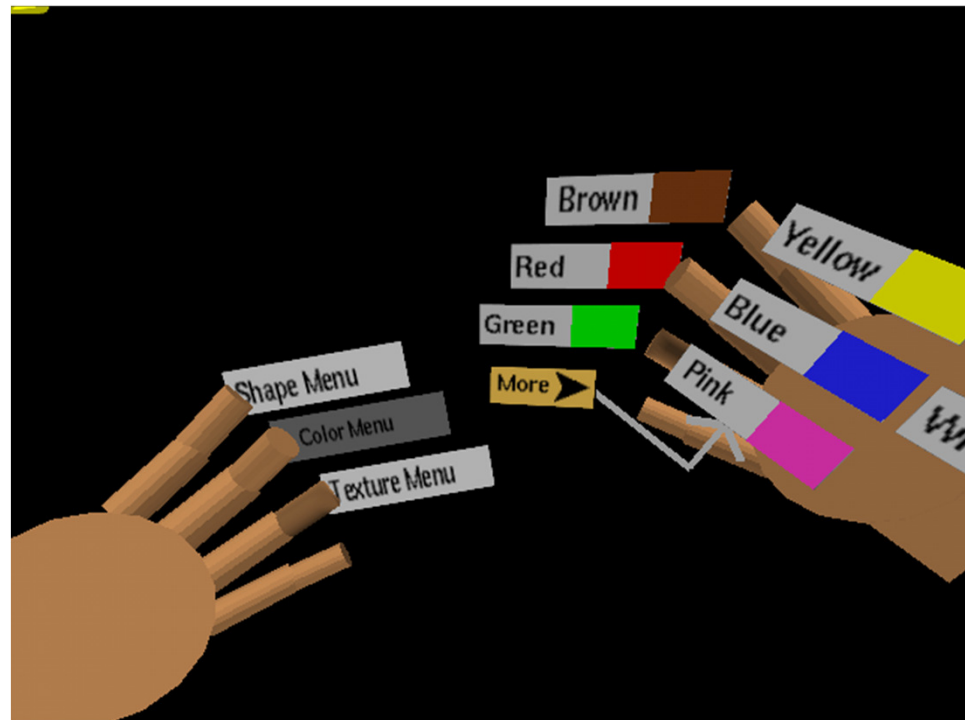
Graphical Menus – Adapted 2D Menus
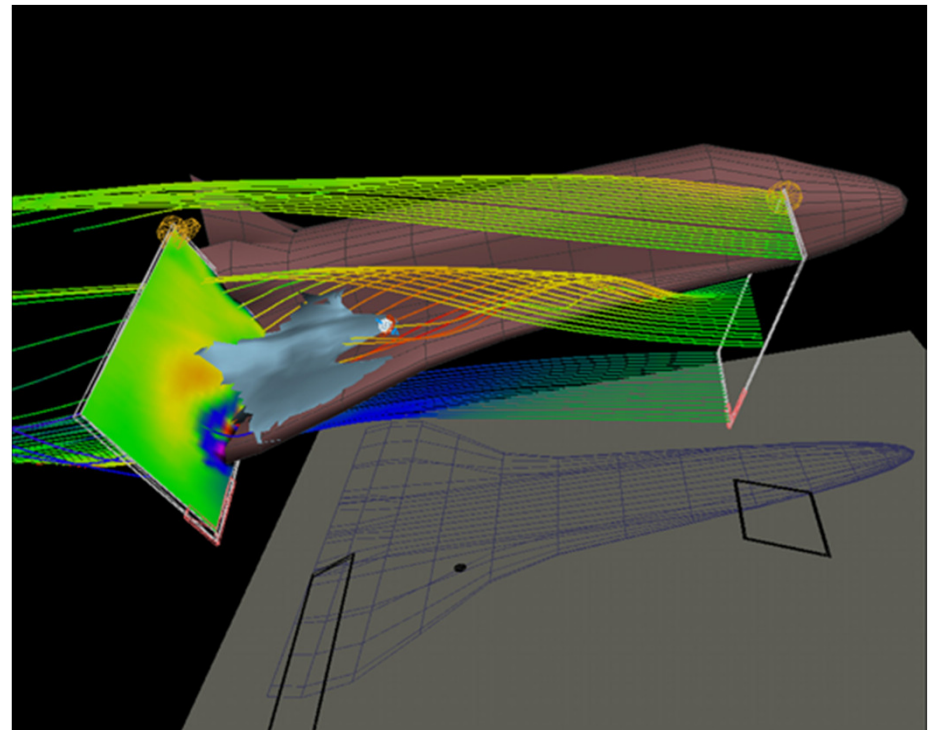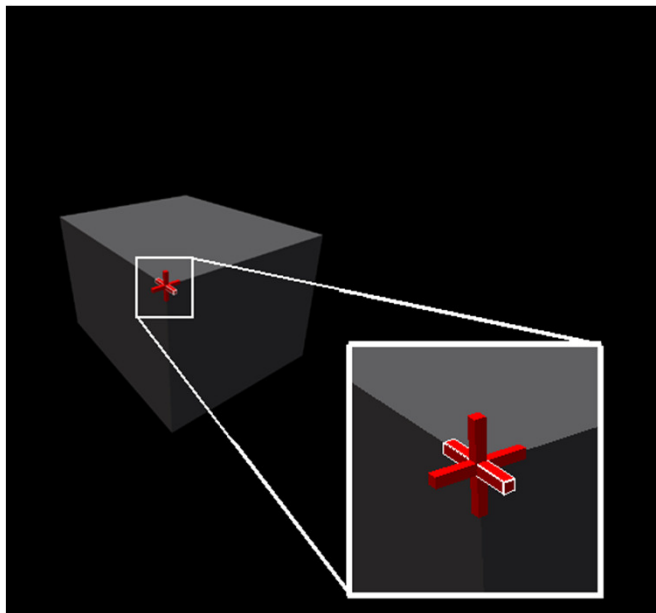
Graphical Menus – 1-DOF Menus

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