CS-525H:
Immersive HCI

Selection & Manipulation

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Overview

- How do we choose objects?
  - Selecting single objects
  - Disambiguation
  - Selecting groups of objects
  - Releasing objects

- How do we change objects?
  - Choosing among object properties
  - Natural mappings of actions to changes
  - Arbitrary mappings

Object Selection

- In the real world, we select by
  - Touching/grabbing
  - Pointing
    - With finger: direct
    - With pointer: extended
    - With mouse: indirect
  - Voice
  - Device
    - Car radio
  - Other ways
    - Context?
    - Eye gaze?

Selection-Task Decomposition

- ☐ Indicate
  - ◼ Denote which object we intend to select
  - ◼ Can be open-loop or closed-loop task

- ☐ Confirm
  - ◼ Verbal
  - ◼ Dwell
  - ◼ Click

Selection in VR

- ☐ Indication
  - ■ Avatar-hand movement
  - ■ Device movement
  - ■ Virtual "beam" for closed-loop feedback
  - ■ Selection from a list
- ☐ Confirmation
  - ■ Click
  - ■ Dwell
  - ■ Verbal

Reaching Objects

☐ Need to be able to indicate at a distance
- Go-go techniques
- Two-handed pointing
- Worlds-in-Miniature (WIM) techniques
  - ☐ http://www.lsi.upc.edu/~virtual/DWIM/
- Flashlight
- Voodoo dolls

☐ Image-plane techniques

Manipulation

- Typical tasks
  - (Re)Position
  - Rotate
  - Property modification

- Approaches
  - WIM
  - 3D widgets
    - Virtual sphere for rotations
    - Jack for scaling
  - Non-isomorphic position/rotation
  - Skewers
  - 2D widgets

CLIP
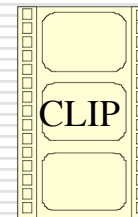
Design Guidelines

- Use existing techniques unless a large amount of benefit might be derived from designing a new, application-specific technique

- Use task analysis when choosing a 3D manipulation technique

- Match the interaction technique with the device

- Use techniques that can help reduce clutching

- Non-isomorphic techniques are more useful and intuitive

Design Guidelines (cont.)

☐ Use pointing techniques for selection, and virtual hand techniques for manipulation

☐ Use grasp-sensitive object selection

☐ Constrain degrees of freedom when possible

☐ There is no, single best interaction technique

☐ Test, test, test!

[Bowman, Kruijff, LaViola, Poupyrev, *3D User Interfaces*, 2005]