CSE165 3DUI
- Winter 2014

CSE 165: 3D User Interaction

Lecture #7: Selection

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Research Papers

- Joshua
  - Gaze tracking and non-touch gesture based interaction method for mobile 3D virtual spaces
- Jonathan
  - inFORM: Dynamic Physical Affordances and Constraints through Shape and Object Actuation

Announcements

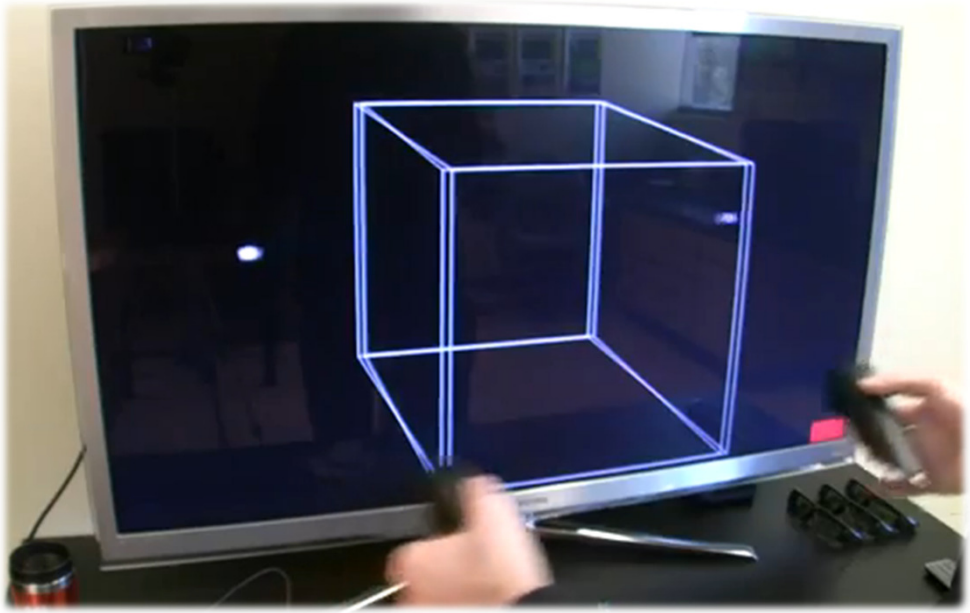
- Homework assignment #2
  - Due Friday, February 7th at 1:30pm in CSE lab 260
- Homework Q&A
  - Wednesday, January 29th at 4pm in CSE lab 260 (or in another lab, check whiteboard in 260)

Razer Hydra

- Developed by Sixense Entertainment
- Released June 16, 2011
- Tracks absolute position and orientation (6 DOF)
  - Precision: 1mm and 1 degree
- Uses a weak electro-magnetic field
- Two wired input devices

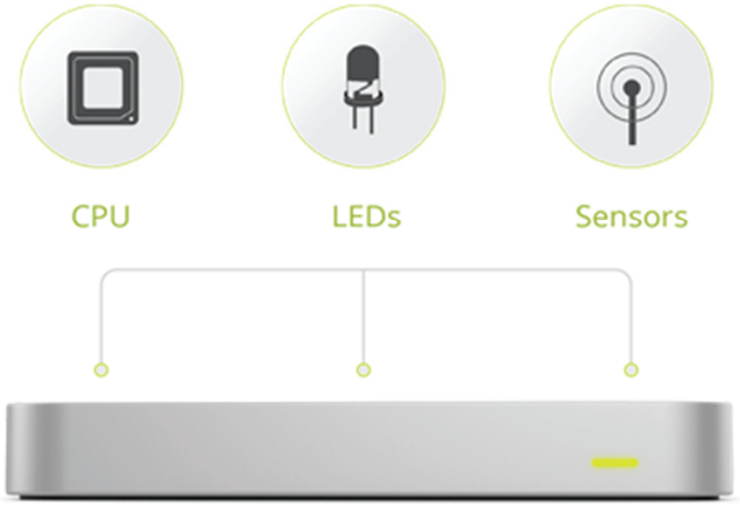
Razer Hydra Video

- Razer Hydra for low-cost 3D displays
  - By Oliver Kreylos, UCD
  - http://www.youtube.com/watch?v=H5bSzVByLjM



Leap Motion

- Released July 2013
- Small form factor (3 x 1.2 x 0.5 inches)
- Short range finger tracking
  - No access to depth map
- Two IR cameras + optimized image processing
- Inexpensive (~$70)
- Drivers for Windows and Mac OS
- Well documented SDK



Leap Video

- Multiple nice marketing videos available at:
  - https://www.leapmotion.com/
- Original viral video:
  - http://www.youtube.com/watch?v=_d6KuiuteIA

Selection and Manipulation

Why Selection and Manipulation?

- Major method of interaction with physical environments
- Major method of interaction with virtual environments
- Affects the quality of entire 3D interface
- Design of 3D manipulation techniques is difficult

Selection & Manipulation

- Selection: specifying one or more objects from a set
- Manipulation: modifying object properties (position, orientation, scale, shape, color, texture, behavior, etc.)

Goals of Selection

- Indicate action on object
- Query object
- Make object active
- Travel to object location
- Set up manipulation

Selection Performance

- Variables affecting user performance
  - Object distance from user
  - Object size
  - Density of objects in area
  - Presence of occluding objects

Canonical Parameters

- Selection
  - distance and direction to target
  - target size
  - density of objects around the target
  - number of targets to be selected
  - target occlusion
- Positioning
  - distance/direction to initial position
  - distance/direction to target position
  - translation distance
  - required precision of positioning
- Rotation
  - distance to target
  - initial orientation
  - final orientation
  - amount of rotation

Input Device Parameters

- Number of control dimensions
- Control integration: how many DOF are controlled simultaneously
- Force vs. position control
- Form factor: impact on accuracy

Sensor attached to hand

Sensor rolled with fingers

Technique Classification by Metaphor

- Manipulation techniques
  - Egocentric metaphor
    - Virtual pointer metaphor
      - Ray-casting
      - Two-handed pointing
      - Flashlight
      - Image plane
    - Direct manipulation
      - "Classical" virtual hand
      - Go-Go
    - Hybrid techniques
      - HOMER
  - Exocentric metaphor
    - World-in-miniature
    - Scaled-world grab
  - Hybrid techniques
    - Voodoo Dolls