Designing 3D User Interfaces
Part II

Lecture #14: 3DUI Design Part II
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3DUI Design

- Microlevel
  - devils in the details
  - correct implementation
  - careful choice of parameters
- Macrolevel
  - strengths and limitations of human psychology/physiology
  - common sense
  - rules of thumb
- Two main strategies
  - designing for humans
  - inventing 3DUIs

Inventing 3D UI

- **Realism** (or isomorphism)
  - borrowing from real world

- **Magic** (or non-isomorphism)
  - deviating from the real world and introducing artificial, magic techniques

- Continuum between realism and magic

Inventing 3DUIs – Simulating Reality

- Tried and true approach
  - replicate world as close as possible
  - bring in certain elements
- Important for simulation applications
  - flight simulators
  - medical training
  - phobia treatment
- Dependent on application

- Advantages
  - + User already knows how to do it from everyday experience
  - + Can be implemented on the basis of designer intuition
- Disadvantages
  - - Limitations of technology do not allow exact realism
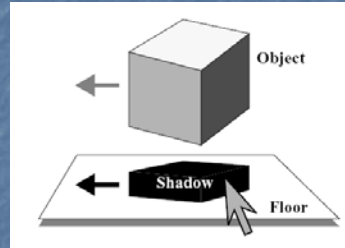 - - Introduces limitations of the physical world into the virtual world

Inventing 3DUIs – Adapting from Real World

- Adapt artifacts, ideas, philosophies, domains
- Architecture and movies
- Real world metaphors
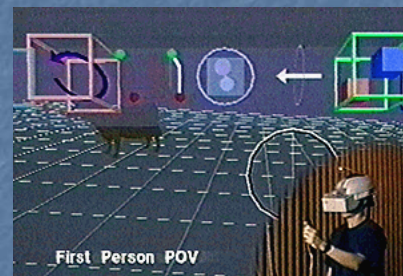- Examples
  - virtual vehicle
  - flashlight
  - shadows

Inventing 3DUIs – Adapting from Real World (II)

Advantages
+ it's already done
+ search for solutions around one
+ experience transfer
+ can be very easy to understand

Disadvantages
- analogy is never exact
- difficult to find analogy for abstract operations
- when is it really effective?
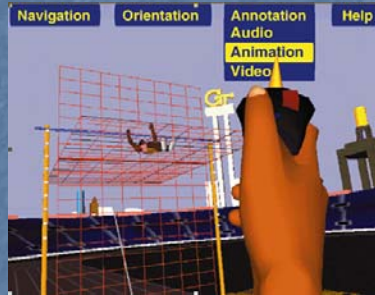

Widgets by Mine et al. , 1996

Inventing 3DUIs – Adapting from 2D

- 2D UIs studied extensively
- Most people fluent with 2D interaction
- Can be easier than 3D
- Approaches
  - literal overlay
  - elements in 3D environment
  - 2D interaction with 3D objects

Inventing 3DUIs – Pen and Tablet

- Two-handed, asymmetric
- Phyical props
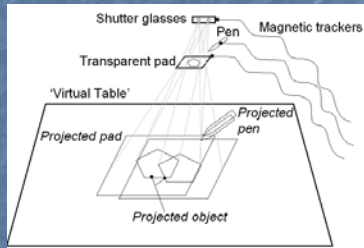- 2D interaction (reduces DOF)
- Surface constraint
- Body referenced

Inventing 3DUIs – 2D Interaction with 3D Objects

Shutter glasses
Pen
Magnetic trackers
Transparent pad
'Virtual Table'
Projected pad
Projected pen
Projected object

Transparent props

ErgoDesk

Inventing 3DUIs – Magic and Aesthetics

- Real power of 3DUIs
  - better reality
  - alternate reality
- Overcome human limitations
- Reduces effects of technological limitations

http://www.cantonmagicrafters.com/images/rabbit.jpg

Magic: Cultural Clichés & Metaphors

- Examples: Flying carpet, Go-Go, WIM
- Advantages:
    + easy to understand if you know the metaphor
    + usually they are very enjoyable
    + many metaphors are available
    + need not to be learned
- Disadvantages:
    - the metaphors can be misleading
    - the metaphors are often rooted in culture
    - it is difficult to come up with good magic metaphor

Magic: Violating Assumptions

- Can we systematically design and evaluate new interfaces by systematically violating our own assumptions? -- Jeff Pierce, CMU
    - Examples
        - what if 2 objects can occupy the same place in space and time?
        - what if we can make time go backwards?
        - what if we have a technology that has no flaws?
- Advantages:
    - systematic approach toward inventing 3D user interfaces
- Disadvantages
    - how far can we violate our assumptions?

Next Class

- 3DUI Evaluation
- Readings
  - 3DUI Book – Chapter 10, 331-347