Designing 3D User Interfaces
Part II

Lecture #14: 3DUI Design Part II
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Joseph J. LaViola Jr.

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

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
- Physical props
- 2D interaction (reduces DOF)
- Surface constraint
- Body referenced
Inventing 3DUIs – 2D Interaction with 3D Objects

- 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