

Lecture 15: 3D Interfaces and Virtual Reality

Chapter 6: Section 6.4
and Section 6.5

3D Interfaces

- “Pure” 3D interfaces have strong utility in some contexts, e.g., medical, product design. In other situations, more constrained interaction may actually be preferable to simplify interactions.
- “Enhanced” interfaces, better than reality, can help reduce the limitations of the real-world, e.g., providing simultaneous views.
- Avatars in multiplayer 3-D worlds,
 - e.g., ActiveWorlds
- First person games

3D Interfaces (cont.)



3D Interfaces (cont.)

Features for effective 3D

- Use occlusion, shadows, perspective, and other 3D techniques carefully.
- Minimize the number of navigation steps for users to accomplish their tasks.
- Keep text readable.
- Avoid unnecessary visual clutter, distraction, contrast shifts, and reflections.
- Simplify user movement.
- Prevent errors.
- Simplify object movement
- Organize groups of items in aligned structures to allow rapid visual search.
- Enable users to construct visual groups to support spatial recall.

3D Interfaces (cont.)

Guidelines for inclusion of enhanced 3D features:

- Provide overviews so users can see the big picture
- Allow teleportation (rapid context shifts by selecting destination in an overview)
- Offer X-ray vision so users can see into or beyond objects.
- Provide history keeping
- Permit rich user actions on objects
- Enable remote collaboration
- Give users control over explanatory text and let users select for details on demand.
- Offer tools to select, mark, and measure.

3D Interfaces (cont.)

Guidelines for inclusion of enhanced 3D features (cont.):

- Implement dynamic queries to rapidly filter out unneeded items.
- Support semantic zooming and movement
- Enable landmarks to show themselves even at a distance
- Allow multiple coordinated views
- Develop novel 3D icons to represent concepts that are more recognizable and memorable.

3D Graphics Example

- Google Earth
 - <http://earth.google.com/>
- Brain Explorer from Brain Atlas site
 - <http://www.brainatlas.org/aba/>

Teleoperation

- Two “parents”: direct manipulation in personal computers and process control in complex environments
- Physical operation is remote
- Complicating factors in the architecture of remote environments:
 - Time delays
 - transmission delays
 - operation delays
 - Incomplete feedback
 - Feedback from multiple sources
 - Unanticipated interferences

Virtual and Augmented Reality

- Virtual reality breaks the physical limitations of space and allow users to act as though they were somewhere else
- Augmented reality shows the real world with an overlay of additional overlay
- Situational awareness shows information about the real world that surrounds you by tracking your movements in a computer model
- Augmented reality is an important variant
 - Enables users to see the real world with an overlay of additional interaction.

Virtual and Augmented Reality (cont.)

- Successful virtual environments depend on the smooth integration of:
 - Visual Display
 - Head position sensing
 - Hand-position sensing
 - Force feedback
 - Sound input and output
 - Other sensations
 - Cooperative and competitive virtual reality
