



Chapter 5 - Direct Manipulation and Virtual Environment



Introduction

- Positive feelings associated with good user interfaces
 - Mastery of the interface
 - Competence in performing tasks
 - Ease in learning the system originally and in assimilating advanced features
 - Confidence in the capacity to retain mastery over time
 - Enjoyment in using the system
 - Eagerness to show the system off to novices
 - Desire to explore more powerful aspects of the system



Examples of Direct-Manipulation Systems

Command line vs. display editors and word processors

- Training times with display editors are much less than line editors
- Line editors are generally more flexible and powerful
- The advances of WYSIWYG word processors:
 - Display a full page of text
 - Display of the document in the form that it will appear when the final printing is done
 - Show cursor action
 - Control cursor motion through physically obvious and intuitively natural means
 - Use of labeled icon for actions
 - Display of the results of an action immediately
 - Provide rapid response and display
 - Offer easily reversible actions

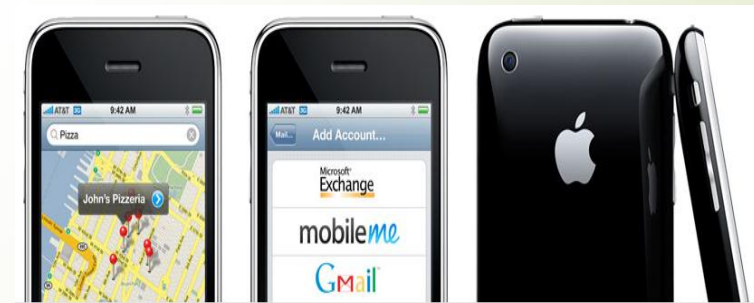
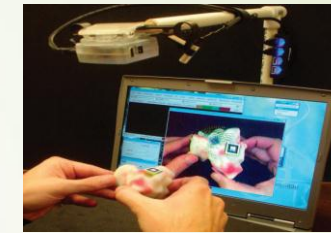


Examples of Direct-Manipulation Systems

The VisiCalc spreadsheet and its descendants

- VisiCalc users delighted in watching the program propagate changes across the screen.
- In some cases, spatial representations provide a better model of reality
- Successful spatial data-management systems depend on choosing appropriate:
 - Icons
 - Graphical representations
 - Natural and comprehensible data layouts
- Spreadsheet
- spatial data management
- Video games
- *Guitar Hero* video game
- Computer-aided design
- Office automation
- management dashboard for a retail store

Continuing evolution of Direct-Manipulation Systems





Problems with direct manipulation

- Spatial or visual representations can be too spread out
- High-level flowcharts and database-schema can become confusing
- Designs may force valuable information off of the screen
- Users must learn the graphical representations
- The visual representation may be misleading
- Typing commands with the keyboard may be faster



Principles of Direct Manipulation

1. Continuous representations of the objects and actions of interest with meaningful visual metaphors.
2. Physical actions or presses of labeled buttons, instead of complex syntax.
3. Rapid, incremental, reversible actions whose effects on the objects of interest are visible immediately.

3D Interfaces

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





3D Interfaces

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.



Guidelines for inclusion of enhanced 3D features:

- Provide overviews so users can see the big picture
- Allow tele operation
- 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. 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.



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.

➤ 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



Impact of this technology in our everyday lives

