Chapter 5

Direct Manipulation and other interaction styles

Objectives

- To understand five primary interaction styles: command line, menu selection, form-fill, direct manipulation, and anthropomorphic.

- To provide guidelines for designing interaction styles.

- To understand the advantages and disadvantages of interaction styles.

- To understand the relation between task characteristics and interaction styles.

Interaction styles

- Interaction styles are different ways a user can communicate with a computer system and a computer system can communicate with a user.

- An interaction style is a collection of UI controls and their associated behavior.

- The interaction style provides both the look (appearance) and feel (behavior) of the UI components, indicating the way a user will communicate with the system.

- Five primary interaction styles
  - Command line
  - Menu selection
  - Form-fill
  - Direct manipulation
  - Anthropomorphic (natural language)

Command line

- The first interactive dialog style to be commonly used.

- Powerful – access to system functionality

- Flexible – options and parameters

- Limitations
    - Commands must be remembered
    - Commands have complex syntax and vary between systems
    - Error rates are high

- Better for expert users

Example

Guidelines for designing command line interfaces

- Choose meaningful commands – use specific and distinctive names.

- Support consistent rules for abbreviation.

- Give commands a representative (inherent) meaning; for example, use commands such as add, plot, and print.

- Make commands as short as possible to help prevent entry errors and to facilitate the detection and correction of errors.

Guidelines for designing command line interfaces *(Cont'd)*

- If commands or responses to commands can be abbreviated, use common abbreviations, for example Y for yes and N for no.

- Limit the number of commands and ways of accomplishing a task.

- Offer frequent users the capability to create macros.

  - A macro is a set of commands that can be called by a name to be executed in one step.

Menu selection

- A set of options from which the user must choose

- Does not have to be visual

- If the menu items are meaningful to the users, then menu selection can be rapid and accurate.

Guidelines for designing menu selection interfaces

- Give menu items titles that reflect their functions.
- Group items meaningfully.
- Avoid lengthy menus.
- Use short names for menu items.
- Use names that reflect the menu items' functions
- Use consistent grammar, layout, and terminology.
- Consider the screen's size when deciding the number of menu items

Form-fill

- Capture user information

- Easy movement around the form

- Include error correction facilities

Example

Guidelines for designing form-fill interfaces

- Give meaningful titles or labels to the fields.

- Give familiar field labels (use the users' language).

- Provide comprehensible instructions.

- Incorporate a logical grouping and sequencing of the fields.

- Present a visually appealing layout for the form.

- Use consistent terminology and abbreviations.

- Provide white space and boundaries.

Guidelines for designing form-fill interfaces *(Cont'd)*

- Restrict the characters that can be entered or provide default values.

- Provide error correction for individual characters and entire fields.

- Provide error messages for unacceptable values and error indicators as soon as possible (prompt error messages should identify the field the error occurred in and why).

- Indicate required fields.

Anthropomorphic (natural language)

- Anthropomorphic interfaces aim to interact with users in the same way that humans interact with each other.

    □ Example search on google

    □ Example: Natural language interfaces and interfaces that recognize gestures, facial expressions, or eye movements.

    □ Siri on iPhone

- Require an understanding of how humans communicate with each other through language, gestures facial expression, and eye contact.
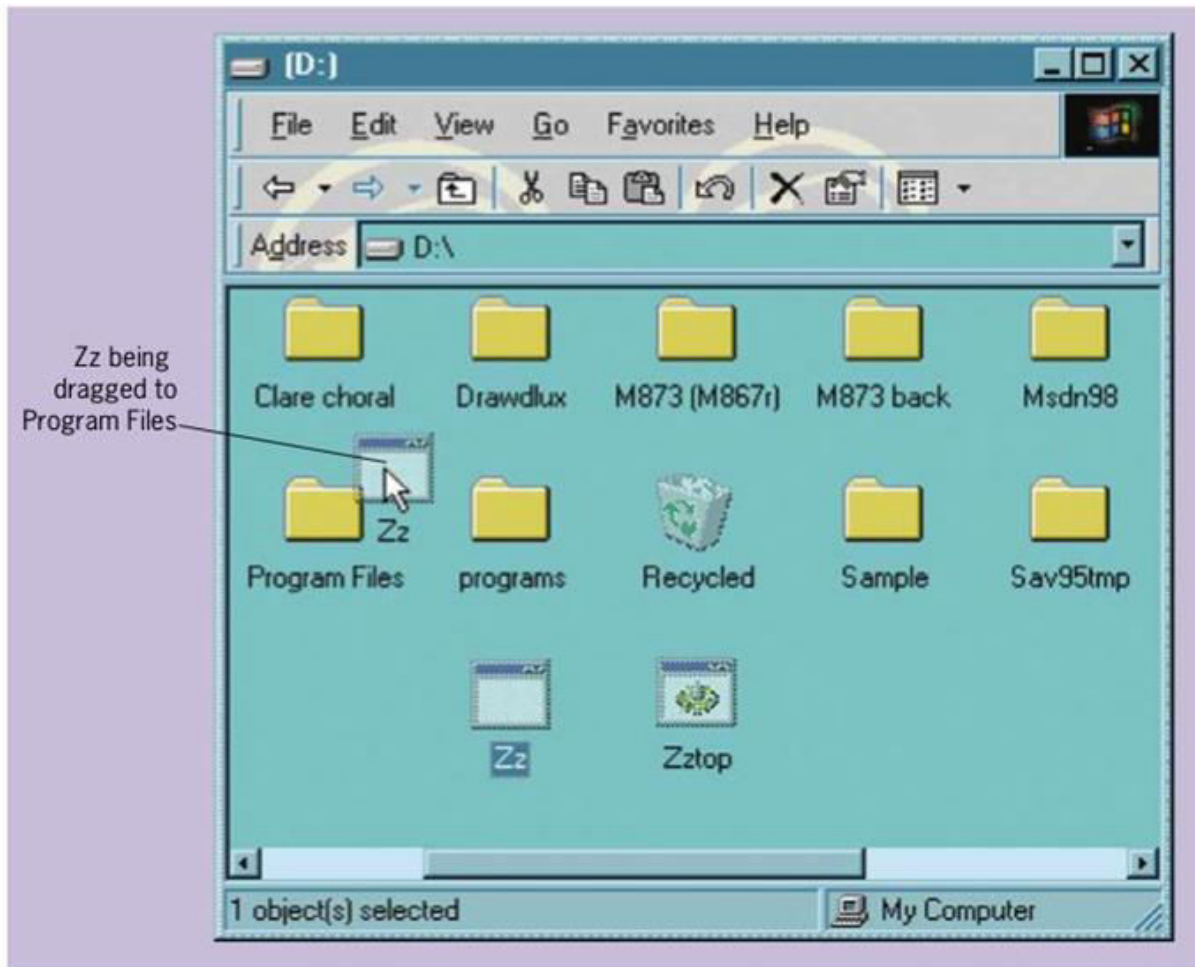
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Direct manipulation

- **Allows direct interaction with the UI**

    - Example 1: dragging a file from one folder and dropping it into another in Microsoft Explorer.
    - Example 2: clicking a map to specify the departure cities and the destinations.

- **The keyboard entry of commands or menu choices is replaced by manipulating a visible set of objects and actions.**

    - Using a continuous input device, such as a mouse, pen, or joystick.

Direct manipulation

- Central ideas in these satisfying interfaces (*direct-manipulation* interfaces) are:
    - ☐ Visibility of the objects and actions of interest;
    - ☐ Rapid, reversible and incremental actions; and
    - ☐ Replacement of typed commands by a pointing action on the object of interest.

Example: Dragging a file from one folder to another

Direct Manipulation Example

Direct Manipulation Example

- A favorite example of using direct manipulation is driving an automobile. The scene is directly visible through the front window, and performance of actions such as braking or steering has become common knowledge in our culture.

- To turn left, the driver simply rotates the steering wheel to the left. The response is immediate and the scene changes, providing feedback to refine the turn.

- You probably can not imagine trying to accurately turn a car by typing a command form the menu.

Direct Manipulation Example

Technologies that derive from the word processor:

- Integration of graphics, spreadsheets, photographs is done in the body of a document

- Desktop publishing software
  - ☐ Newsletters, reports, broachers, books, newspapers
  - ☐ Examples: Adobe PageMaker, QuarkXPress

- Slide-presentation software (e.g. Powerpoint)

- Hypermedia environments and the Web (hyperlinks, bookmarks, etc)

- Spell checker and thesaurus

- Grammar checkers

Guidelines for designing direct manipulation interfaces

- Create visual representations of the users' tasks.

- Provide rapid, incremental, and reversible actions.

- Replace typing with pointing/selecting.

- Present a visually appealing layout.

- Make the results of actions immediately visible—provide quick visual or auditory feedback.

Blending interaction styles

- Appropriate when the UI will be used for a wide range of tasks and the experience of the users is varied.

Advantages and disadvantages of the five primary interaction styles

- Discuss at least 2 advantages and 2 disadvantages of the each five interaction styles

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Advantages and disadvantages of the five primary interaction styles

Interaction style	Advantages	Disadvantages
Command line	Is versatile and flexible Appeals to expert users Supports users' initiative by allowing them to define macros and shortcuts	Requires substantial training and memorization of commands
Menu selection	Is easy to learn Involves fewer keystrokes than command line Structures decision making by breaking down the functionality into a set of menu items Is good for learners and infrequent users	Presents the danger of creating too many menus and complex menu hierarchies May slow frequent users who would prefer to use commands or shortcuts Consumes screen space
Form-fill	Simplifies data entry May require modest training Assists users by providing defaults (that is, examples of the inputs expected)	Consumes screen space

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Advantages and disadvantages of the five primary interaction styles *(Cont'd)*

Interaction style	Advantages	Disadvantages
Direct manipulation	Presents the task concepts visually — the user can see the task objects and act on them directly Is easy to learn Is easy to remember how to use Avoids errors and allows easy recovery from errors if they occur Encourages exploration	Requires graphic displays and continuous input devices Presents the danger that icons and metaphors may have different meanings for different user groups
Anthropomorphic interfaces	Can relieve the burden of learning the syntax for the interaction with the system	Can be unpredictable Difficult to implement

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The relation between task characteristics and interaction styles

Task characteristics	Interaction style
A large amount of data entry is required	Form-fill or command line
A paper form exists that must be computerized	Form-fill
Familiar notation exists	Command line
A natural visual representation exists, or a modest number of task objects and actions can represent the task domain	Direct manipulation
Multiple decisions or selections from a large range of unfamiliar options are required	Menu selection or direct manipulation
Exploration is anticipated	Direct manipulation

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Problems with Direct Manipulation

- Not good for vision-impaired users
- Spatial or visual representations can be too spread out forcing valuable information off-screen causing scrolling or multiple actions
  - Table vs. plot; table vs. icons; program text vs. flowchart
- Users must learn the graphical representations
  - Do you understand the meaning of various icons around you?
- The visual representation may be misleading
  - Drawing incorrect conclusion
- Typing commands with the keyboard my be faster
  - Keyboard maybe more direct device in some cases.
- Choosing the right objects and actions for DM maybe difficult
- Web-based implementers face further challenges because of the limitations of HTML

3D Interfaces

- Some designers dream about building interfaces that approach the richness of 3D reality
- Some 3D prototypes only add clutter and limit navigation. e.g., slow down performance in 3D interfaces
- "Pure" 3D interfaces have strong utility in some contexts, e.g., medical, architectural, product design, scientific visualization.
- Successful applications of 3D representations are game environments
  - First person games in which users patrol city street
  - Users choose avatars (object representing the user) to represent themselves in multiplayer 3-D worlds. e.g., ActiveWorlds

3D Interfaces

Features for effective 3D

- ☐ Use 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.

3D Interfaces

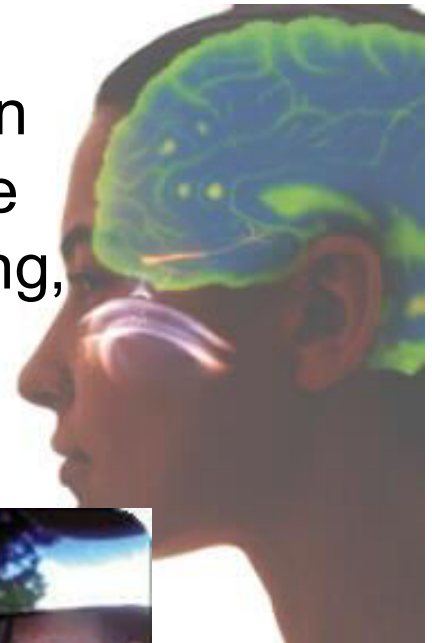Guidelines for inclusion of *enhanced* 3D features:

- ☐ Provide overviews so users can see the big picture
- ☐ Offer X-ray vision so users can see into or beyond objects.
- ☐ Provide history keeping (recording, undoing, replaying)
- ☐ Permit rich user actions on objects (save, copy, annotate, share, send)
- ☐ Offer tools to select, and mark.
- ☐ Support zooming and movement

Virtual and Augmented Reality

- *Virtual reality* puts users in an electronic environment in which the normal surroundings are blocked out by a head-mounted display.

- It breaks the physical limitations of space and allow users to act as though they were somewhere else.

- Imagine a 3D design view of a building on a display; and then using a head-mounted display, virtually walking through the doors

- Successful Examples:
  - Flight-simulators
  - Medical: treatment of phobia, fear of height

Virtual and Augmented Reality

- *Augmented reality* is an important alternative of virtual reality

  - Enables users to see the real world with an overlay of additional information, e.g. while users are looking at the walls of the building, their eyeglasses show where the electrical wires or plumbing located

- Effectively used in:

  - Medical
  - Tourist guides

Virtual and Augmented Reality

- Successful virtual environments depend on the smooth integration of:
  - ☐ Visual Display
    - faster and wider ranged are desirable
  - ☐ Head position sensing
    - in head-mounted display or by video recognition
  - ☐ Hand-position sensing (glove devices)
  - ☐ Sound input and output
  - ☐ Other sensations (vibrating, hot/cold sensing, etc.)
  - ☐ Collaborative and competitive virtual environments

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