

## User Interface Technologies

- Command line interface
  - simple, quick
  - developed from Teletypewriters (TTY)
  - not for complex tasks
  - useful for operating system tools, compilers, ...
- WIMP interface
  - graphical user interface (GUI)
  - for interactive applications
  - standardized
- Other graphical user interfaces
  - games
  - palmtops and cell phones
  - special purpose interfaces
    - e.g., drawing programs

## Command Line Interface

- History
  - TTY remotely writes data on a roll of paper
  - one line at a time
  - “carriage return” both line break and end of command
- Input structure:

```
command -option1 -option2 file1 file2 file3
```
- Advantages
  - works with script files
    - batch files in MS-Dos
  - pipelining and input/output indirection can be used

```
ls -al | more
ls -al > someFile
```
- Disadvantages
  - user needs to memorize command format
  - not interactive

## **WIMP Interface**

- WIMP: Windows, Icons, Menus, Pointers
  - developed at Xerox Parc in the 1970s
  - first used commercially by Apple
  - now industry standard
- Window
  - a rectangular part of the screen
  - can be moved and resized
  - can cover other windows
- Icon
  - a graphical representation of an object
  - can be dragged and dropped
- Menu
  - a list of command buttons
  - pull-down or pop-up (context menu)
- Pointer
  - mouse or similar pointing device

## **Other Elements of Wimp Interfaces**

- Button
  - action button: causes action
  - toggle button: switches state
- Scroll Bar
  - allows viewing of documents larger than the window
- Label
  - just a text string that doesn't do anything
- Text box
  - for entering a string
- List box
  - choice from a fixed list
- Combo box
  - select one out of a list of items
  - may be editable
- Radio buttons
  - select one of a number of choices
- Check boxes
  - select any of a number of choices
- Tool tip
  - floating over a UI element
- Toolbar
  - set of buttons with icons
- Tabs
  - like paper folders behind each other

## User Interface Design Principles

- User familiarity
  - use concepts that people know
- Consistency
  - similar tools for similar tasks
- Minimal surprise
  - user should know what's going to happen next
  - program should behave how the user expects
- Recoverability
  - undo command
- User guidance
  - context-sensitive help; meaningful error messages
- User diversity
  - expert users versus beginners versus system administrators
- Make it easy for the user!

## World's Most Famous Computer UI



## **Common UI Mistakes**

- Unhelpful error messages
  - for programmers or for users?
- Lack of navigation support
  - where am I in the Web site?
  - how do I get back?
- No keyboard support
- Not adhering to standards
  - Pull down menu: File, Edit,..., Help
- No context menus / no pull-down menus
- Misleading visualization
  - graphs with wrong labels
- Color issues
  - colors look different on different screen
  - color scheme of OS may be different
- Having the user make too many decisions
- Hidden dependencies / effects

## **Heuristics**

- Guessing the right answer
- Example
  - type "teh" in MS Word
  - bullets, capitalization, autocompletion for dates
- Useful, but may be annoying
- Rules
  - it must be correct most of the time
  - it must be obvious what happened
  - it must be easy to undo it
  - it must be easy to switch off the heuristic

## **The User Model**

- Metaphor in a user's mind
  - explains how the program works
  - relates it to experiences outside the computer
- Desktop metaphor
  - overlapping windows, trash can, icons
- Graphical layers
  - similar to paper
  - menus, tool tips (balloon help)
- Scrolling
- Notebook, tabs
- Tools
  - magnifying glass, scissors, spray can...
- What happens if metaphor is broken?
  - saving files...
  - notebook tabs in two rows...

## **Shneiderman's Eight Golden Rules**

1. Strive for consistency.
2. Enable frequent users to use shortcuts.
3. Offer informative feedback.
4. Design dialog to yield closure.
5. Offer simple error handling.
6. Permit easy reversal of actions.
7. Support internal locus of control.
8. Reduce short-term memory load.