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Windowing Systems

- Application Windows
- Dialogues
  - A form of form
  - Modal versus modeless
- Windoids
  - Always on top

Pros of Window Systems

- Optimize use of limited display
- Coordinate multiple sources of info or multiple views on info
- Works well with direct manipulation
- Handled by the OS:
  - Application programmer doesn’t have to
  - Uniform look and behavior of window controls
- Non-advantage: signals contexts that have modal implications (why not avoid modes?)

Cons of Window Systems

- Information not visible
  - Harder to learn
  - Harder to find
- Requires more time
  - to manage windows
  - to learn management policies
- Window controls take space

Window Working Set

- The set of windows needed to carry out a task effectively
- If not all visible, time lost to window management
- Solutions:
  - Automatically open/arrange screen - a dangerous solution!
  - Workspaces (rooms), e.g., CD-E - a good solution
  - Redesign task or interface to reduce working set

Window Components

- Title bar
- Application Area
  - Panes?
- Controls
  - Close
  - Minimize
  - Maximize
  - Revert
  - Size
  - System menu
  - Scroll bars
Widgets

- Menus (various types discussed)
- Buttons
- Check boxes
- Radio buttons
- Sliders
- Gauges, dials
- Text fields

Examples of Dialogue Design

- Raskin examples

Managing Windows

- Focus: to where does input go?
  - Click to focus
  - Mouse to focus
- Focus Feedback
  - Focused window on top
  - Title bar/border/background change
- Organizing Multiple Windows
  - Iconification
  - Tiling
  - Overlapping
    - Positioning new windows

Taxonomy of Interaction Styles

- Restricted
  - Question/Answer "Dialogue"
  - Menus
  - Forms
- Open
  - Commands
  - Natural Language
  - Direct Manipulation

Question/Answer "Dialogue"

- System asks, you reply
- Requires little space
- No user control
  - Guides novices
  - Frustrating for others
- Examples?
  - Unix passwd

Forms

- Fixed fields
- Great for data entry
- Need not watch screen; tab to next
- Importance of matching screen to
  - Flow of information (does tab take you to the right field?)
  - Paper artifacts in use
Menus

- Choice from fixed set
- Recognition rather than recall
- Design issues:
  - Invoking: static, pull-down, explicit pop-up, implicit pop-up
  - Representation: list, hierarchical, pie
  - Organization: categorical, lexical, by frequency (static, dynamic)
  - Using: Drag-Release versus Click-Click

Fitt's Law

- Time to hit a target at distance D and of size S (in one dimension)
  \[ t(\text{milliseconds}) = a + b \log(D/S+1) \]
- Substantial empirical support
  - For estimates: \( a = 50 \text{ ms}, b = 150 \text{ ms} \)
- Windows versus Mac Menus
  - D may be greater for Mac
  - S also greater for Mac! Why?
  - Empirically faster on Mac

Pie Menu Example

- How does the Pie menu affect S? D?

- Spatial memory may also be enhanced

Hick's Law

- Time to select from n equiprobable choices:
  \[ t(\text{milliseconds}) = a + b \log(n+1) \]
- Hierarchical versus Single Menus:
  - One menu of 8 or two menus of 4?
  - \( a + b \log(8) = a + 3b < 2(a + 2b) = 2(a + b \log(4)) \)
  - Backed up with empirical studies

Commands

- Recall, not recognition
- Meaningful words easier to remember than
  - Keys or chords
  - Inconsistently deleted vowels (Unix)
- Great for experts

Natural Language

- Easy
- Ambiguous and vague
- Speech vs. Typing
- Used in restricted domains
Direct Manipulation

- **Definition:**
  - Objects are visible
  - Act directly on objects
  - Actions are incremental, reversible

Direct Manipulation

- **Advantages:**
  - Easy to learn
  - Experts can work quickly
  - Immediate visual feedback on effects of actions
  - Less anxiety, more feeling of control
  - Visual interface helps you remember
- **Disadvantages:**
  - Complex or abstract tasks not supported well
  - More difficult to automate parameterized sequences of actions

The Gulfs of HCI

- **Gulf of Execution:**
  - Gap between users' goals and means of achieving them
  - "How do I get it to do what I want to do?"
- **Gulf of Evaluation:**
  - Gap between system's behavior and users' goals
  - "Did it do what I want to do?"

Bridging the Gulfs

- **Gulf of Execution:**
  - Users: reconceptualize your task in terms of system's model
  - Designers: match input actions to users' conceptualizations and operators
- **Gulf of Evaluation:**
  - Users: adjust interpretation of system image
  - Designers: match output to users' conceptualizations

Analyzing the Gulf

- **Semantic Directness:** does what the user wants to do match the meaning of the interface’s expressions
- **Articulatory Directness:** do the semantics of the expressions match sensory-motor aspects of their physical form? (Affordances and Mappings)

Miscellaneous Important Concepts

- Affordances
- Constraints
- Mappings
- Feedback
Comparison

- How much knowledge needed?
- How much flexibility?
  - Question/Answer "Dialogue"
  - Menus
  - Forms
  - Commands
  - Natural Language
  - Direct Manipulation
- Hybrids support mixed types of users

Interaction Style Examples

- Word versus Emacs
  - Insert text
  - Copy region of text, paste elsewhere
  - Search for some text
  - Search and query-replace
- More on Menus
  - Organization of menus in common apps
  - Gallery: Art Department Web Site