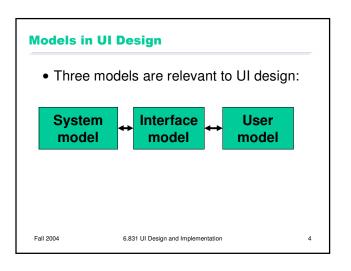
# Lecture 6: Models & Metaphors Fall 2004 6.831 UI Design and Implementation 1

## Today's Topics Conceptual models Interaction styles Direct manipulation Errors Metaphors

# • Model of a system = how it works - its constituent parts and how they work together to do what the system does • Implementation models - Pixel editing vs. structured graphics - Text file as single string vs. list of lines • Interface models - RealCD's online help as liner notes Fall 2004 6.831 UI Design and Implementation 3



### **Interface Model Hides System Model**

- Interface model should be:
  - Simple
  - Appropriate: reflect user's model of the task (learned from task analysis)
  - Well-communicated

Fall 2004

6.831 UI Design and Implementation

### **User Model May Be Wrong**

- Sometimes harmless
  - Electricity as water
- Sometimes misleading
  - Thermostat as a valve

Fall 2004

6.831 UI Design and Implementation

### **Interaction Styles**

- Command language
- Menus & forms
- Direct manipulation

Fall 2004

6.831 UI Design and Implementation

### **Command Language**

- User types in commands in an artificial language
- Examples
  - Unix shell ("ls -I \*.java")
  - Search engine query language ("AND, OR, site:www.mit.edu")
  - URLs ("http://www.mit.edu/admissions/")
- Command syntax is important

Fall 2004

6.831 UI Design and Implementation

### **Menus and Forms**

- User is prompted to choose from menus and fill in forms
- Examples
  - virtually all web sites
  - dialog boxes
- Navigation structure is important
  - Menu trees (Yahoo!)
  - Wizard: linear sequence of forms

Fall 2004

6.831 UI Design and Implementation

### **Direct Manipulation**

- User interacts with visual representation of data objects
  - Continuous visual representation
  - Physical actions or labeled button presses
  - Rapid, incremental, reversible, immediately visible effects
- Examples
  - Files and folders on a desktop
  - Scrollbar
  - Dragging to resize a rectangle
  - Selecting text
- Visual representation and physical interaction are important

Fall 2004

6.831 UI Design and Implementation

10

12

### **Comparison of Interaction Styles**

- Knowledge in the head vs. world
- Error messages
- Efficiency
- User experience
- Synchrony
- Programming difficulty
- Accessibility

Fall 2004

6.831 UI Design and Implementation

### **Direct Manipulation Cues**

- Affordances
- Constraints
- Natural mapping
- Visibility
- Feedback

Fall 2004

6.831 UI Design and Implementation

### Affordances

- Perceived and actual properties of a thing that determine how the thing could be used
  - Chair is for sitting
  - Knob is for turning
  - Button is for pushing
  - Listbox is for selection
  - Scrollbar is for continuous scrolling or panning
- Perceived vs. actual

Fall 2004

6.831 UI Design and Implementation

## Natural Mapping

- Physical arrangement of controls should match arrangement of function
- Best mapping is direct, but natural mappings don't have to be direct
  - Light switches
  - Stove burners
  - Turn signals
  - Audio mixer

Fall 2004

13

6.831 UI Design and Implementation

14

16

### **Visibility**

- Relevant parts of system should be visible
  - Not usually a problem in the real world
  - But takes extra effort in computer interfaces

Fall 2004

6.831 UI Design and Implementation

### Feedback

- Actions should have immediate, visible effects
  - Push buttons
  - Scrollbars
  - Drag & drop
- Kinds of feedback
  - Visual
  - Audio
  - Haptic

Fall 2004

15

6.831 UI Design and Implementation

### **Modeling Human Error**

- Description error
- Capture error
- Mode error

Fall 2004

6.831 UI Design and Implementation

### **Description Error**

- Intended action is replaced by another action with many features in common
  - Pouring orange juice into your cereal
  - Putting the wrong lid on a bowl
  - Throwing shirt into toilet instead of hamper
  - Going to Kendall Square instead of Kenmore Square
- Avoid actions with very similar descriptions
  - Long rows of identical switches
  - Adjacent menu items that look similar

Fall 2004

17

6.831 UI Design and Implementation

## Capture Error

- A sequence of actions is replaced by another sequence that starts the same way
  - Leave your house and find yourself walking to school instead of where you meant to go
  - Vi :wq command
- Avoid habitual action sequences with common prefixes

Fall 2004

6.831 UI Design and Implementation

### **Mode Error**

- Modes: states in which actions have different meanings
  - Vi's insert mode vs. command mode
  - Caps Lock
  - Drawing palette
- · Avoiding mode errors
  - Eliminate modes
  - Visibility of mode
  - Spring-loaded or temporary modes
  - Disjoint action sets in different modes

Fall 2004

6.831 UI Design and Implementation

20

### **Metaphors**

- Another way to address the model problem
- Examples
  - Desktop
  - Trashcan

Fall 2004

6.831 UI Design and Implementation

### **Dangers of Metaphors**

- Hard to find
- Deceptive
- Constraining
- Breaking the metaphor
- Use of a metaphor doesn't excuse bad communication of the model:
  - RealCD's bad affordances, visibility

Fall 2004

21

6.831 UI Design and Implementation