CSE 40416
System Interface Design
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Lecture 35 – November 23, 2009

Today’s Lecture
- Models / Metaphors
  - Guides -> Larger Design Considerations

Reminders
- Blog Post (Week)
- Project 3
- Alpha Submission

Models
- Conceptual model
  - Choose
  - Teach it to a user
- Model of a system = how it works
  - Visio / Powerpoint
  - Photoshop / Gimp
  - Objects vs. Pixels
  - Text as lines vs. single string
- Books
  - Design of Everyday Things, 1988
  - How Things Work

MDBuyLine – Cynergy Systems
https://www.cynergysystems.com/whatwedo/ria.jsp

Interface Model
- Should hide the system model
- Interface model should be:
  - Simple
  - Appropriate: reflect user’s model of the task (learned from task analysis)
  - Well-communicated

Example: Cell phones

Three modes in practice
System model
Interface model
User model

Technical aspects
Presentation
How the user thinks it works

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User Model
- Sometimes wrong
  - Sometimes harmless
    - Electricity as water
  - Sometimes misleading
    - Thermostat as a valve

Command Language
- User types in commands in an artificial language
- Examples
  - Unix shell ("ls -l *.java")
  - Search engine query language ("AND, OR, site:www.nd.edu")
  - URLs ("http://netscale.cse.nd.edu/")
- Command syntax is important
  - Syntactic sugar anyone?

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

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

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

Vision / Motor vs. Linguistics
Direct Manipulation

- Affordances
- Constraints
- Natural mapping
- Visibility
- Feedback

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

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

Visibility

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

Feedback

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

Human Error

- Description error
- Capture error
- Mode error
Description Errors
- 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

Capture Errors
- 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

Mode Errors
- 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

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

Danger of Metaphor
- Hard to find
- Deceptive
- Constraining
- Breaking the metaphor
- Use of a metaphor doesn't excuse bad communication of the model

Questions?
- Weekly Blog
- Project 3
- Alpha Submission