Interaction design

Gulf of Execution
- System Goal
- Action Plan
- Executing Action Sequences

Handout: Exam 1 Review Sheet

Reminder: Exam 1 Review on Thursday, Exam 1 next Tuesday

Interaction Design

Third phase of design of user interfaces

Goal is to specify the mechanisms for accessing and manipulating task information. Want to lead users to do the right things at the right times.

Focus on the Gulf of Execution: how to get from user task goal to the physical movements to accomplish the task.

Gulf of Execution

Example: Task goal is to investigate an irregularity in last month's budget by checking the budget columns

System goal – a software-oriented goal to accomplish task: Open Excel spreadsheet file with last month’s budget

Action plan – steps for accomplishing system goal: Double-click on file icon, point and click on cell, read equation

Execution – physical actions that implement the plan steps: Grasp mouse, move cursor to icon, click twice rapidly, click on cell

End of execution produces a screen of information. Traverse Gulf of Evaluation to make sense of the information

Gulf of Evaluation

Perception – pointer over icon, icon highlighted, grid of cells, rectangle highlighted, symbols in box above cells

Interpretation – opened Excel file, selected cell with equation

Making sense – equation looks okay, move on to next task
Selecting a System Goal

- Translate real-world goal to software-oriented goal
- Two models to consider
  - User’s mental model of what to do
  - Designer’s model that is conveyed and supported by user interface

Key is to minimize the cognitive distance between the two models to allows user to more easily map task goal to appropriate system feature.

Different interaction styles can help map task goals to system goals.

Direct Manipulation

- In direct manipulation, UI controls appear as analogs to real objects; affordance suggests interaction goals.
  - buttons to press
  - slider bars to be moved up and down
  - folders for data storage

Tradeoffs:
- Visual objects must be present at right time
- Too many controls is distracting
- Not all task goals have visual analog
- Relies on recognition of users to tasks

Command Language

- Command language used to complement direct manipulation
- Indirect identification and manipulation of task objects via vocabulary and composition rules. Relies on recall rather than recognition.

Economical and flexible - saves screen space and is faster for power users, but can be difficult or tedious to learn
- UNIX commands vs. WIMP
- LaTeX text formatter vs. word processor
- Design issue: size and structure of vocabulary determines cognitive distance
Buttons and menus (especially) are an interesting compromise between direct manipulation and command languages. Allows users to select a command from a large set of commands. Economical and flexible, while supporting recognition over recall.

Action plan is steps required to achieve system goal. Not necessarily a conscious endeavor, but for new or complex tasks, the UI helps determine what steps to take. Analogous to hierarchical task analysis; identify goals, break down into subgoals, break down into steps.

Goal is to make plans easy for users to learn and remember. Make action sequence match how users think about similar real world task. E.g., use interaction controls with good affordance. Design a sequence, then analyze and refine it. Look for arbitrary sequences, overall complexity, consistency, interference.

Consider that users have limited short-term memory capacity. Average is 7 ± 2 steps at any given time. Look for ways to chunk long sequences into more abstract subplans. Example: changing line spacing in Word 2007 document is 5-6 steps. Can chunk into three subplans.

User interaction errors should be analyzed as misunderstandings or confusions (i.e., no one is to blame). General technique is to provide a forcing function that prevents user for continuing down an error path. E.g., warnings, initiating a dialog, auto-correct, etc. Sometimes useful to distinguish between mistakes and slips.
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Forms Guide Action Plans

- Users are familiar with forms (both paper and on-line)
- Action plan is implicit in the layout of a form
  - Numbering or instructions for ordering
  - Tabs or auto advance for convenience

CS 350: Computer/Human Interaction

Flexibility

- Note that humans are good at multi-tasking; consider its effect on interaction
- Users must have flexibility and control over multiple interactions, must be able to stop and start “in the middle”
- Example: multiple windows
  - Easy to have multiple tasks going
  - Increases plan complexity; i.e., how to find things
  - Overlapping windows vs. Tiled windows

- Example: modal interaction
  - Modes generally are to be avoided, since usually they require that a task be completed before starting another, but sometimes are necessary
  - Example: vim vs. emacs
  - Message dialog boxes especially annoying, compromise by allowing user to cancel