

## Computer/Human Interaction

### Lecture 24

#### Overview:

- Interaction Design
- Gulf of Execution
  - System goal
  - Action plan
  - Execution

## Interaction Design

- Third phase of design of user interfaces
- Goal is to specify the mechanisms for accessing and manipulating task information.
- 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

## Gulf of Execution 2

- Execution – physical actions that implement the plan steps: Grasp mouse, move cursor to icon, click twice rapidly...
- End of execution produces a screen of information. Traversing Gulf of Evaluation – perception, interpretation, and making sense – begins again.

## Selecting a System 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
- Doing so allows user to more easily map task goal to appropriate system feature

## Direct Manipulation

- UI controls appear as analogs to real objects - affordance suggests interaction goals. Examples: buttons to press, slider bars to be moved up and down
- 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

- 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 (think UNIX)
- Design issue: size and structure of vocabulary determines cognitive distance

## Buttons and menus

- 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 Planning

- Analysis of 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
- Look for arbitrary sequences, overall complexity, consistency, interference

## Designing Action Plans

- 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.

## Refining Action Plans

- Consider that users have limited short-term memory capacity. Average is  $7 \pm 2$  at any given time.
- Look for ways to **chunk** long sequences into more abstract subplans. Example: changing line spacing in Word document is 6-7 steps. Can chunk into three subplans.
- Use intermediate feedback or action to "mark" the subplan boundaries

## 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