

User Interface Design and Programming

CS422

Principles and Golden Rules

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Books

- *Things that Make us Smart* by Donald Norman
- *Information Anxiety* by Saul Wurman
- *The Visual Display of Quantitative Information* by Edward Tufte
- *Designing the User Interface* 3rd Ed. by Ben Schneiderman
- *The Psychology of Human-Computer Interaction* by Stuart Card and friends
- *Human-Computer Interaction* 2nd Ed by Alan Dix and friends

Principles

- Recognize Diversity
- Eight golden rules of interface design
- Prevent Errors

Recognize Diversity

- Diversity of users
 - User Profile
 - Novice / first time users
 - Knowledgeable intermittent users

Recognize Diversity: Users

- **User Profile**

- age, gender, education, cultural background, job

- **Novice / first time users**

- novice - know little of task or interface concepts
- first time users - have task concepts but shallow knowledge of interface
- need to be able to accomplish basic needs with small number of consistent actions

- **Knowledgeable intermittent users**

- know about the task and general knowledge about the interface - will forget specific features
 - need to easily rediscover how to perform tasks
- Expert frequent users
 - Thoroughly familiar with task and interface concepts
 - Need ability to quickly carry out actions, get rapid responses, brief feedback

Recognize Diversity

- Diversity of tasks
 - Determine set of tasks early in design
 - Choose 'atomic' actions
 - look at task frequencies
- Diversity of interaction styles

Interaction Styles

- Direct Manipulation
- Menu Selection
- Form Filling
- Command Language
- Natural Language

Direct Manipulation

Advantages	Disadvantages

Direct Manipulation

Advantages	Disadvantages
<ul style="list-style-type: none">- visually presents task concepts- allows easy learning- allows easy retention- allows errors to be avoided- encourages exploration- affords high subjective satisfaction	<ul style="list-style-type: none">- may be hard to program- may require graphics display and pointing device

Menu Selection

Advantages	Disadvantages

Menu Selection

Advantages	Disadvantages
<ul style="list-style-type: none">- shortens learning- reduces keystrokes- structures decision making- permits use of dialogue management tools- allows easy support of error handling	<ul style="list-style-type: none">- presents danger of many menus- may slow frequent users- consumes screen space- requires rapid display rate

Form Filling

Advantages	Disadvantages

Form Filling

Advantages	Disadvantages
<ul style="list-style-type: none">- simplifies data entry- requires modest training- gives convenient assistance- permits use of form management tools	<ul style="list-style-type: none">- consumes screen space

Command Language

Advantages	Disadvantages

Command Language

Advantages	Disadvantages
<ul style="list-style-type: none">- is flexible- appeals to 'power' users- supports user initiative- allows convenient creation of user-defined macros	<ul style="list-style-type: none">- has poor error handling- requires substantial training and memorization

Natural Language

Advantages	Disadvantages

Natural Language

Advantages	Disadvantages
<ul style="list-style-type: none">- relieves burden of learning syntax	<ul style="list-style-type: none">-requires clarification dialogue- may require more keystrokes- may not show context- is unpredictable

Eight golden rules of interface design

1. Strive for consistency
2. Cater to universal usability
 - help new users through basic procedures
 - enable frequent users to use shortcuts
3. Offer informative feedback
 - All actions should result in system feedback
4. Design dialogues to yield closure

Eight golden rules of interface design

5. Offer error prevention and simple error handling
6. Permit easy reversal of actions
7. Support internal locus of control
 - make users the initiators of actions, want users to feel they are in control
8. Reduce short term memory load
 - 7 items +/- 2

Principles

- Prevent Errors
 - most importantly, evaluate the design at multiple stages during its development

Attention and Memory

Jennifer Golbeck
U. Maryland

- Memory principles:
 - Short term memory is limited to seven plus or minus two chunks of information.
 - Short term memory is volatile, and users will often forget in the presence of distractions
 - A schema is a mental model that makes it easier for users to recall an item. It provides a meaningful method for grouping information
 - Well developed model make it easier to remember items that fit within a schema

Attention and Memory

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- Design Principles:
 - Design minor messages, alerts, and warnings to be minimally disruptive
 - For example, if a user tries to select something they are not allowed to, use a small beep or tone instead of a pop up alert menu. This will prevent the user from forgetting the data stored in short term memory
 - Use familiar structures in application design to conform to model with which users are familiar to make learning easier
 - Design interfaces that provide on-screen references for commands

Attention and Memory

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U. Maryland

- Applicability to HCI
 - Consistency with standards using common keyboard shortcuts for their common purpose, i.e. ctrl-C for copying
 - Dialogue Boxes with familiar options, layout, and commands
 - Familiar positioning of menu bars, placement of specific menus within the bar, and organization of menu items within a menu

Example

- “Apple Human Interface Guidelines”
- 350 pages document
 - <http://developer.apple.com/documentation/UserExperience/Conceptual/OSXHIGuidelines>
- PDF online
 - Design process, Design, User Experience
 - Interface: user input, drag and drop, text, icons, cursors, menus, windows, controls, layout,

Guidelines for Data Display and Entry

Smith & Mosier

Data Display	Data Entry
consistency	consistency
efficient information assimilation by the user	minimal input actions by user, and avoid redundancy <ul style="list-style-type: none">• use selection from a list whenever possible• use single clicks/keys rather than typing strings
minimal memory load	minimal memory load
compatibility of data display with data entry	compatibility of data display with data entry
flexibility for user control	flexibility for user control

Locheed guidelines for design of power plant control rooms

- Be consistent in labeling and graphic conventions
- Standardize abbreviations
- Use consistent format in all displays
- Present data only if they assist the operator
- Present information graphically where appropriate by using widths of lines, positions of markers on scales, and other techniques that relieve the need to read and interpret alphanumeric data
- Present digital values only when knowledge of numeric values is necessary and useful
- Design a display in monochromatic form using spacing and arrangement for organization and then judiciously add color where it will aid the operator
- involve users in the development of new displays and procedures

Conditions for Optimum Problem Solving

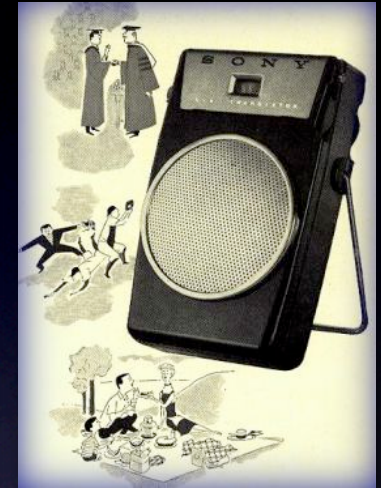
- Users have adequate knowledge of the objects and actions necessary for the problem-solving task
- The solution plan can be carried out without delays
- Distractions are eliminated
- User anxiety is low
- There is feedback about progress toward solution
- Predictability of system behavior
- Errors can be avoided or can be handled easily if they occur

Getting the User's Attention

- **Intensity:** 2 levels - human perception of intensities
- **Marking:** ____, *, arrows, boxes
- **Size:** up to 4
- **Choice of fonts:** up to 3
- **Inverse video**
 - Blinking (2-4 Hz) on off or color changes used sparingly
- **Color:** up to 4 standard colors
- **Audio:** soft / harsh

Successful Products

- Radio
- Walkman
- VCR



Example

- Guidelines for Public Access Terminals
- <http://www.tiresias.org/>
- PDF

