Human-Computer Interaction

Overview

- These days, some of the most important non-functional requirements have to do with usability.
  - How easy is it for people to use, learn to use, recall how to use the system?
- Human-Computer Interaction (HCI) deals with these issues, including modes of operation, usage styles, and human factors.
Objectives

- Here is what you should be able to do upon completion of this module:
  - Identify Usability and User Experience goals.
  - Apply usability rules and guidelines for designing human-computer interaction.
  - Discuss the advantages and disadvantages and design considerations of four types of user interaction mechanism: menus, form fill-in, command language, and direct manipulation.

Outline

- Usability goals.
- Eight golden rules of HCI.
- HCI mechanisms.
- Error message guidelines.
- General HCI principles.
- HCI design checklist.
Usability Goals

- Effectiveness.
- Efficiency.
- Safety.
- Utility.
- Learnability.
- Memorability.

User Experience Goals

- Satisfying.
- Enjoyable.
- Fun.
- Entertaining.
- Helpful.
- Motivating.
- Aesthetically pleasing.
- Supportive of creativity.
- Rewarding.
- Emotionally fulfilling.
Eight Golden Rules of HCI (1)

1. Consistency terminology in:
   - Command formats.
   - Screen layout.

2. Shortcuts for frequent users:
   - Abbreviations.
   - Macro facilities.

3. Informative feedback or every operator action.

4. Closure:
   - Organize sequences of actions into groups with a beginning, middle and end, with informative feedback at the end.

Eight Golden Rules of HCI (2)

5. Error handling:
   - Design to avoid user errors.
   - Detect errors.
   - Offer help as to cause of error.
   - Make correction simple.

6. Reversal of actions – provide “undo” functions.

7. Make users the initiators of actions, rather than responders.

8. Reduction of short term memory load:
   - 7 plus-or-minus 2 chunks.
   - Keep it simple.
Human-computer Interfaces

- Menu selection.
- Form fill-in.
- Command language.
- Direct manipulation.


Menu Selection

- Advantages:
  - Shortens learning.
  - Reduces keystrokes.
  - Structures decision-making.
  - Permits use of dialog management tools.
  - Easy to support error handling.

- Disadvantages:
  - Danger of many menus.
  - May slow frequent users.
  - Consumes screen space.
  - Requires rapid display rate.
Menu Selection Guidelines (1)

- Use task semantics to organize.
- Give position in organization by graphic design, numbering, and titles.
- Make meaningful groupings and sequences of items in a menu.
- Items should be brief and consistent.
- Permit short-cuts for experienced users.

Menu Selection Guidelines (2)

- Permit jumps to previous menu, and back to the main menu.
- Use consistent layout and terminology.
- Consider selection mechanisms and devices.
- Consider response time and display rate.
- Consider screen size.
- Offer help facilities.
Phrasing of Menu Items

- Use familiar and consistent terminology.
- Ensure that items are distinct from one another.
- Use consistent and concise phrasing.
- Bring the keyword to the left.

Menu Layout Guidelines

- Titles:
  - Centered.
  - Left justified (for slow displays).
  - Case (upper or mixed).
  - Font.
  - Item placement.
- Instructions:
  - Identical in each menu.
  - Same position in each menu.
- Error messages.
  - Consistent position.
- Status reports.
  - Consistent position.
Selection Mechanisms

- Numbered items:
  - Use when there is a numerical sequence to the choices.
- Lettered items:
  - User must be familiar with keyboard.
- Mnemonic letters:
  - Must have unique first letters on selections.
- User shortcuts:
  - Type-ahead.
  - Macros.
- Item selection:
  - Select by use of arrow keys or mouse.
  - Selected item is highlighted.
  - Press RETURN key or mouse button to activate.

Form Fill-in

- Advantages:
  - Simplifies data entry.
  - Requires modest training.
  - Assistance is convenient.
  - Permits use of form management tools.
- Disadvantages:
  - Consumes screen space.
Form Fill-in Guidelines (1 of 2)

- Meaningful title.
- Comprehensible instructions:
  - Use familiar terminology.
  - Be brief.
- Logical grouping and sequencing of fields:
  - Alignment.
  - Blocking.
- Visually appealing layout of the form.
- Familiar field labels.

Form Fill-in Guidelines (2 of 2)

- Consistent terminology and abbreviations.
- Visible space and boundaries for data entry fields:
  - Underscores.
- Convenient cursor movement:
  - TAB key.
  - Arrow keys.
- User error correction and editing.
- Explanatory messages for fields.
Command Languages

- Advantages:
  - Flexibility.
  - Appeals to “power users.”
  - Supports user initiative.
  - Convenient for creating user-defined macros.

- Disadvantages:
  - Poor error handling.
  - Requires substantial training and memorization.
  - Harder to automate with tools.

Direct Manipulation

- Advantages:
  - Visually presents task concepts.
  - Easy to learn.
  - Easy to retain.
  - Errors can be avoided.
  - Encourages exploration.
  - High subjective satisfaction.

- Disadvantages:
  - May be hard to program.
  - May require graphics display and pointing devices.
Error Message Guidelines

- Be specific.
  - Tell user what the problem was.
- Provide constructive guidance.
  - Give user advice about how to fix problem.
- Be positive.
  - Rather than condemning.
  - Avoid words such as ILLEGAL, ERROR, INVALID, or BAD.

- User-centered phrasing.
  - User should have the feeling that he is controlling the session, not the computer.
- Use consistent visual format and placement.
- Use consistent grammatical form, terminology, and abbreviations.
- Consider multiple levels of messages.

General HCI Principles

- Know who your user is.
  - Experience level.
  - Interest.
  - User requirements.
  - Interface devices.
- Be considerate of the user.
  - "User friendly" systems are actually "user considerate."
  - Instructions & help.
  - Messages, feedback.
- Make most effective use of tools.
  - Use appropriate interface.
  - Use standard interface conventions.
**HCI Design Checklist (1 of 3)**

- Simple and natural dialogue.
  - No irrelevant information.
  - Natural and logical sequence.
- Speak the user’s language.
  - Rather than system-oriented terms.
- Minimize the user’s memory load.
  - From one part of the dialogue to another.
  - Provide context clues, help facilities.

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**HCI Design Checklist (2 of 3)**

- Be consistent:
  - In use of words, phrases.
  - In required user actions.
  - Across subsystems.
- Provide feedback within a reasonable time.
- Provide clearly marked exits.
  - To cancel an action.
  - To “undo” an action.
HCI Design Checklist (3 of 3)

- Provide shortcuts for experienced users.
- Provide good error messages:
  - Defensive (non-criticizing).
  - Precise.
  - Constructive.
- Error prevention:
  - Don't put user in situation where an error can be made.

References