CS 66.460

Introduction to Graphical Human-Machine Interfaces

Instructor: Bowden Wise

RPI

Spring 1997

Introduction and Course Overview

What is the User Interface?

- Developer View

  application functionality is separate from UI

  UI often seen as an add-on

- User View

  do not see the distinction between the UI and the application

  if the UI is well designed and usable, then the entire application will appear usable

What is the UI? (continued)

❐ The UI includes all aspects of the system design that influences the interaction between the system and the user.

❐ The UI includes:

- ***the match with the tasks of the user;***
- ***the metaphor that is used (e.g., desktop)***
- ***the controls and their behavior;***
- ***navigation within and flow between screens;***
- ***integration among different applications;***
- ***the visual design of the screens;***
- ***the design of nonspeech audio;***

Technology Trends

❐ Trends in technology have increased the need for improved UIs and UI design practices:

- ***Network and distributed systems allow access to information in remote locations, or across an enterprise.***
- ***Greater memory and faster processing are available at ever decreasing costs.***
- ***More people have access to computing power***

❐ Technology now exists for improved UIs and UI designs.

New Technology is NOT Enough!

- New interface technology alone does not produce usable interfaces
  - ***Graphical user interfaces (GUIs) are not intrinsically more usable than traditional character user interfaces (CUIs).***
  - ***GUIs can be far less usable if they are poorly designed.***
- Usable user interfaces requires a good design

User Interfaces: Code/Cost/Effort

- The UI is 47% -- 60% of the total code.
- A GUI is minimally 29% of the software development project budget
- A GUI may take as much 40% of the development effort

High Quality User Interfaces are in Demand

- The UI is the key to the system functionality
  - ***UIs that do not work well will make it impossible for users to access the functionality they require and make them less productive***
- Human capital is higher, so need UIs and systems that are:
  - ***Learnable***
  - ***Efficient***
  - ***Memorable***
  - ***Not error prone***
  - ***Satisfactory for the user***

Poorly Designed UIs Lead to Major Problems

- A $3 million application for an insurance company to be used by independent agents to support them in selling their companies products. However, agents refused to use the application because the system was ‘‘unlearnable’’ and ‘‘unusable’’
- In a customer service organization, training on the system took 6 months, but employees typically had a tenure of only 18 months in that department.
- Extensive and expensive functionality in a Human Resources system was not used at all because users forgot how to access it a mere week after training.

Good Designs Lead to Usable Systems

- Work the way the user thinks they should
  - ***Allows the user to focus on the task at hand and not worry about the underlying interaction technology***
- Easier to use
- More efficient
- Minimize user errors
- Promote user satisfaction

Benefits of Good UI Design

- Reduced errors
- Lower support costs
- Lower initial training costs
- Less productivity costs when the system is introduced
- More focus on the task to be done
- Lower turnover and better morale
- Reduced rework to meet user requirements
- High transfer skills across applications
- Fuller utilization of application functionality

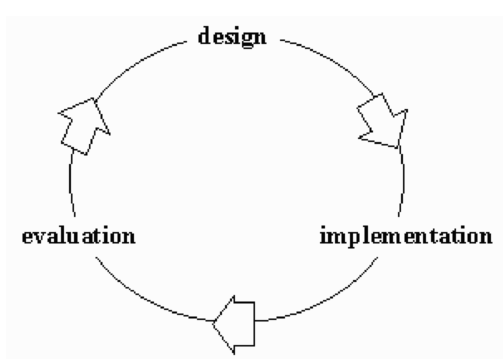
Course Overview

- Human-computer interaction
- User interface design
- User interface implementation
- Examination many existing systems
- Evaluation of user interfaces
- Advanced topics in human-computer interaction

Human-Computer Interaction

- **Human-computer interaction** is a discipline concerned with the design, implementation, and evaluation of interactive computing systems for human use and with the study of major phenomena surrounding them.

- The **HCI lifecycle** is an iterative cycle that involves designing and evaluating with "users" as much as possible.



Multidisciplinary Nature of HCI

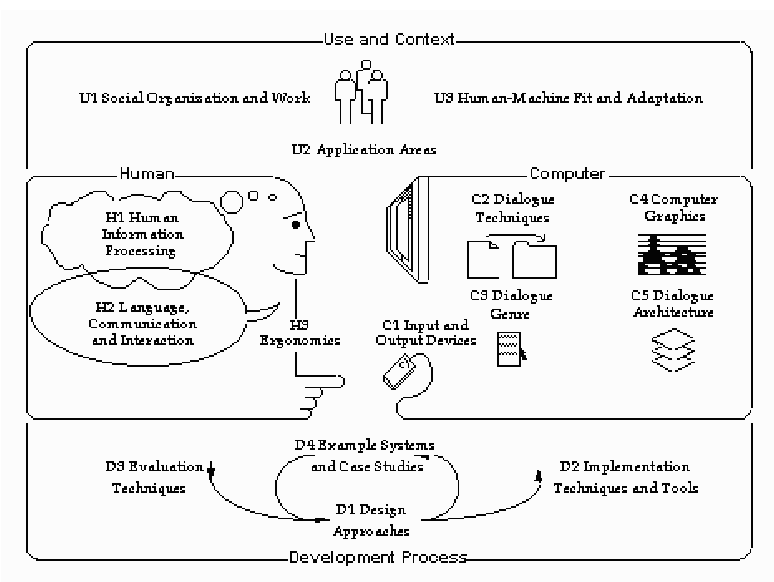
❒ Human side:

- ***cognitive psychology***
- ***ergonomics and human factors***
- ***sociology and anthropology***
- ***linguistics***
- ***communication theory***
- ***social and organizational psychology***
- ***graphic and industrial design***

❒ Machine side:

- ***computer science***
- ***engineering***
- ***computer graphics***
- ***operating systems***
- ***programming languages***
- ***software architecture***
- ***development environments***
- ***artificial intelligence***

ACM SIGCHI Map of HCI



Design

- Design of Everyday Things
  - ***Psychology and psychopathology of everyday objects***
- Designing with users
  - ***User-centered design***
  - ***Participatory design***
- Designing without users
  - ***Task-centered design***
  - ***Usability heuristics***
  - ***Guidelines***

Implementation of User Interfaces

- User interface software tools
  - ***windowing systems***
  - ***toolkits***
  - ***application frameworks***
  - ***higher order tools***
- Examination of many existing systems

Evaluation of User Interfaces

- ❐ Evaluation with user testing
- ❐ Evaluation with usability inspection methods
  - ***heuristic evaluation***
  - ***cognitive walk-through***

Current Research in HCI

- ❐ Many possible topics:
  - ***virtual reality / immersive environments / telepresence***
  - ***systems for people with disabilities***
  - ***visual languages***
  - ***speech interfaces***
  - ***use of nonspeech audio***
  - ***World Wide Web / internet / VRML / hypertext***
  - ***gesture / pen computing***
  - ***collaborative computing / CSCW***
  - ***agents***
  - ***intelligent user interfaces***