DEPARTMENT OF COMPUTER SCIENCE
UNIVERSITY OF TORONTO

CSC428F/2514F

HUMAN-COMPUTER INTERACTION

Lecture 1

INTRODUCTION

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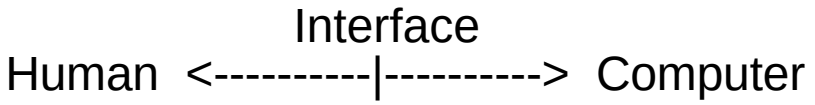
1.1 Class discussion

Why are you here? What do you hope to learn?

1.2 What is the human-computer interface?

The boundary, meeting place, between human and computer



The human's image, or view of the computer

The way in which a computer system will behave

1.3 Some example problems with interfaces

Computer software and systems examples
- A missing period in UNIX mail & its consequences (Fig. 1.1)
- Mode errors with VI
- “User-friendly” tables in Microsoft Word

Causes
- Hidden system state
- Much useless information; little useful feedback
- Inadequate user's mental model
- Little intelligence in the software

Figure 1.1 A missing period in UNIX Mail and its consequences

```
To:     <rmb>
From:   The Post Office <postmaster>
Sender: mailer-daemon
Subject: Invalid message envelope information
Cc:     The Post Office <postoffice>
Date:   Fri, 27 Jun 1997 16:48:53 -0400

The following message arrived with illegal envelope data, typically a
mangled address that doesn't obey the RFC822/976 protocol specification.
If you do not recognize the source of the bad header, perhaps you should
contact a Postmaster at your site and ask why your mail was rejected.

Your message is being returned unprocessed.

The following annotated envelope headers illustrate the error(s):

Error in "to" envelope address:

        <adel.sedra@.utoronto.ca>
                    ^-illegal subdomain in domain


Error in "Cc" header address:

        adel.sedra@.utoronto.ca
                   ^-illegal subdomain in domain

The entire original message file follows.

----------------------------------------
external
rcvdfrom [128.100.4.16] ([128.100.4.16])
with SMTP
from <rmb@dgp.toronto.edu>
to <AMRHEIN@cirque.geog.utoronto.ca>
to <rmb>
to <barek@macpost.scar.utoronto.ca>
to <carl_bereiter@cacsmail.oise.on.ca>
to <willy>
to <jbc@itrchq.itrc.on.ca>
to <chignel@ie>
to <choo@fis.utoronto.ca>
to <clement@fis.utoronto.ca>
to <robert.cook@utoronto.ca>
to <curran@civ>
to <land@clr.utoronto.ca>
to <derrick@chass.utoronto.ca>
to <vfdicicc@ccng.uwaterloo.ca>
to <dodson@ecf>
to <djdoyle@inforamp.net.utoronto.ca>
to <elf>
to <msf@mie.utoronto.ca>
to <ccg@cs>
to <ian.graham@utoronto.ca>
to <gh@cs>
```

1.4 The importance of the interface

The success of the Macintosh

"User-friendly," "ergonomically designed" systems

Costs of interface development — estimate that 48% of application code and comparable amount of development time is devoted to the interface (Myers and Rosson, 1992, quoted in BGBG, p. xi)

Usability issues in *Infoworld* software reviews (Nielsen, 1993, quoted in BGBG, p. 276)

Ease of learning	4-10%
Ease of use	8-13%
Quality of documentation	5- 8%
Error handling	5- 8%
TOTAL usability	22-39%
Typical usability budget	6-10%

"Look-and-feel" copyright issues

Economics: savings by good designs, costs of poor designs

Higher productivity, speed of performance
Fewer user errors
Less training, learning time and costs
Greater user job satisfaction, lower job turnover
For example,

20 users X
240 days/year X
100 screens/day X
5 seconds/screen =
2,400,000 seconds = 667 hours

At $40/hour ---> savings of $26,667

> For example, Xerox managed to cut typical downtime for a paper jam for a copier from 28 minutes to 20 seconds by observing and redesigning the instructions and trouble-shooting procedures (Landauer, 1995, p. 247)
>
> Yet not enough of this has happened, for there is little evidence that computers have increased our productivity (Landauer, 1995)

In fact, life or death consequences

- Therac computer-controlled radiation therapy machine
  - Massive radiation overdoses to 6 people
  - Poor interface a partial cause, including
    - Poor screen layout and typography
    - Inadequate safeguards after error conditions
    - Cryptic numeric error messages
    - No documentation about error conditions
- London ambulance dispatching system
  - Long delays in ambulances reaching emergencies
  - Poor interface a partial cause, including
    - Improper handling of error messages

1.5 What is user interface design?

The design of human-computer interfaces, requiring:

- Inspiration, multidisciplinary insights
- Craftsmanship, style
- Thoughtfulness, careful work
- Design methodologies, structured processes
- Evaluation, usability testing, iterative refinement

1.6 What is human-computer interaction (HCI)?

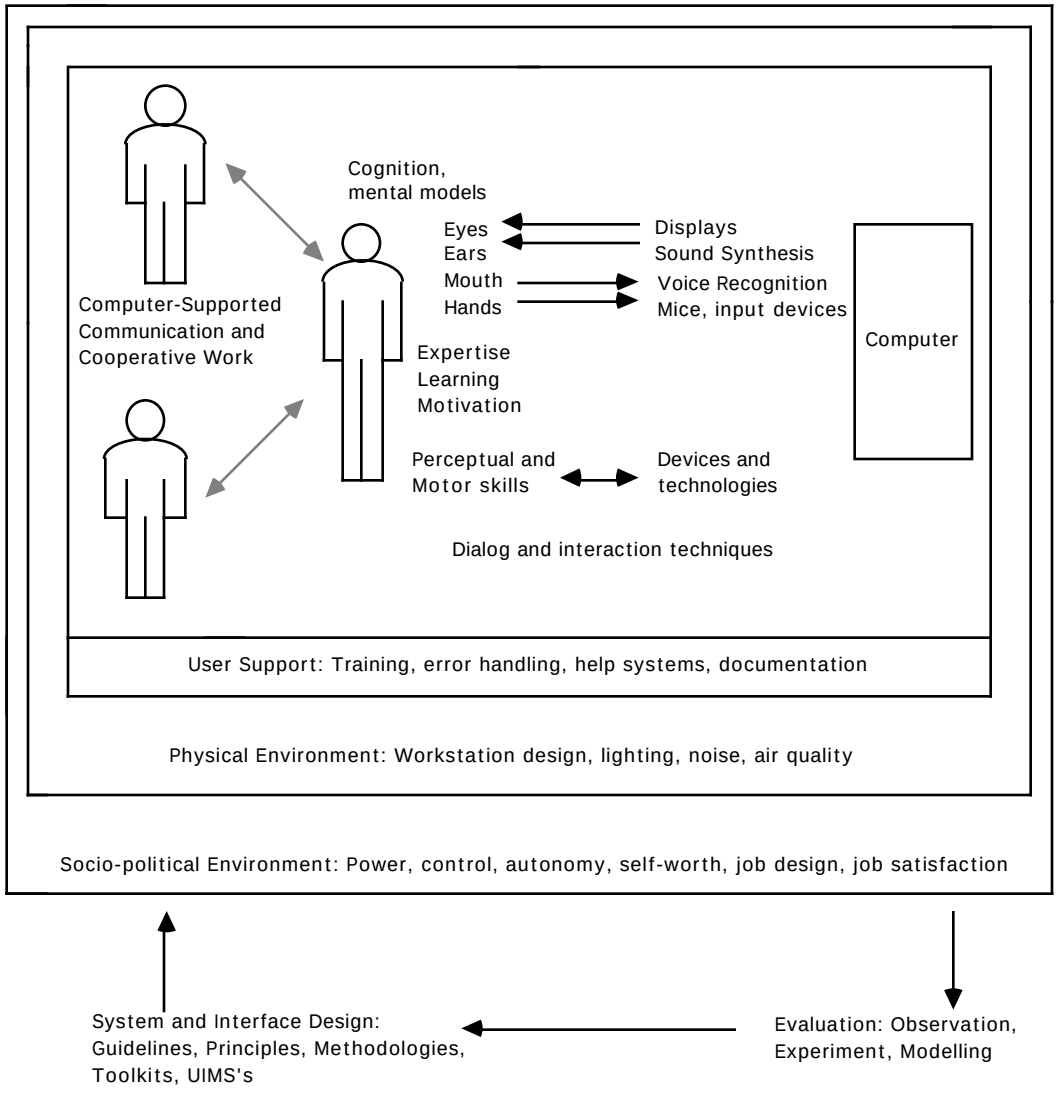
The scientific study of the human-computer interface

The scientific study of humans as they use computers

"Human-computer interaction (HCI) is about designing computer systems that support people so that they can carry out their activities productively and safely." (Preece, et al., 1994, p. 1)

A multi-faceted, multidisciplinary endeavor (Fig. 1.2)

Figure 1.2 A diagram of Human-Computer Interaction



1.7 The relationship of user interface design to HCI

User interface design: a craft, design, synthesis, creation

HCI (CSC 428F/2514F): science, analysis, understanding

The goal: design rooted in an emerging science, a science grounded in and relevant to design

1.8 Goals of the course

Concepts of human computer interaction, user interface design
Key design approaches, methods, tools
Promising theories and models

Acquaintance with literature

Critical thinking about interfaces

Design and prototyping experience

Paradigms and approaches to evaluation

Project team experience

1.9 Some central themes of the course

Importance of multi-disciplinary teams and problem solving

Synergy between art and science, synthesis and analysis

Importance of real examples (case studies, video tape)

Importance of task analysis of work of users

Importance of users' mental model, good representations

Importance of evaluation with real users in real contexts

1.10 Some questions to be raised

What is the relationship of HCI to software engineering and the system development process?

What do psychology, sociology, and anthropology have to teach us about HCI and effective user interface design?

How can we design and build computer systems and interfaces that are responsive to human needs and capabilities?

What design principles or methodologies can we use for this purpose (also, formulated differently, in CSC 318S)?

What programming tools can assist us in the process?

How can we decide if a computer system or interface actually does what we intend it to do?

How can we evaluate and compare different systems or interfaces designed to solve the same problem?

How do we build formal mathematical models of user interfaces and of user interactions?

Why might a computer system be effective in one organization and fail in another?

1.11 Some questions not to be raised

What interaction techniques are effective in human-computer interaction, and how do they compare (CSC 318S)?

What sensory modalities are useful for human-machine communication, what are their salient features, and what technologies enable such communication (CSC 318S)?

What physical problems do computer users encounter, and what can be done about it (CSC 318S)?

What are the principles for effective screen design (CSC 318S)?

What happens when people learn a new system, how does this differ from skilled usage, and what are the implications for documentation, training, and user support (CSC 318S)?

Which design methodology for interactive systems is the *best*?

When will we talk in plain English to computers?

1.12 Course topics

HCI and system development methodologies

Understanding users
- Interviews and questionnaires
- What psychology can teach us

Design methodologies and development tools

Modeling users and systems

Interface evaluation
- Using video
- Running experiments

Human-human computer-mediated interaction
- Group and organizational processes
- Groupware and CSCW

1.13 Course organization, assignments, evaluation

See the course overview handout

Page 1: Important facts + course description

Page 2: Course objectives, texts

Page 3: Course calendar, lecture, and tutorial topics

Pages 4-5: Assigned readings

Pages 6-8: Assignments, grading, evaluation

Be prepared to work really hard!!!

1.14 References

Landauer, Thomas K., *The Trouble with Computers: Usefulness, Usability, and Productivity*, MIT Press, 1995

Leveson, Nancy G., *Safeware: System Safety and Computers*, Addison-Wesley, 1995, see esp. App. A, Medical Devices: The Therac-25 Story, 515-553

Preece, J., Rogers, Y., Sharp, H., Benyon, D., Holland, H., and Carey, T. (1994). *Human-Computer Interaction.* Addison Wesley.