CMPE 131/231 - PSYC 131/223, DANM 231: Human-Computer Interaction

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What's this course about?

- Development of user interfaces that are:
  - fit for the purposes
  - of their diverse users
  - in a variety of contexts



- Interactive system development lifecycle
  - gather user requirements
  - create prototypes
  - conduct evaluations to verify the design
- Movie clips of relevant examples of work in the area
- Demonstrations and hands-on exercises on various techniques

Assessment

- Mid-term exam (W1-5 material): 40%
- Group project report* (3-4 people): 60% for undergrad, 50% for grad
- Grad only: Reviewing work: 10%

*Project: Choose one or propose your own, sample:

- Student Design Competition, CHI'09 or UPA'09 (http://chi2009.org/Authors/CallForPapers/StudentDesignCompetition.html OR http://www.usabilityprofessionals.org/conference/2009/students/)
- Microsoft's Software Design Competition (http://imaginecup.com/Competition/mycompetitionportal.aspx?competitionId=19)
- Evaluation of at least 3 low cost eye trackers in exciting domains – e.g., game playing, youtube watching, etc (http://www.cogain.org/eyetrackers/low-cost-eye-trackers)
- In general, evaluation of 3 competing systems

Tentative Lecture Timetable

- W1: History of HCI. Human.
- W2: Human senses and memory and their design implications.
- W3: User-, Task- and System-Centered Designs. Requirements analysis and techniques (scenarios, personas, storyboards, brainstorming, use cases). Prototyping (low and high fidelity).
- W4: Design process (task analysis, screen design). Evaluation and quality assurance concepts (formative and summative).
- W5: Designing for differently-abled users: users with special needs, accessibility initiatives (WCAG, Section 508, Universal Design), ethical consideration, IRB.
- Mid-term exam

Tentative Lecture Timetable

- W6: Evaluation method 1: inquiry (ethnography, focus group, contextual inquiry, interview, questionnaire).
- W7: Evaluation method 2: inspection (cognitive walkthrough, heuristics evaluation – Nielsen's heuristics) and testing (thinking aloud protocol, retrospective testing, co-discovery learning)
- W8: Experimental design, basic analysis of qualitative and quantitative data.
- W9: Experience design. Flow, immersion, attractiveness. Emotion. Affective computing.
- W10: Mobile/ubiquitous computing. Physical issues (screen size, screen legibility, input mechanism, heat); societal effects of mobility; context awareness and location-dependent technology.

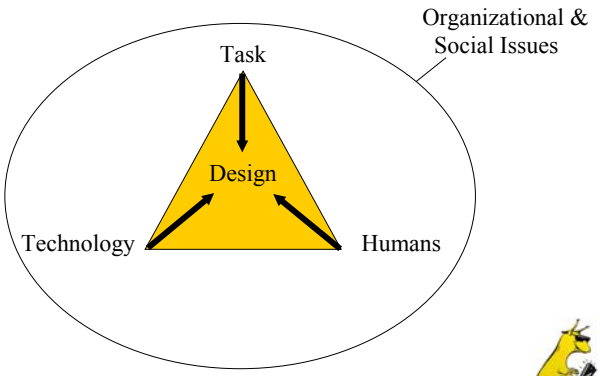
Project Timetable

- Timeline
  - W1: Choose team mates – 3-4, please attempt to have multidisciplinary team, let me know if you cannot team up (no promise)
  - W3: Project proposal – project description, target audience, why it is interesting
  - W5: User requirement report due.
  - W8: Prototypes and evaluation report due.
  - W10: Paper/report due. Project presentation.
  - W10: Review due (graduate)
- Email to arrive by 23:55 Friday of that week (timestamp) – cc all members

Using course resources

- The lecture notes
  - http://www.soe.ucsc.edu/classes/cmpe131/Fall08/
- Suggested readings:
  - Preece, Sharp, Rogers: Interaction Design (2nd ed)
  - http://developer.apple.com/documentation/UserExperience/Conceptual/OSXHIGuidelines/OSXHIGuidelines.pdf
  - http://msdn2.microsoft.com/en-us/library/aa185848.aspx
- The lectures
  - 2 lectures of 1hr 45 min / week over 10 weeks
- If you have any questions:
  1. Ask me questions at the end of the class
  2. Send me an email
  3. In emergency situation, knock on my door

Why do we learn HCI?



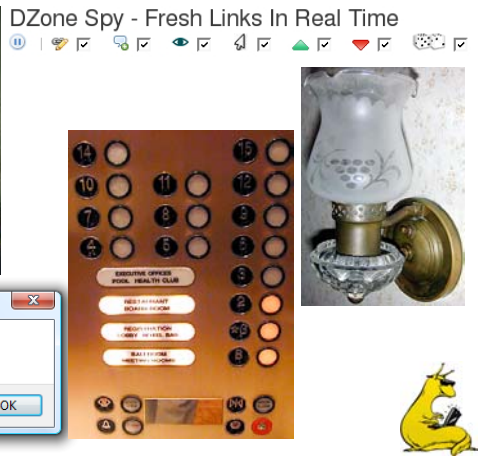
What is Human-Computer Interaction?

- A discipline concerned with
  - the design, evaluation and implementation
  - of interactive computing systems for human use and with
  - the study of major phenomena surrounding them
- Design of interactive systems that are:
  - enjoyable to use, that do useful things and that enhance the lives of the people that use them.
  - accessible, usable and engaging.
- Methods for:
  - capturing what people want to do rather than just what the technology/designer can do
  - understanding how to translate from what people wants to good design
  - involving people in the design process
  - designing for diverse users and uses

Related fields

- *Interaction design*: Designing interactive products to support the way people communicate and interact in their everyday and working lives
- *User experience*: study of how a product behaves and is used by people in the real world
- *Human-centered computing*: study of humans, as individuals and in social groups, by focusing on the ways that human beings adopt, adapt, and organize their lives around computational technologies
- *User-centered design*: a design philosophy and a process in which the needs, wants, and limitations of the end user of an interface or document are given extensive attention at each stage of the design process
- *Universal usability*: design of products with built-in flexibility enabling use by all people, regardless of age and ability

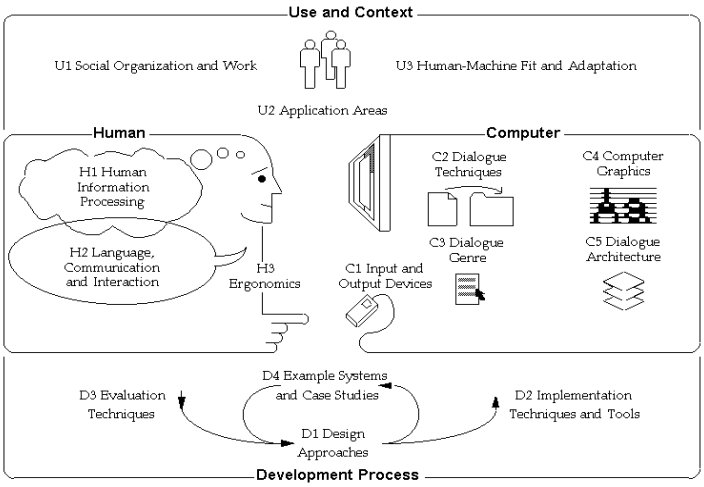
Bad designs are everywhere



How to avoid bad design?

- Identify needs and establish requirements
- Develop alternative designs to meet these
- Build prototypes with increasing complexity and interactivity that can be communicated and assessed by users
- Evaluate what is being built throughout the process (not only at the end)
- Things to remember:
  - Project goals need to be identified, clearly documented and agreed at the beginning
  - Users should be involved throughout the process
  - Iteration is a part of the process – sometimes by throwing away previous prototype

That means we need to know

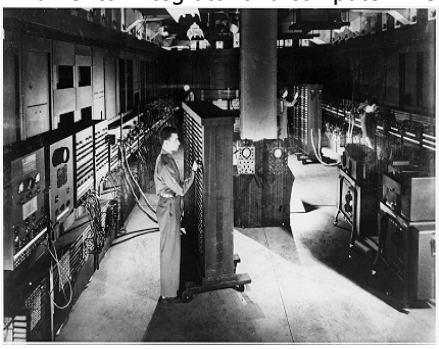


History of HCI

1. Evolution of machines: from ENIAC to Mac
2. And everything else
3. Historical figures and their inventions

1. Evolution of Machines: ENIAC (1943)

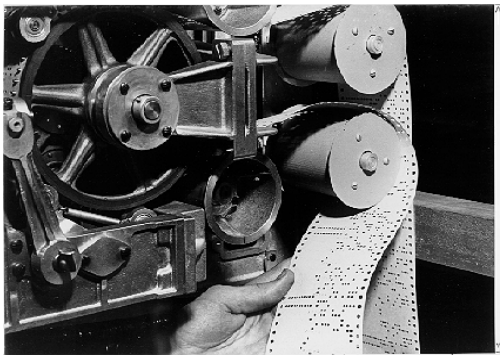
A general view of the ENIAC, the first all electronic numerical integrator and computer in USA.



From IBM Archives.

1. Evolution of Machines: Mark I (1944)

The Mark I paper tape readers.



From Harvard University Cruft Photo Laboratory.

1. Evolution of Machines: Mainframe Computers

IBM SSEC (1948): Selective Sequence Electronic Calculator. http://www.columbia.edu/acis/history/ssec.html

Manchester SSEM (1948) – "Baby": Small Scale Experimental Machine. Mark 1 prototype. http://www.computer50.org/mark1/new.baby.html

1. Evolution of Machines: DEC PDP-1 (1961)

- The world's first commercial interactive computer
- Pioneer in timesharing systems
- Affordable for smaller businesses and laboratories

1. Evolution of Machines: Xerox Alto (mid-1970s)

Alto applications:

Bravo WYSIWYG text editor.

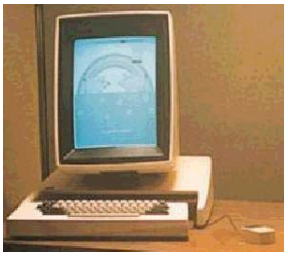
BravoX an ancestor of MS Word

Laurel e-mail program.

Neptune Disk file manipulation program.

Press Document printing program.

Sil Drawing program.



From Xerox Alto Archive

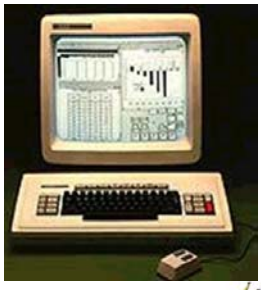
1. Evolution of Machines Apple II (1977)

- Colour graphics display
- Plastic case – beige
- 4K RAM (very large)
- 8 expansion slots
- BASIC hard-coded on the ROM
- Two game paddles
- Demo cassette = US$1298 (cheap)
- Disk drive was released in 1978

© Apple Inc.

1. Evolution of Machines: Xerox Star - 1981

- First commercial PC designed for "business professionals"
  - Desktop metaphor, pointing, WYSIWYG
- First system based on usability engineering
- Commercial flop



1. Evolution of Machines: Apple Macintosh - 1984

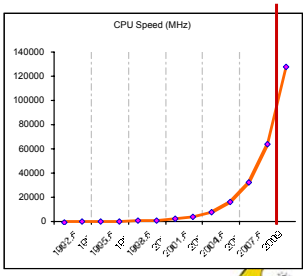
- Apple Lisa (1983) was a failure
- Macintosh is expensive - $2500
- Motorola 68000 chip (8MHz)
- 3rd party applications
- High quality graphics and laser printer but B&W
- The first PC that took 400k 3.5" disks

1. Evolution of Machines: Others – by IBM

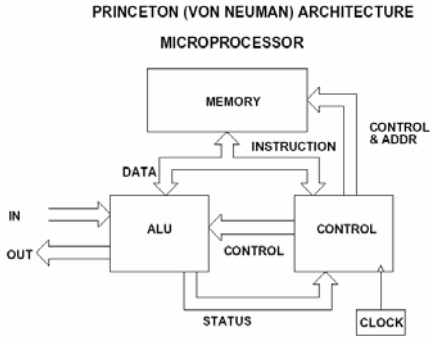
- IBM Mark-8 (1974)
- IBM 5100 (1975)
- IBM PC 5150 (1981)

1. Evolution of Machines: Processing speed and interactive performance

- Moore's Law - For a given cost: Speed and capacity double every 18 months
  - Predictability useful for planning
- Is faster better?
  - Need time to read and hear
  - Predictable feedback time
    - Unpredictability and error
  - Necessary to plan temporal response characteristics

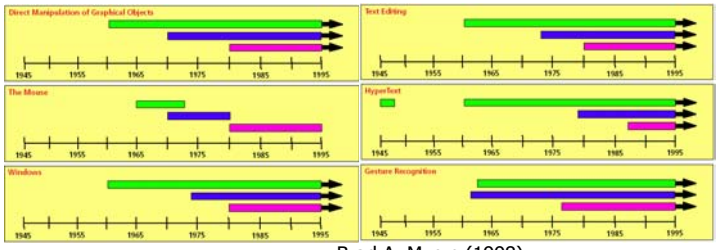


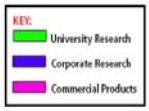
1. Historical Computer Architecture: Princeton Architecture (1946)



- A course on computer design run by von Neuman, Herman Goldstine and Arthur Burks.
- Blue print for 'modern' digital computing.

2. Historical Overview (1945-1995)





Brad A. Myers (1998).
A brief history of human-computer interaction technology.
Interactions, 5(2), pp. 44-54

2. Cell phone (1954)

- Martin Cooper, for Motorola, developed Dyna Tac
- 1089 gram, 9x5x1.75", 35 minutes of talk time
- 1955 introducing the worlds first whole automatic mobile-phone system.
- 1972 A global system is presented. Covers all the oceans of the world.
- 1978 introducing the worlds first person searching-system with a number-display.
- 1981 The world's first automatic and boundless mobile-phone system.
- 1986 First time when you can transfer computer services via a mobile system.
- 1988 The pocket-phone is introduced.

2. Virtual Reality (VR)

- 1956 Sensorama (Morton Heilig): 3D visuals, vibration, stereo sound, wind, smell.
- 1961 Headsight System (Philco Corp): Head Mounted Display (HMD), head tracking, remote video camera, telepresence.
- 1965 The Ultimate Display (Sutherland): Stereoscopic HMD, computer generated images, tracking, visually coupled system.
- 1967 Grope (Univ. North Carolina): 6 degree of freedom force feedback.
- 1977 The Sayre Glove (Univ. Illinois) Gesture recognition.
- 1987 Virtual Cockpit (British Aerospace) head and hand tracking, eye tracking, 3D visuals, 3D audio, speech recognition, vibro tactile feedback.

3. Historical Figures and Their Inventions

- 1945: Bush: information storage and retrieval problem (MEMEX)
- 1960: Licklider: Man-machine symbiosis
- 1962: Englebart: A conceptual framework for augmenting human intellect, mouse
- 1963: Sutherland: Sketchpad PhD thesis
- Some less talked about figures

3.1. Vannevar Bush (1890-1974)

- As We May Think* - 1945 *Atlantic Monthly p*ostulated **Memex** device
  - Can store all records/articles/ communications
  - Large memory
  - Items retrieved by indexing, keywords, cross references
  - Can make a trail of links through material.
- Envisioned as microfilm, not computer

*http://www.theatlantic.com/unbound/flashbks/computer/bushf.htm

3.2. J.R. Licklider (1915-1990)

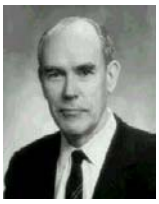
- 1960 - Postulated *man-computer symbiosis***
- Couple human brains and computing machines tightly to revolutionize information handling

"The hope is that, in not too many years, human brains and computing machines will be coupled together very tightly and that the resulting partnership will think as no human brain has ever thought and process data in a way not approached by the information-handling machines we know today."

**http://www.ipo.tue.nl/homepages/mrauterb/presentations/licklider.pdf

3.3. Ivan Sutherland (1938-)

- **SketchPad**: 1963 PhD thesis at MIT
  - Hierarchy - pictures & subpictures
  - Master picture with instances
  - Constraints
  - Icons
  - Copying
  - Light pen as input device
  - Recursive operations



3.4. Douglas C. Engelbart (1925 -)

- Engelbart invented the mouse at Stanford Research Labs in 1964.
- Landmark system/demo:
  - hierarchical hypertext, multimedia, mouse, hires display, windows, shared files, electronic messaging, CSCW, teleconferencing.
  - Augment/NLS system [NLS: oN Line System] - 2-D display text editting, by two persons from different consoles, at the same time.

3.5. Alan C. Kay (1940-)

- Dynabook - Notebook sized computer loaded with multimedia and can store everything, developed at Xeroc-parc (1979)
- Personal Computing
- Desktop Interface & GUI
- The FLEX OO software (1964)

3.6. Other historical figures

- Ted H. Nelson (1937-)
  - Coined the term "hypertext"
- Nicholas Negroponte (1935-)
  - wall-sized displays, video disks
  - AI in interfaces (agents), speech recognition, multimedia with hypertext
- Bill Gates (1955-)
  - Founded Microsoft Corp w/ Paul Allen in 1975
  - Founded Gates Foundation in 2000
  - Software for PC
- Steve Jobs (1955-)
  - Founded Apple Computer Inc. w/ Steve Wozniak in 1976