CSE 440: Introduction to HCI
User Interface Design, Prototyping, and Evaluation

Lecture 14: History

Tuesday / Thursday
12:00 to 1:20

James Fogarty
Kailey Chan
Dhruv Jain
Nigini Oliveira
Chris Seeds
Jihoon Suh

PAUL G. ALLEN SCHOOL
OF COMPUTER SCIENCE & ENGINEERING

DUB
DESIGN USE BUILD
Exam

Tuesday 11/21, in Denny 303

Mostly short answer, some long answer

Content drawn from lecture and readings

Compilation of the lecture slides is posted

Q&A Monday 11/20 at 3:00 in CSE 403
Project Status

Looking Forward

3e: Digital Mockup Due Tonight
3f: Report Due Monday 11/27
3g: Presentation Due Wednesday 11/29

4a: Initial Website Due Monday 11/27
4b: Video Prototype Due Monday 12/4

Other Assignments

Reading 5 Due Saturday 12/2, Sooner is Better
Denny 303 on Tuesday 11/21
Why do we do HCI in CSE?
Why do we do HCI in CSE?

Every engineering discipline includes the study of breakdowns and the design of improved solutions that address those breakdowns.
Tacoma Narrows
O-Rings

History of O-Ring Damage in Field Joints (Cont)

<table>
<thead>
<tr>
<th>SRM No.</th>
<th>O-Ring Temp (°F)</th>
<th>O-Ring Temp (°C)</th>
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<tr>
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<tr>
<td>3</td>
<td>69</td>
<td>20.5</td>
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<td>4</td>
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<tr>
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<td>72</td>
<td>27.8</td>
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<td>25.0</td>
</tr>
<tr>
<td>24</td>
<td>68</td>
<td>20.0</td>
</tr>
</tbody>
</table>

*Morton-Thokol, Inc.*

Warning: Operations

Information on this page was prepared to support an oral presentation and cannot be considered complete without the oral discussion.

* No Erosion
O-Rings

O-ring damage index, each launch

26°-29° range of forecasted temperatures (as of January 27, 1986) for the launch of space shuttle Challenger on January 28

Temperature (°F) of field joints at time of launch
Tractors
Tractors
Older tractors with narrow front ends are easily upset.

Tractor upsets cause more fatalities than other farm accidents.

Injuries often include a broken or crushed pelvis.
Tractors

Tractor upsets used to be dismissed as driver error

But such accidents are less frequent because modern designs have:

- roll cage
- low center of gravity
- wider wheel bases
Human Factors Tradition

Emerges during and after WWII, as highly trained people are failing to effectively control the machinery they operate

(pilots are crashing planes)

The phrase “human factors” now often has a connotation of studying factory workers, ergonomics, or other physical tasks

(ask me about Grudin article if interested)
1988: Iran Air Flight 655

In 1987, *USS Stark* was struck by two missiles launched by an Iraqi Mirage F-1, killing 37 with no weapons fired in self-defense during the attack.

In 1988, crew of the *USS Vincennes* Combat Information Center confusingly reported the plane as ascending and descending at the same time (there were two "camps").
1988: Iran Air Flight 655

The Airbus’s original track, number 4474, had been replaced by the USS Sides track, number 4131, when the computer briefly recognized them as one and the same. Shortly thereafter, track 4474 was re-assigned by the system to an American A-6, several hundred miles away, following a descending course at the time. Apparently not all the crew in the CIC realized the track number had been switched on them.
Why do we do HCI in CSE?

Every engineering discipline includes the study of breakdowns and the design of improved solutions that address those breakdowns.

Understanding how and why human interaction breaks down is fundamental to designing better computing systems.

This study must include computer scientists, as we are the ones creating the technology.
A History Question

Who invented hypertext? When?
Computing in 1945
Harvard Mark I, 55 feet long, 8 feet high, 5 tons
Computing in 1945

Harvard Mark I, 55 feet long, 8 feet high, 5 tons
Computing in 1945

Ballistics calculations

Physical switches (no microprocessor)

Paper tape

Simple arithmetic & fixed calculations (before programs)

3 sec. to multiply
Computing in 1945

First computer bug
(Harvard Mark II)
Adm. Grace Murray Hopper
A Little About Vannevar Bush

Name rhymes with “Beaver”
Faculty member at MIT
Coordinated WWII effort with 6000 US scientists

Social contract for science
- Federal government funds universities
- Universities do basic research
- Research helps economy and defense
As We May Think

Published in the Atlantic Monthly in 1945

http://www.theatlantic.com/magazine/print/1945/07/as-we-may-think/3881/

Motivated in part by defining a scientific grand challenge as WWII was ending
As We May Think

“There is a growing mountain of research. … The investigator is staggered by the findings and conclusions of thousands of other workers—conclusions which he cannot find time to grasp, much less to remember, as they appear. Yet specialization becomes increasingly necessary for progress, and the effort to bridge between disciplines is correspondingly superficial.”
As We May Think

“The world has arrived at an age of cheap complex devices of great reliability; and something is bound to come of it.”

“Had a Pharaoh been given detailed and explicit designs of an automobile, and had he understood them completely, it would have taxed the resources of his kingdom to have fashioned the thousands of parts for a single car, and that car would have broken down on the first trip to Giza.”
MicroPhotography

Describes a combination of photocells, facsimile transmission, and electron beam technology

Enables capturing a photograph into micro form

“It would be a brave man who would predict that such a process will always remain clumsy, slow, and faulty in detail.”
MicroPhotography

“Assume a linear ratio of 100 for future use. Consider film of the same thickness as paper, although thinner film will certainly be usable. Even under these conditions there would be a total factor of 10,000 between the bulk of the ordinary record on books, and its microfilm replica. The Encyclopedia Britannica could be reduced to the volume of a matchbox. A library of a million volumes could be compressed into one end of a desk.”
Memex
“If the user wishes to consult a certain book, he taps its code on the keyboard…”

“Frequently-used codes are mnemonic, so that he seldom consults his code book;”

“He can add marginal notes and comments … even … by a stylus scheme”

“All this is conventional…”
Memex

“It affords an immediate step, however, to associative indexing”

“tying two items together is the important thing”

“Before him are the two items to be joined, projected onto adjacent viewing positions. At the bottom of each there are a number of blank code spaces, and a pointer is set to indicate one of these on each item. The user taps a single key, and the items are permanently joined.”
Memex

“Thereafter, at any time, when one of these items is in view, the other can be instantly recalled merely by tapping a button below the corresponding code space. Moreover, when numerous items have been thus joined together to form a trail, they can be reviewed in turn, rapidly or slowly, by deflecting a lever like that used for turning the pages of a book.”
Memex

“Wholly new forms of encyclopedias will appear, ready made with a mesh of associative trails running through them, ready to be dropped into the memex and there amplified.”

Memex is the first proposed hypertext system
A History Question

Who invented desktop computing? When?
Macintosh in 1984 is well known

On January 24th, Apple Computer will introduce Macintosh.
And you’ll see why 1984 won’t be like “1984”

http://courses.cs.washington.edu/courses/cse440/videos/history/Apple1984.mp4
Macintosh in 1984 is well known

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http://courses.cs.washington.edu/courses/cse440/videos/history/Apple1984.mp4
Alan Kay on Early Interface Work

Narrator is Alan Kay, speaking in 1987

This video is almost 20 years old
It was a historical account when it was filmed

Speaks to four systems

Sketchpad
NLS
GRAIL
Dynabook

http://courses.cs.washington.edu/courses/cse440/videos/history/AlanKay1987.m4v
Ivan Sutherland’s Sketchpad

http://courses.cs.washington.edu/courses/cse440/videos/history/AlanKay1987-Sketchpad.m4v
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Ivan Sutherland’s Sketchpad

When do we think this was done?
Ivan Sutherland’s Sketchpad

When do we think this was done?
Ivan Sutherland’s Sketchpad

When do we think this was done?

1962

Windows
Constraints (i.e., non-procedural)
Prototype/Instance Inheritance (i.e., object-oriented)
Doug Engelbart’s NLS (Online System)
Doug Engelbart’s NLS (Online System)

<table>
<thead>
<tr>
<th>Category</th>
<th>Items</th>
</tr>
</thead>
</table>
| Produce  | Orange  
|          | Apples  
|          | Bananas |
| Produce  | Carrots |
| Produce  | Lettuce |
| Produce  | Beans   |
| Cans     | Apple Sauce |
| Cans     | Bean Soup  
| Cans     | Tomato Soup |
| Cereals  | Bread    |
| Cereals  | Noodles  
| Cereals  | French Bread |
| Dairy    | Cold Lotion  
| Dairy    | Milk     |
Doug Engelbart’s NLS (Online System)

When do we think this was done?
Doug Engelbart’s NLS (Online System)

When do we think this was done? 1968

Invention of the mouse
First working hypertext system
Chording keyboard to reduce hand movement
Remote collaboration

Analog Mouse leads to heavy moding
Reactions include accusations of “faking it” and claims of irrelevance because “terminal can do that”
GRAIL

http://courses.cs.washington.edu/courses/cse440/videos/history/AlanKay1987-GRAIL.m4v
GRAIL

http://courses.cs.washington.edu/courses/cse440/videos/history/AlanKay1987 GRAIL.m4v
When do we think this was done?
GRAIL

When do we think this was done? 1968

Window handles
Modeless interaction via direct action
Gesture recognition

Proposed for end-user programming via flow charts
Dynabook

http://courses.cs.washington.edu/courses/cse440/videos/history/AlanKay1987-Dynabook.m4v
Dynabook

http://courses.cs.washington.edu/courses/cse440/videos/history/AlanKay1987-Dynabook.m4v
Xerox to Apple and Microsoft

XEROX Alto 1973
Xerox Alto
Xerox Alto

--- BEGINNING ---
1012: AutoReads.Boot.
Anonymous.1.
Battleship.cr.
Battleship.RUN.
Blockade.RUN.
BuildKalcm.
Calculator.scm.
Calculator.SUN.
Chess.log.
Chess.run.
Cms.Cm.
CompileKalcm.
CRTTEST.RUN.
DMT.boot.
EdBuild.run.
empress.run.
Executive.Run.
Fly.run.
galaxian.boot.
Garbage.3.
Go.run.
GolFont.ALI.
Intruders.Run.
junk.
junkbss.
Kal.bpl.
Kal.cm.
Kal.A.scm.
Kal.M.scm.
Kinetic4.RUN.
LookKalcm.
MasterMind.RUN.
maze.run.
Mesa.Typescript.
Musical.run.
NEPTUNE.RUN.
other.run.
Fintail.easy.run.
POLYGON.88.run.

No DISK <SYSDIR> *,*
Xerox to Apple and Microsoft

XEROX Alto 1973
Steve Jobs visits PARC in 1979
Xerox to Apple and Microsoft

XEROX Alto 1973
Steve Jobs visits PARC in 1979
XEROX STAR 1981
Xerox Star
Xerox Star
Xerox Star

XEROX 8010 Star Information System

Star provides integrated text and graphics. A variety of type sizes and styles may be used.

<table>
<thead>
<tr>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
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<td>$0.39</td>
</tr>
<tr>
<td>Beans</td>
<td>$0.50</td>
</tr>
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</table>

NAME
- 0 Temporary title page
- A Copyright and abstract
- B Front matter
- Chapter 1
- Chapter 2
- Chapter 3
- Chapter 4
- Chapter 5
- Chapter 6
- Chapter 7
- References
- Styles

SIZE
- 1 Page
- 2 Pages
- 4 Pages
- 11 Pages
- 15 Pages
- 21 Pages
- 36 Pages
- 15 Pages
- 7 Pages
- 13 Pages
- 3 Pages
- 5 Pages

VERSION OF
- 10/30/84 13:29
- 11/06/84 16:12
- 10/31/84 22:05
- 10/30/84 13:56
- 10/31/84 22:49
- 11/02/84 15:41
- 10/31/84 21:47
- 11/02/84 15:45
- 10/30/84 18:02
- 10/31/84 22:10
- 10/31/84 21:58
- 10/22/84 11:42
Xerox Star
Xerox Star
Xerox Star
Xerox Star
Xerox Star
Xerox Star
Xerox to Apple and Microsoft

XEROX Alto 1973
Steve Jobs visits PARC in 1979
XEROX STAR 1981
Apple Lisa 1981
Apple Lisa
Apple Lisa
Apple Lisa
Apple Lisa
Xerox to Apple and Microsoft

XEROX Alto 1973
Steve Jobs visits PARC in 1979
XEROX STAR 1981
Apple Lisa 1981
Apple Macintosh 1984
Macintosh
Macintosh

The Macintosh™ Finder
Bruce Horn and Steve Capps

1932K  Version 4.1 ©1985 Apple Computer

System Folder
6 items  165K in folder  48K available
System  Finder  Imagewriter  Clipboard  File  Note Pad  File  Scrapbook File
Macintosh
Xerox to Apple and Microsoft

XEROX Alto 1973
Steve Jobs visits PARC in 1979
XEROX STAR 1981
Apple Lisa 1981
Apple Macintosh 1984
Windows 1.0 1985
Windows 1.0
Windows 1.0

floppy drive configuration as it conserves disk space. To use this feature change the "Spooler=yes" in the [windows] section of the WIN.INI file to read "Spooler=no".

Note: Setting Spooler=no will disable printing from Windows Terminal.

RUNNING BATCH (.BAT) FILES FROM WINDOWS
If you run a standard application from a batch file you should create a PIF file for the batch file. The PIF file should have the same PIF options set as the application. The Memory Required and Memory Desired options for the batch PIF file should always be set to 32K. This is independent of the memory requirements for the application.

Batch files should be run from the MS-DOS Executive.

RUNNING WINDOWS WRITE ON A TWO FLOPPY SYSTEM
Several precautions should be observed when using Windows
Windows 1.0
Xerox to Apple and Microsoft

XEROX Alto 1973
Steve Jobs visits PARC in 1979
XEROX STAR 1981
Apple Lisa 1981
Apple Macintosh 1984
Windows 1.0 1985
Windows 2.0 1987
Windows 2.0 (1987)
Windows 2.0
Xerox to Apple and Microsoft

XEROX Alto 1973
Steve Jobs visits PARC in 1979
XEROX STAR 1981
Apple Lisa 1981
Apple Macintosh 1984
Windows 1.0 1985
Windows 2.0 1987
Windows 3.0 1990
Windows 3.0

Microsoft Windows Version 3.00a
Copyright © 1985-1990 Microsoft Corp.

Real Mode

Free Memory...... 396K

OK
Windows 3.0
Windows 3.0
Xerox to Apple and Microsoft

XEROX Alto 1973
Steve Jobs visits PARC in 1979
XEROX STAR 1981
Apple Lisa 1981
Apple Macintosh 1984
Windows 1.0 1985
Windows 2.0 1987
Windows 3.0 1990

Bill Gates: "Hey, Steve, just because you broke into Xerox's house before I did and took the TV doesn't mean I can't go in later and take the stereo"
HCI Turing Awards

Sutherland wins 1988 Turing Award

Engelbart wins 1997 Turing Award

Alan Kay wins 2003 Turing Award
  (in part for SmallTalk and OOP, though he says OOP is linked to the GUI)

Tim Berners-Lee wins 2016 Turing Award
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