

Historical Perspective of HCI

Questions

- Historical perspective of HCI
 - a short history of “computer”
 - major developments in HCI fields

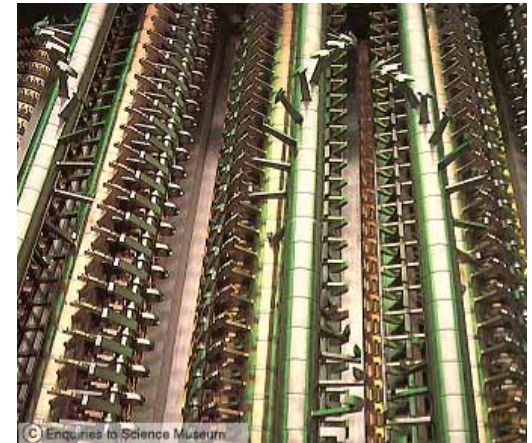
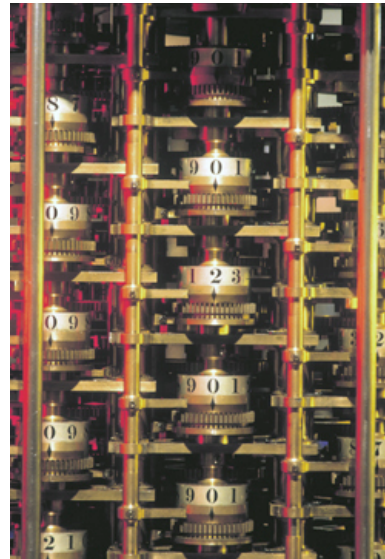
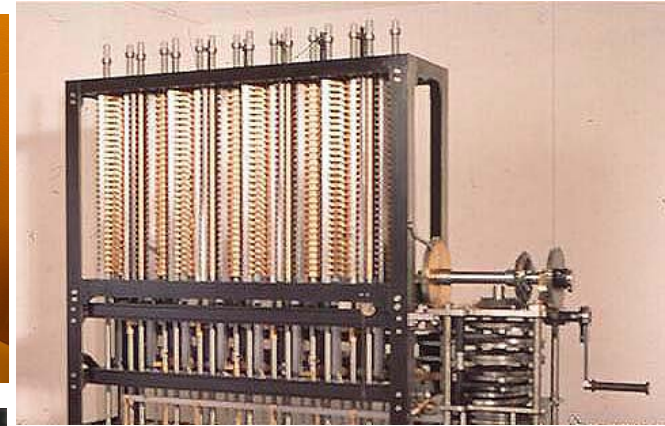
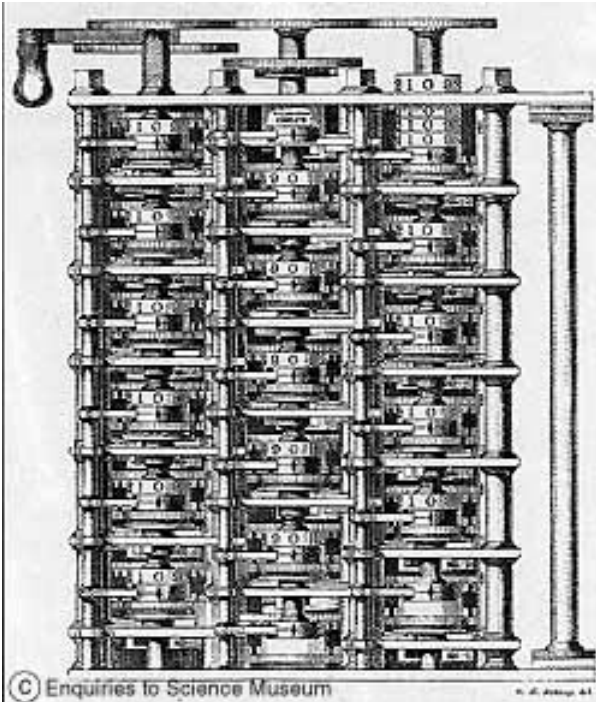
Early example: Astrolabe (Middle Age)

- time of the day
 - sun & star
 - season
 - latitude of the observation
- Convenient interface to complex computation
- easy to use?



Babbage Difference Engine (1791~1840)

- Original design
- Replica (British Museum, 1985)

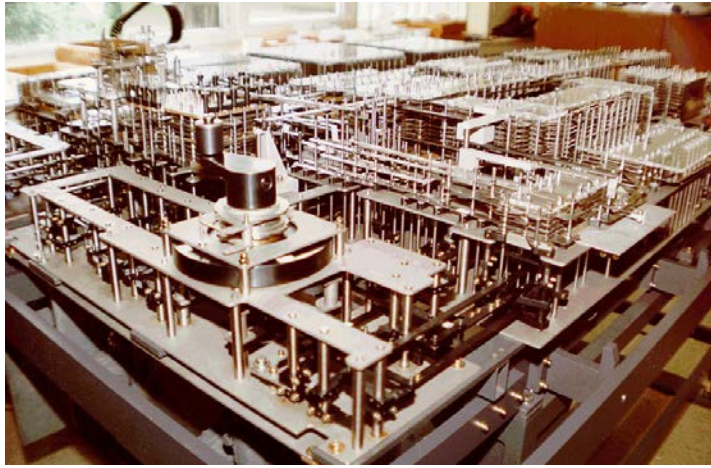


the father of today's computer

To calculate mathematical tables
(for ship navigation)

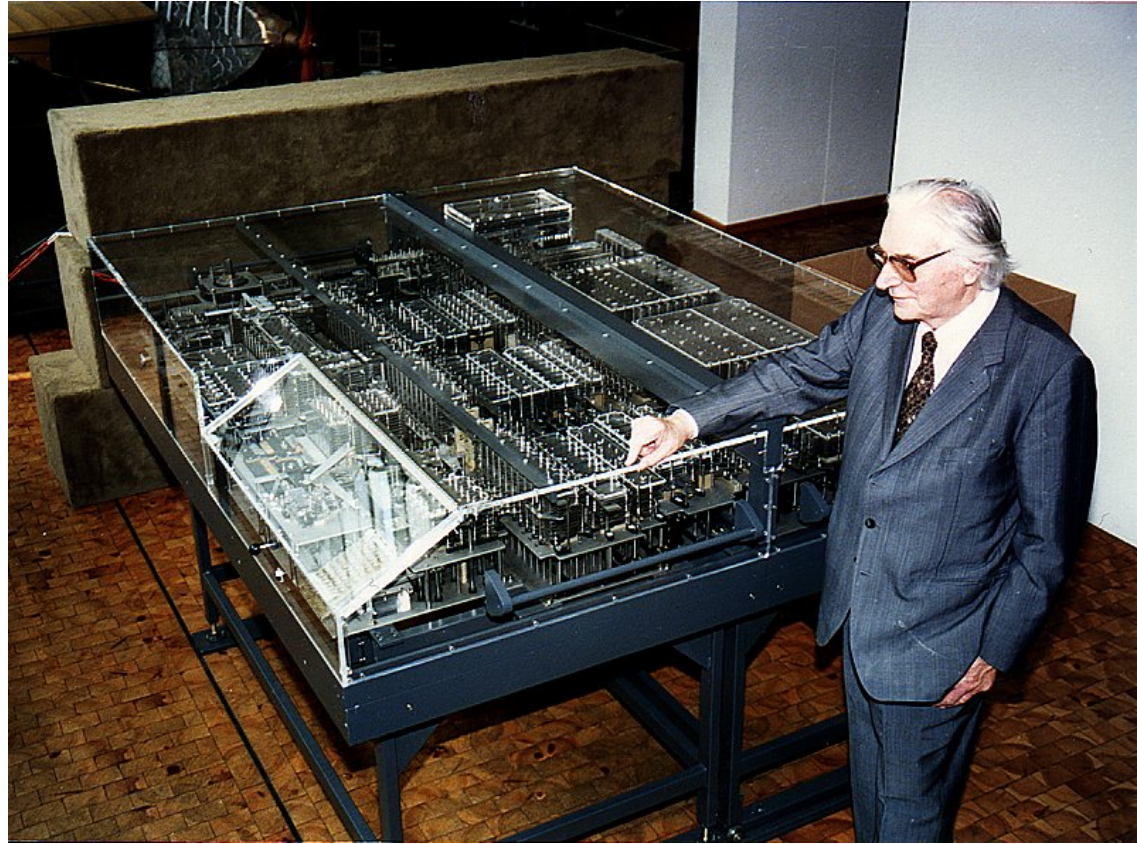
* a design with “printer”

automatic mechanical calculator
designed to tabulate polynomial functions



Z1(1936)

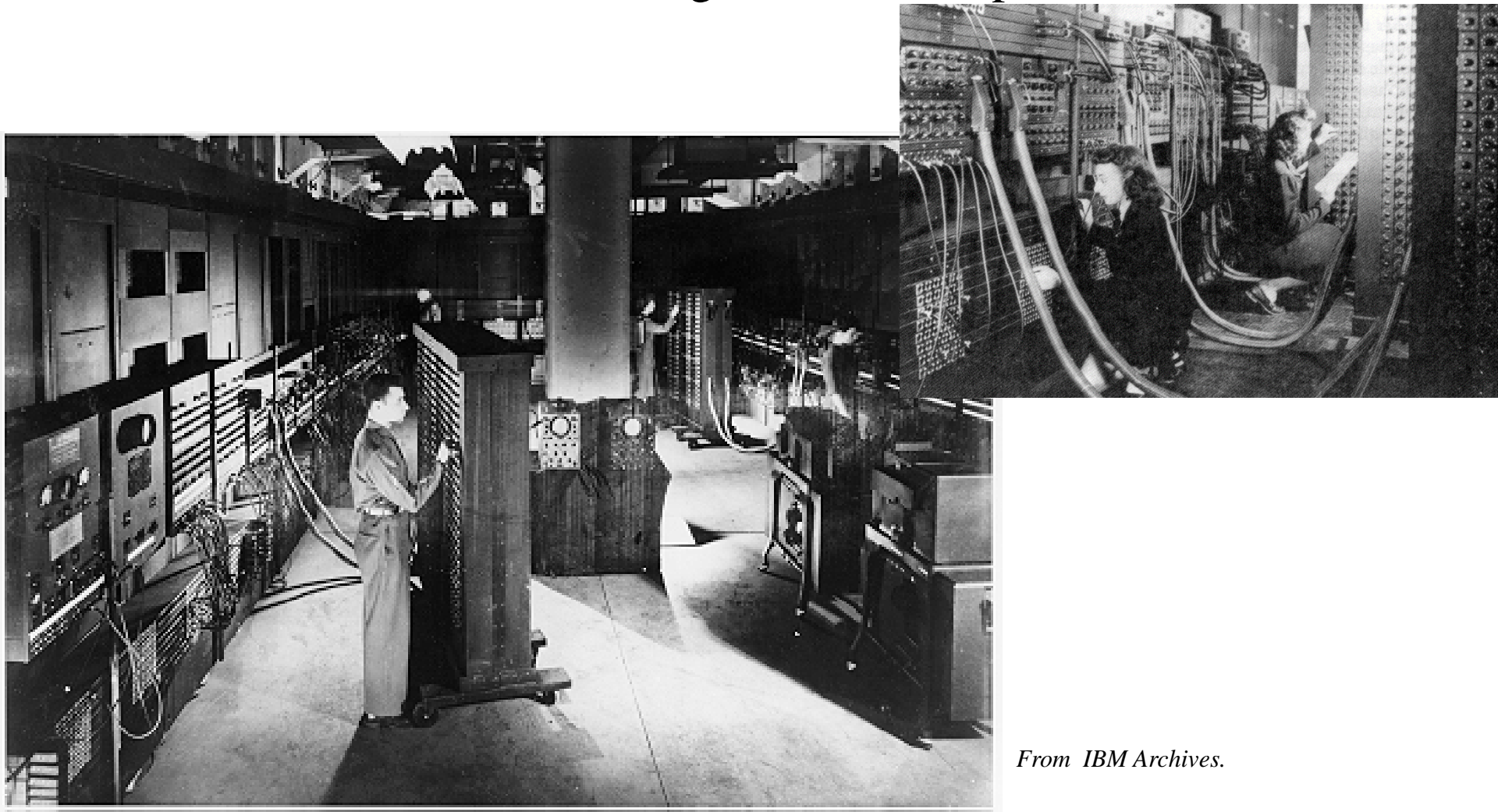
by Konrad Zuse



- a 22-bit floating point value adder and subtractor
- multiplication (by repeated additions)
- division (by repeated subtractions)
- punch cards

ENIAC (1943)

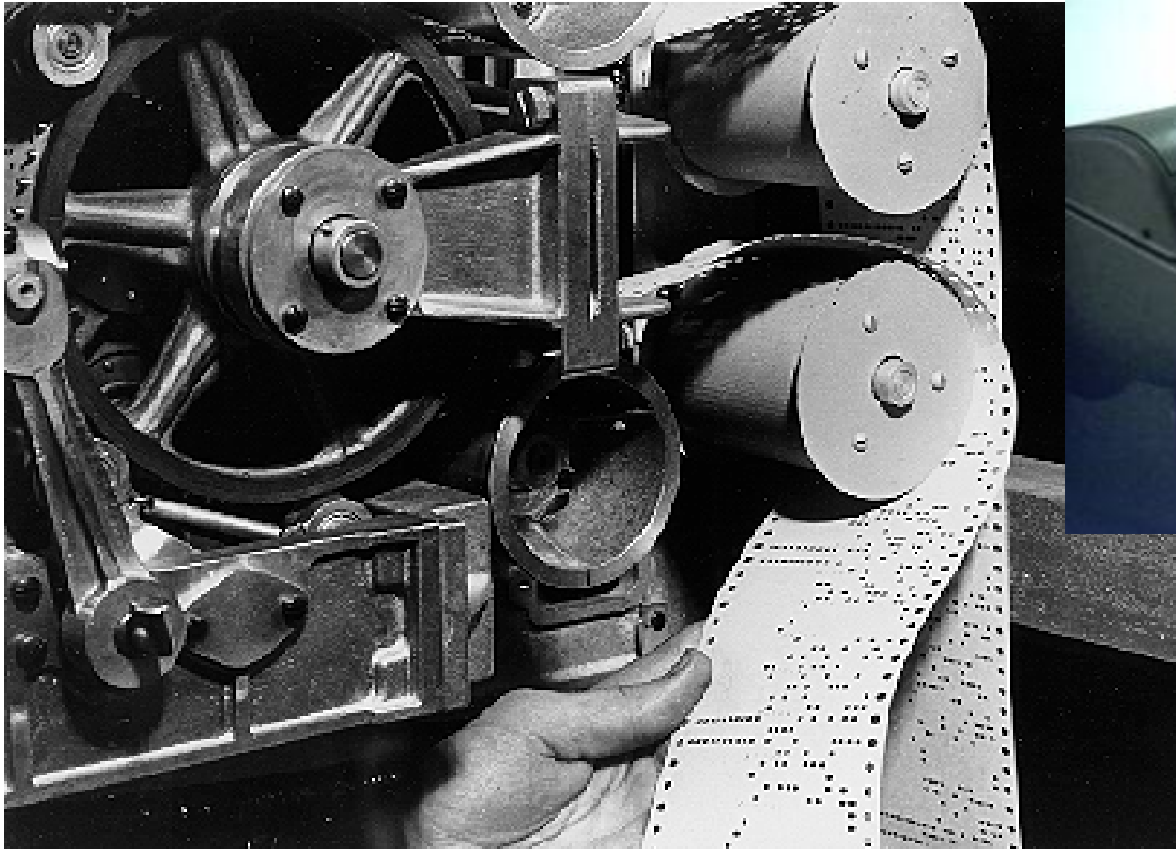
- A general view of the ENIAC, the world's first all **electronic** numerical integrator and computer.



From IBM Archives.

Mark I (1944)

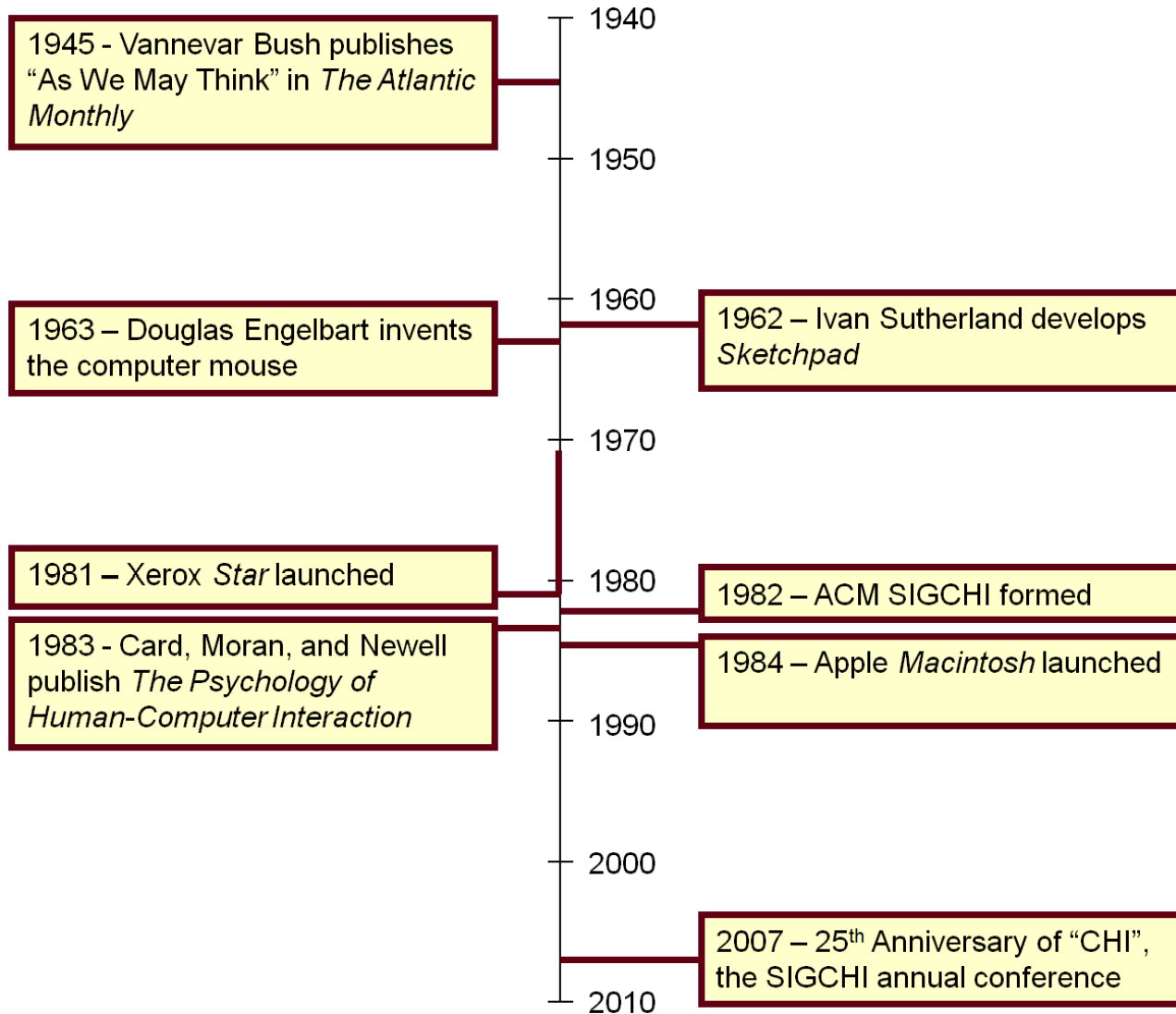
- The Mark I paper tape readers.



From Harvard University Cruft Photo Laboratory.

use Teletype to enter data and program

Significant Event Timeline



“As We May Think” Vannevar Bush (1945)



Memex (1945)

Vannevar Bush published “As We May Think”

- in Atlantic Monthly
- the theoretical proto-hypertext computer system
- read a large self-contained research library, and add or follow associative trails of links and notes (associative indexing)

Precursor to:

- Hypertext
- The Web
- Digital Libraries
- Recorded human memory

But no search...

Sketchpad (1963)

- Ivan E Sutherland's PhD thesis – [video](#)
- “talking to computer graphically”
- “don't know what the problem is and how to solve it”
- “making computer almost like a human assistance”
- let human solve the problem as they are formulating it



Sketchpad: “Direct Manipulation”

- Direct manipulation features:
 - Visibility of objects
 - Incremental action and rapid feedback
 - Reversibility
 - Exploration
 - Syntactic correctness of all actions
 - Replacing language with action
- Term coined by Ben Shneiderman¹

¹ Shneiderman, B., Direct manipulation: A step beyond programming languages, in *IEEE Computer*, 1983, August, 57-69.

Sketchpad

- founding father of Computer Graphics
- done with computing power far less than old palm pilot

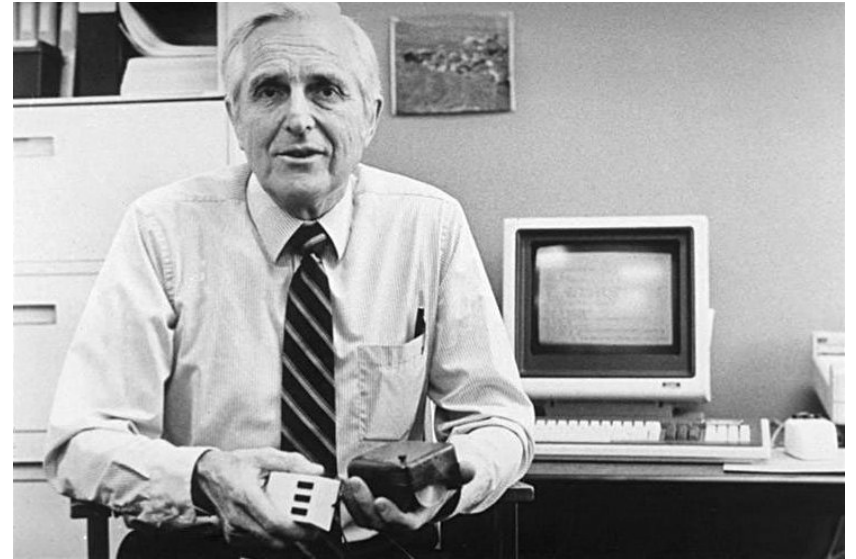
“Having a computer helping human solving a problem by letting human solve the problem as they are formulating it.”

- 2 handed interactions
- Immediate feedback
- Magnetic snap
- Constraints

- But no user study of Sketchpad

Invention of the Mouse

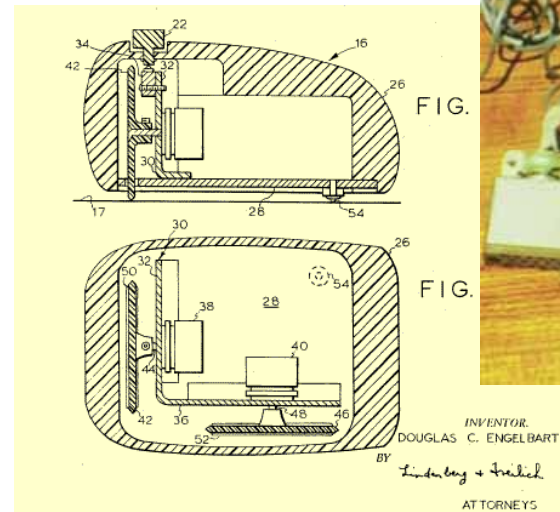
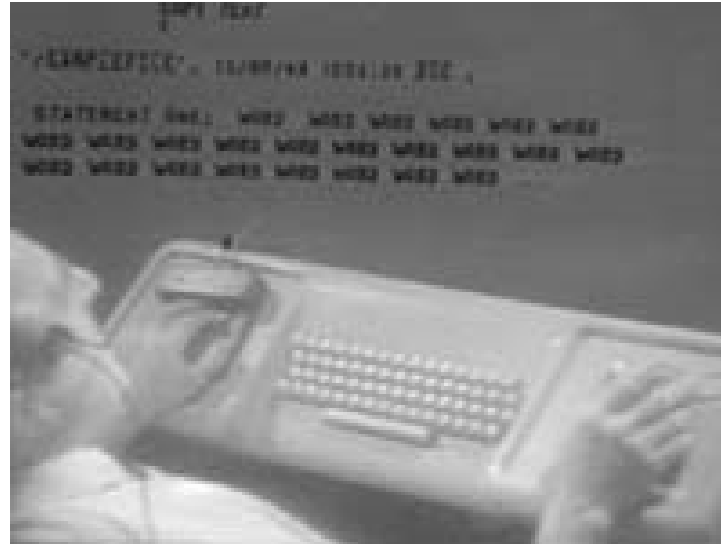
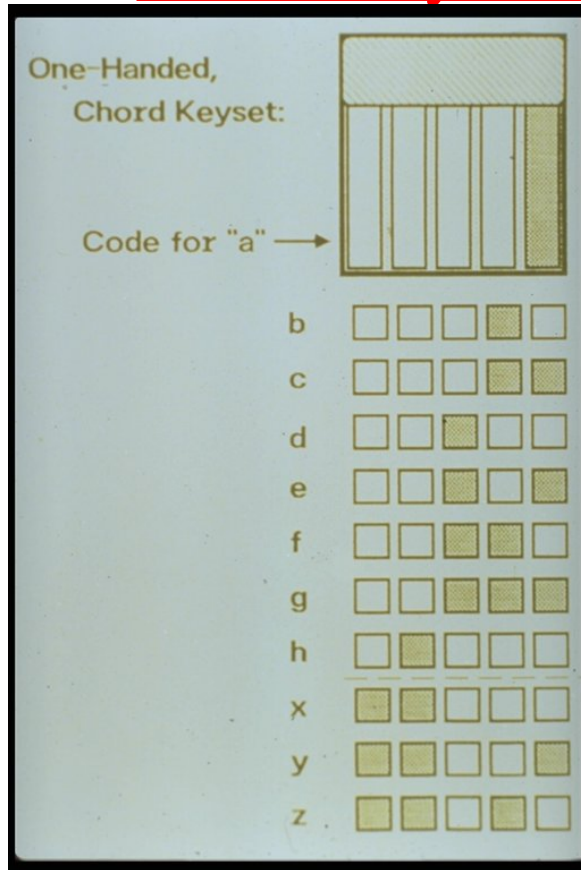
Doug Engelbart (1963)



NLS (Douglas Engelbart, 1968)

oNLine System (NLS)

Office Worker

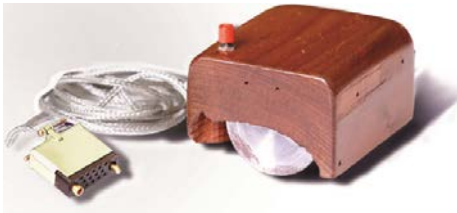


90-minute live public
demonstration, 1968

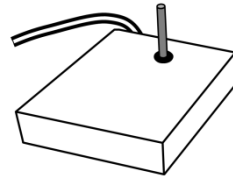
<http://www.dougelbart.org/>

HCI's First User Study¹

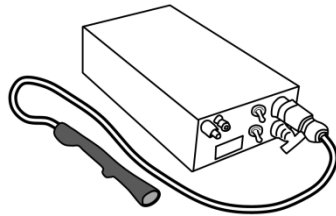
A comparative evaluation of...



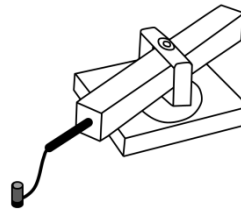
Mouse



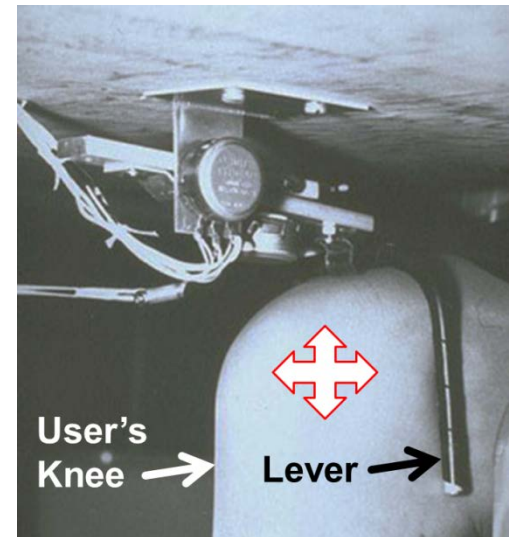
Joystick



Lightpen



Grafacon



Knee-controlled lever

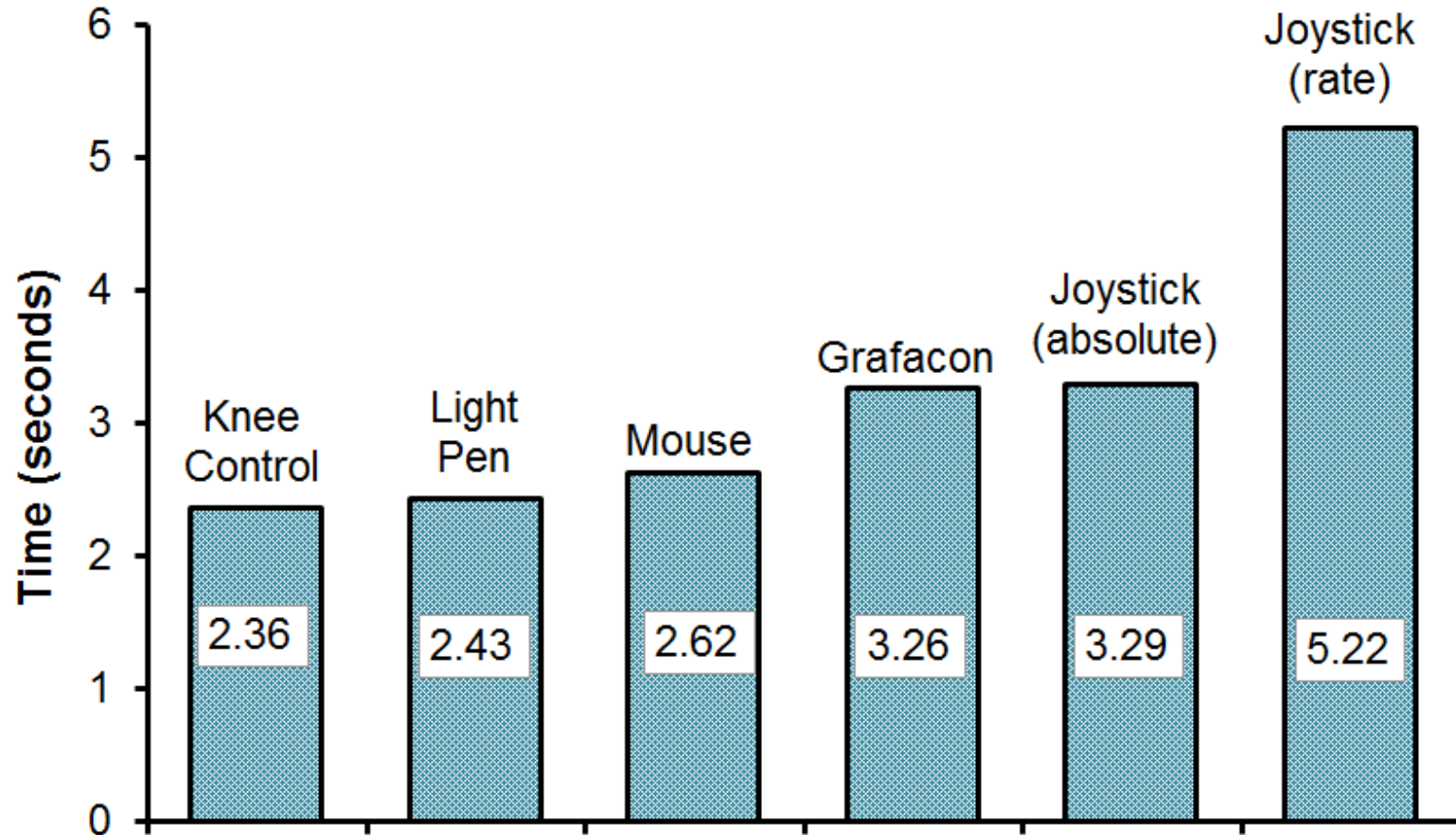
¹ English, W. K., Engelbart, D. C., & Berman, M. L. (1967). Display selection techniques for text manipulation. *IEEE Transactions on Human Factors in Electronics*, HFE-8(1), 5-15.

[Click here](#)

Experiment Design

- Participants: 13
- Independent variable
 - “Input method” with six levels: mouse, light pen, Grafacon, joystick (position-control), joystick (rate-control), knee-controlled lever
- Dependent variables
 - Task completion time, error rate
 - (Note: task completion time = access time + motion time)
- Within-subjects, counterbalanced
- Task:
 - Press spacebar, acquire device, position cursor on target, select target

Results (1)

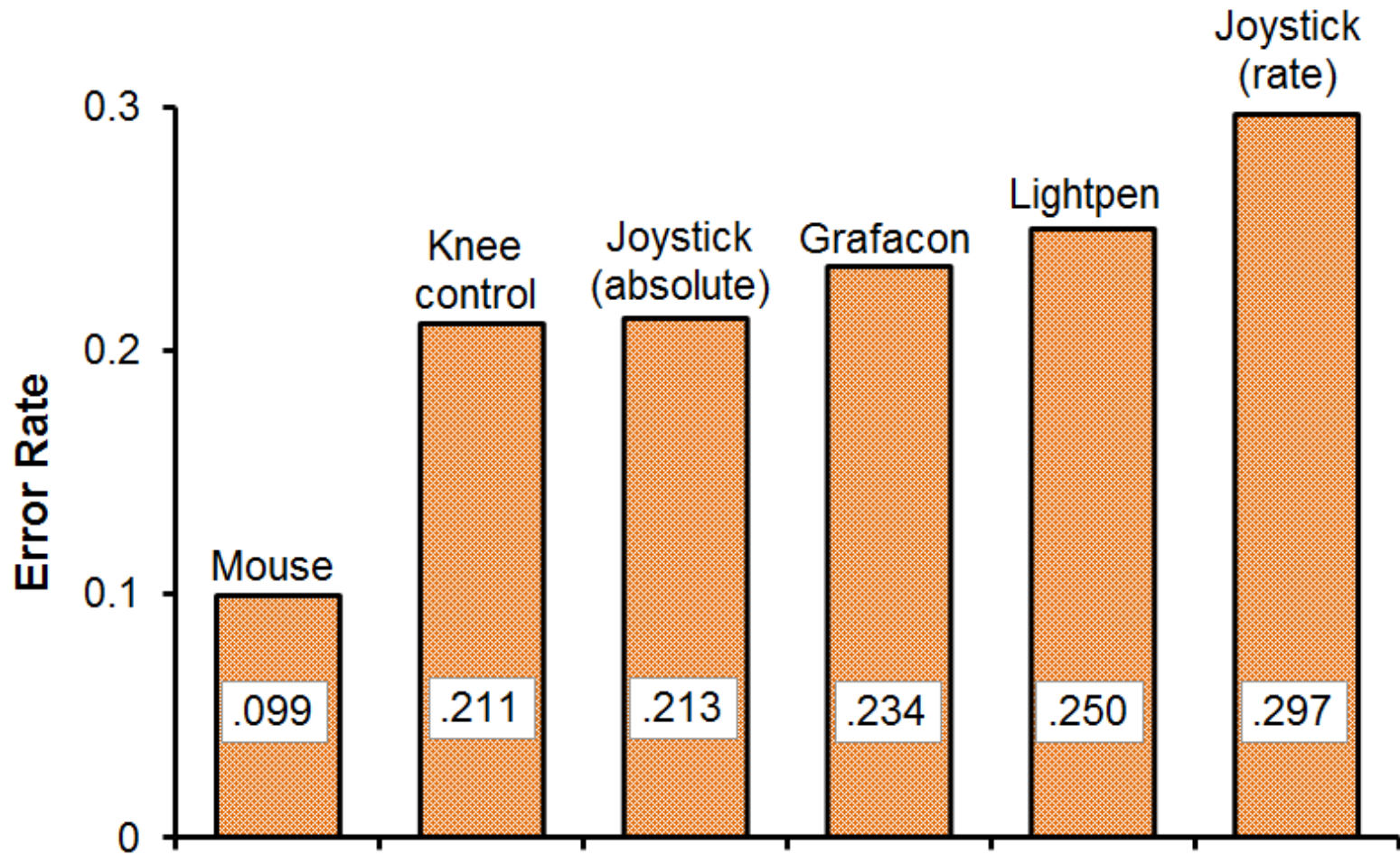


Notes:

¹ Access time with the knee-controlled lever was zero (since the device is always “acquired”).

² Light pen use is fatiguing, since the user’s arm is held in the air in front of the display.

Results (2)



NLS (Douglas Engelbart, 1968)



wikipedia

- Mouse
- A cording keyboard
- Foldable outline system
- Hypertext
- Online help...
- Direct text manipulation
- Shared-screen collaboration
 - involving two persons at different sites communicating over a network with audio and video interface.

Apple *Macintosh* Timeline

1976	April – Apple Computer Inc. founded in Cupertino, California.
1977	Launch of Apple II. Sells for \$1300 U.S. with 4KB RAM. Hugely successful (more than one million units sold). Works with a text-based command-line interface.
1978	<i>Lisa</i> project started . Goal of producing a powerful (and expensive!) personal computer.
1979	September – <i>Macintosh</i> project started. Goal of producing a low-cost easy-to-use computer for the average consumer. December – Apple and Xerox sign an agreement that allows Xerox to invest in Apple. In return Apple's engineers visit Xerox PARC and see the Xerox <i>Alto</i> . The GUI ideas in the <i>Alto</i> influence <i>Lisa</i> and <i>Macintosh</i> development.
1980	December – Apple goes public through initial public offering (IPO) of its stock.
1981	May – Xerox <i>Star</i> launched at the National Computer Conference (NCC) in Chicago. Members of the <i>Lisa</i> design team are present and see the <i>Star</i> demo. They decide to re-vamp the <i>Lisa</i> interface to be icon-based. August – IBM PC announced. Highly successful, but embodies traditional text-based command-line interface.
1982	<i>Lisa</i> and <i>Macintosh</i> development continue. Within Apple, there is an atmosphere of competition between the two projects
1983	January – <i>Lisa</i> released. <i>Lisa</i> incorporates a GUI and mouse input. Sells for \$10,000 U.S. In the end, <i>Lisa</i> is a commercial failure. December -- brochures distributed in magazines (e.g., <i>Time</i>) pre-announcing the <i>Macintosh</i> .
1984	January 22 – <i>Macintosh</i> ad plays during Super Bowl XVIII. January 24 – <i>Macintosh</i> released. Sells for \$2500 U.S.

Alto (mid-70's) & Star (1981)

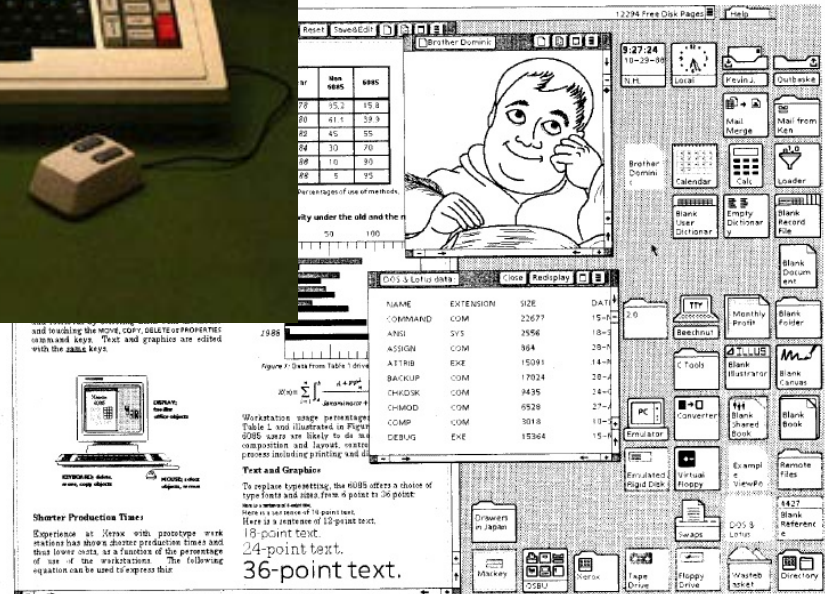
- Xerox PARC



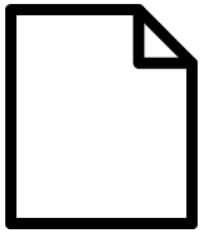
Xerox Alto w/ hard drive
1973



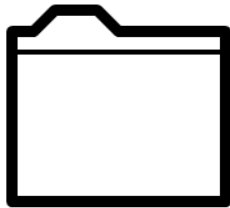
Star, 1981



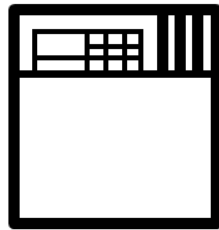
Star GUI Icons



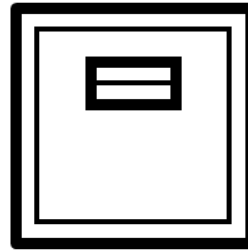
Document



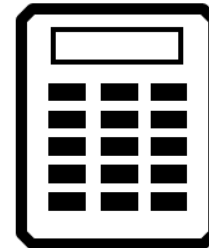
Folder



Record File



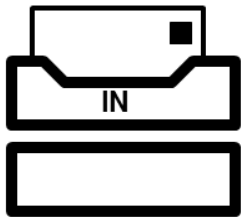
File Drawer



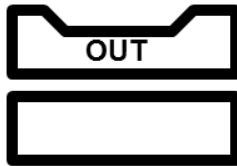
Calculator



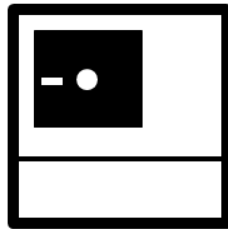
Terminal



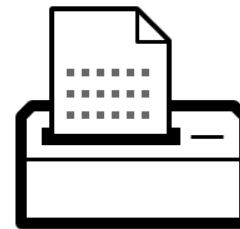
In Tray



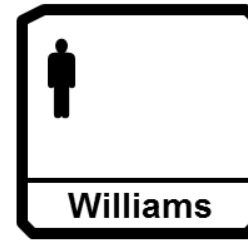
Out Tray



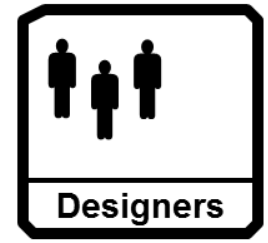
Floppy Disk
Drive



Printer



User



User Group

Star Details

- Number of mouse buttons
- Mouse vs. cursor keys
- Progressive exposure
- Direct manipulation
- WYSIWYG
 - Windows, scrollbar, property window, network, distributed resources

Apple IIe (1977 ~1993)



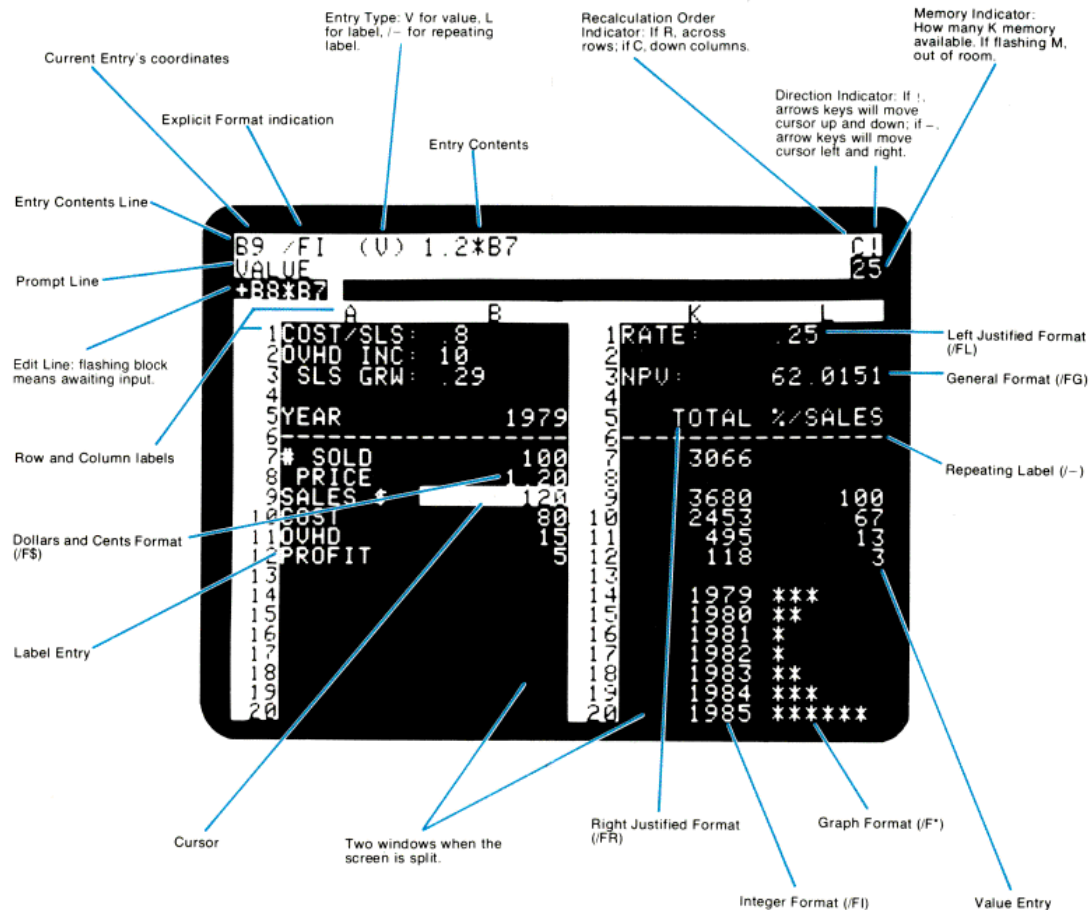
- longest-lived computer in Apple's history
- reset key
- auto-repeat function
- full ASCII character set
- input/display lower case letters



Apple I, 1976

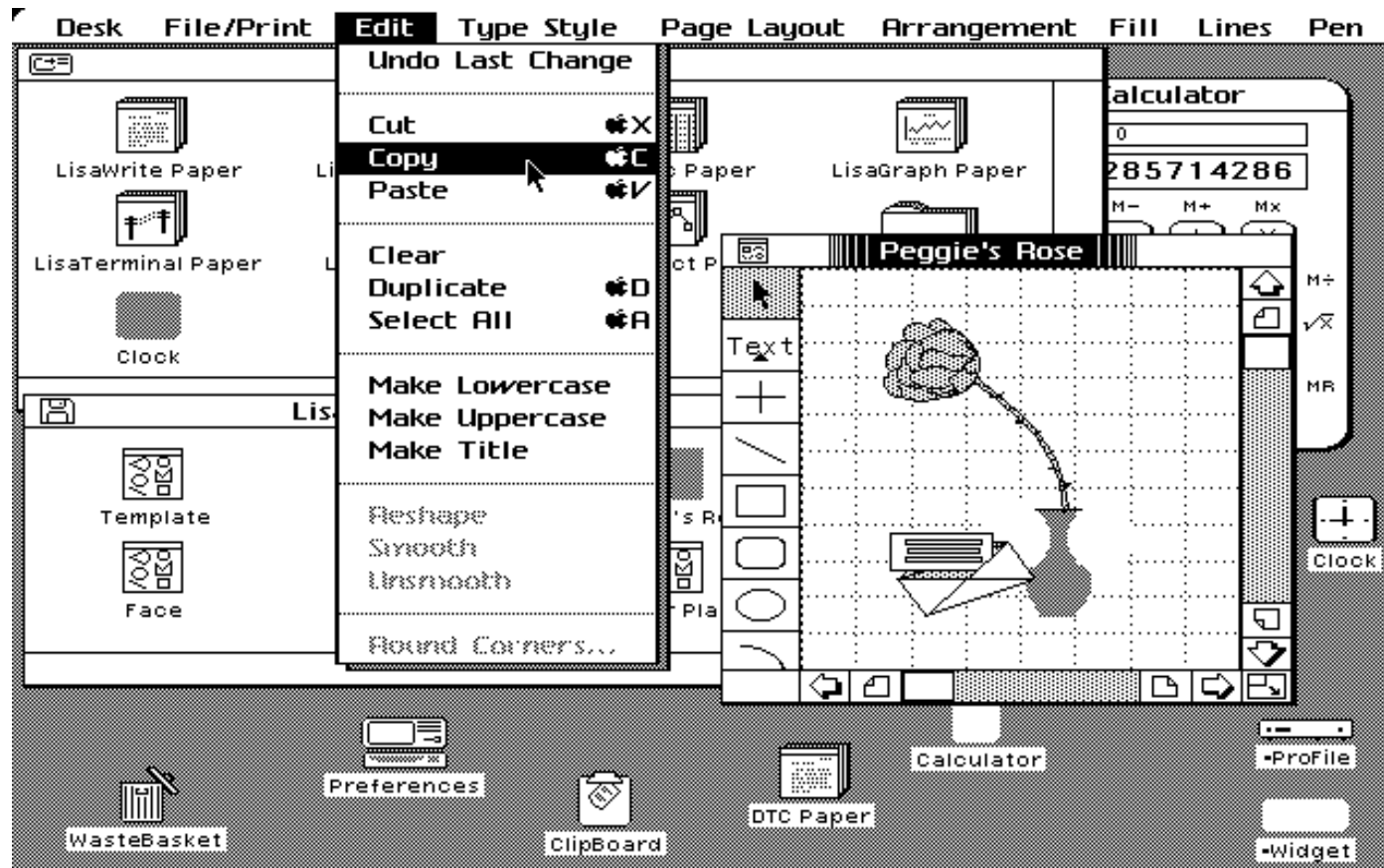
9

10



Apple Lisa (1983)

- based upon many ideas in the Star; predecessor of Macintosh,
- somewhat cheaper (\$10,000)
- commercial failure as well



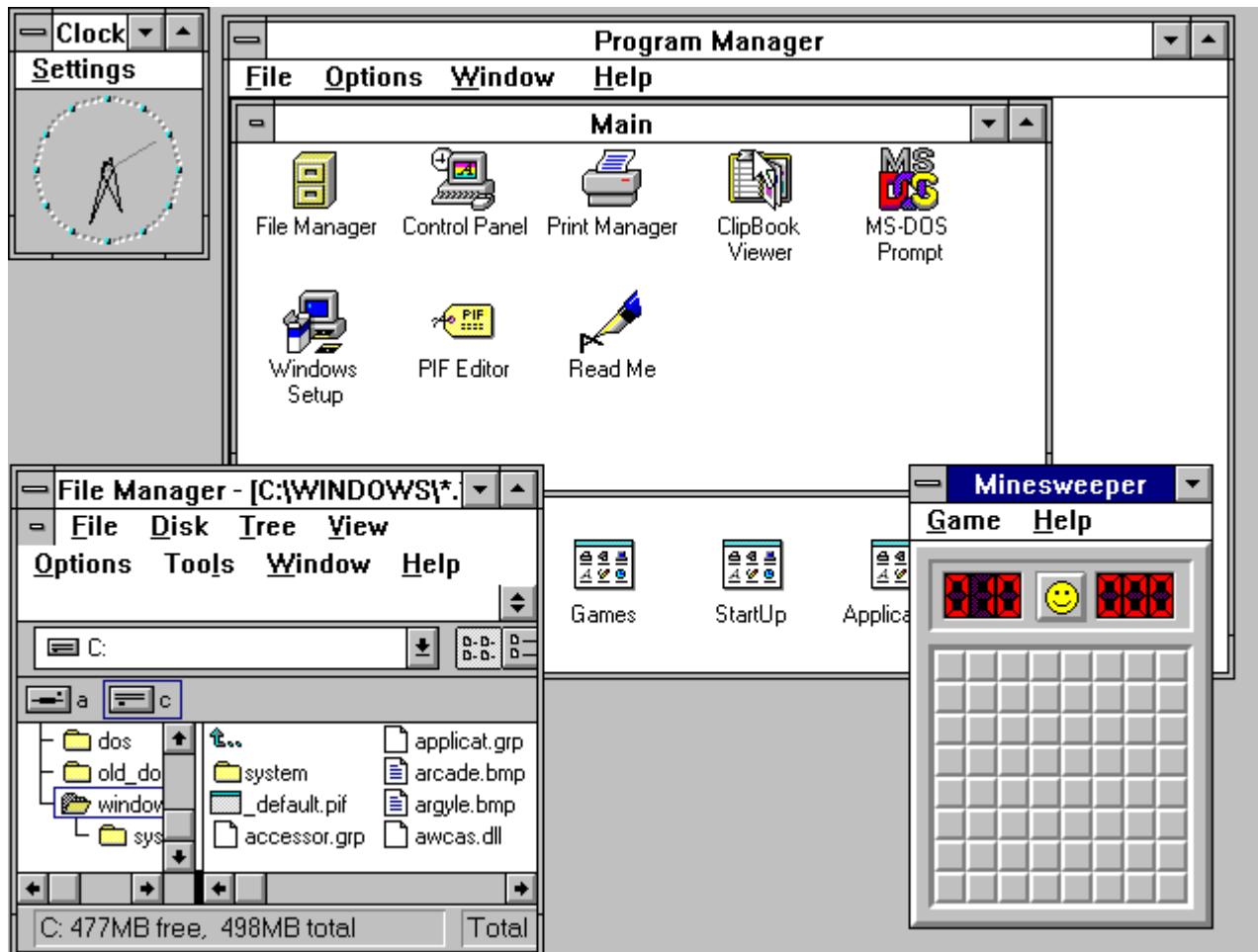
Apple *Macintosh* (1984)



IBM PC (1981)



Windows 3.1 (1992)

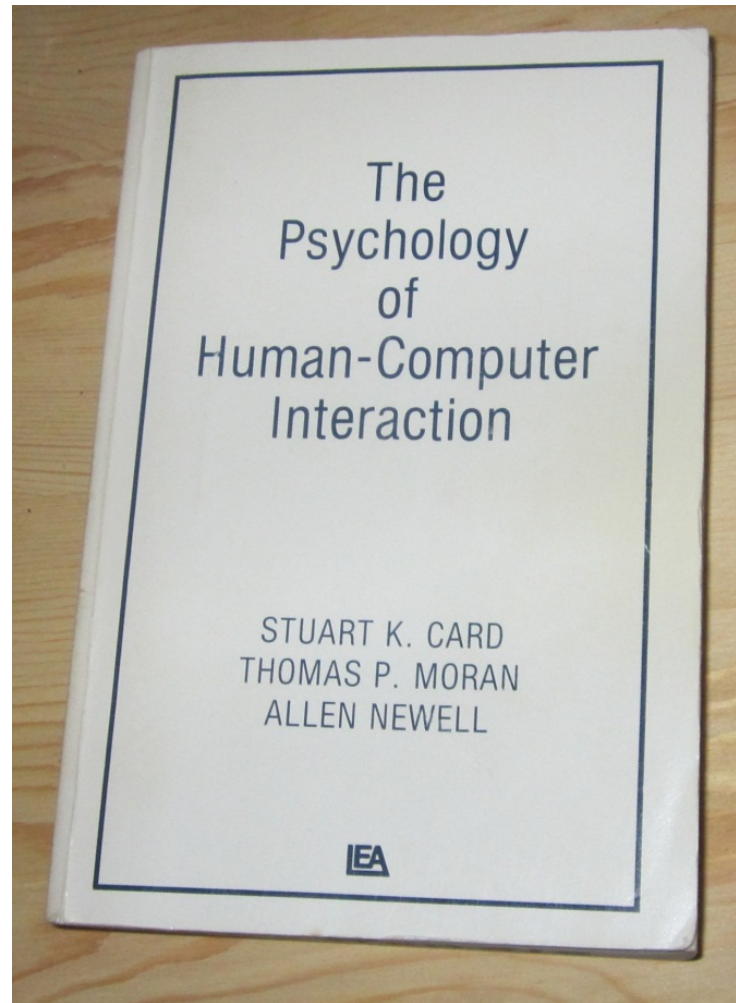


Birth of HCI - 1983

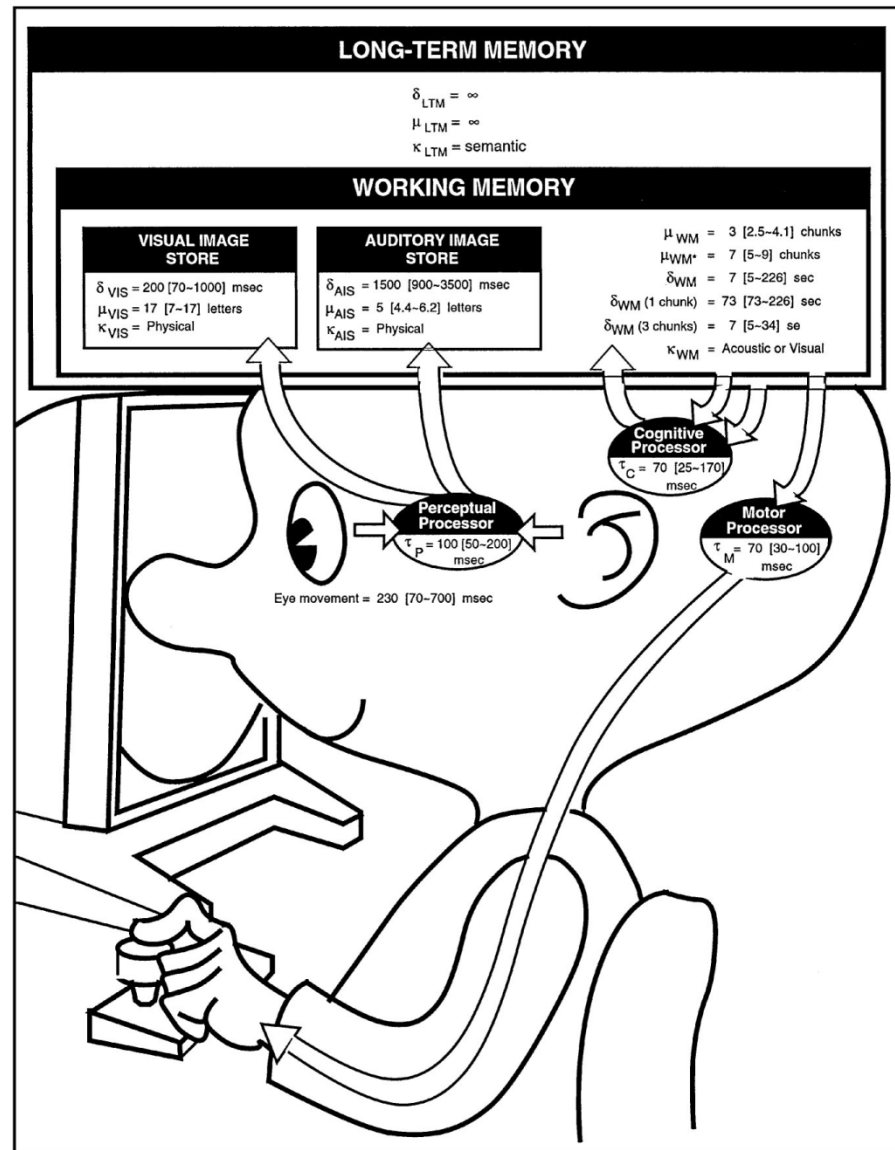
- Notable events:
 1. First ACM SIGCHI conference (1983)
 2. Publication of *The Psychology of Human-Computer Interaction* by Card, Moran, and Newell (1983)
 3. Apple *Macintosh* announced via brochures (December, 1983) and launched (January, 1984)

The Psychology of Human-Computer Interaction

Card, Moran, and Newell (1983)

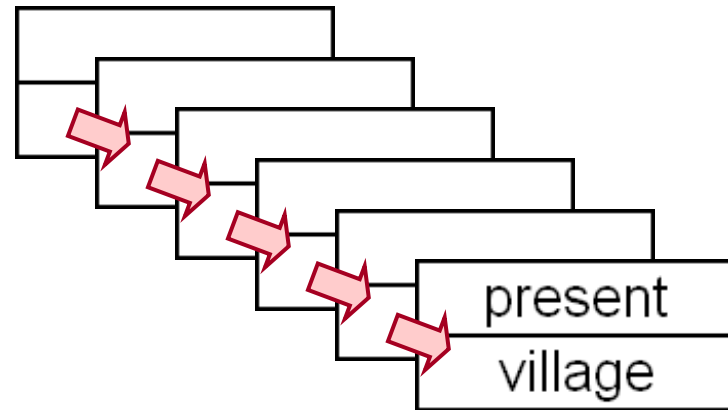
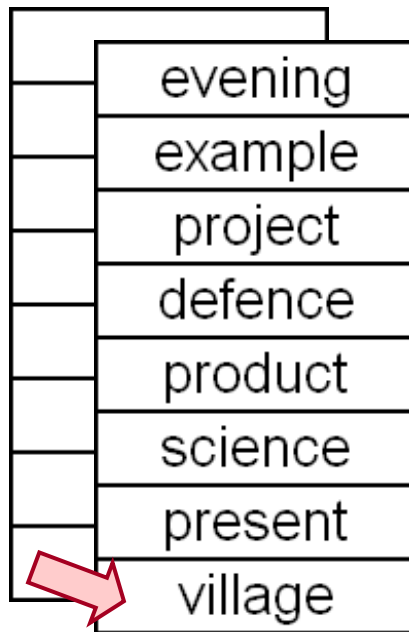


The Model Human Processor



Growth of HCI (1983-...)

- Example of an early research topic
 - Breadth vs. depth in menu design

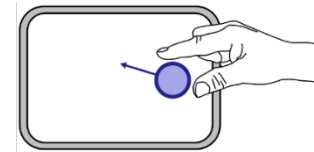


HCI Research

- Research precedes products
- Consider...
 - Two-finger gestures (Apple *iPhone*, 2007)
 - Acceleration-sensing (Nintendo *Wiimote*, 2005)
 - Wheel mouse (Microsoft *Intellimouse*, 1996)
 - Single-stroke text input (Palm's *Graffiti*, 1995)
- Were these ideas born out of engineering or design brilliance? Not really...

- Two-finger gestures:

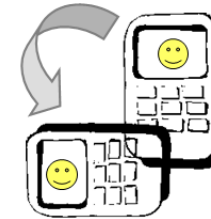
~~2007?~~



1978 ¹

- Acceleration-sensing:

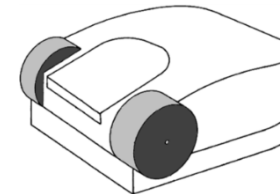
~~2005?~~



1998 ²

- Wheel mouse:

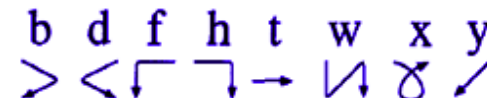
~~1986?~~



1993 ³

- Single-stroke text input:

~~1995?~~



1993 ⁴

¹ Herot, C. F., & Weinzapfel, G. (1978). One-point touch input of vector information for computer displays. *Proc SIGGRAPH '78*, 210-216, New York: ACM.

² Harrison, B., Fishkin, K. P., Gujar, A., Mochon, C., & Want, R. (1998). Squeeze me, hold me, tilt me! An exploration of manipulative user interfaces. *Proc CHI '98*, 17-24, New York: ACM.

³ Venolia, D. (1993). Facile 3D manipulation. *Proc CHI '93*, 31-36, New York: ACM.

⁴ Goldberg, D., & Richardson, C. (1993). Touch-typing with a stylus. *Proc CHI '93*, 80-87, New York: ACM.

Resources

Google Scholar: <http://scholar.google.ca/>

ACM Digital Library: <http://portal.acm.org/>

HCI Bibliography: <http://hcibib.org/>

Wikipedia: <http://en.wikipedia.org/>

Book web site: <http://www.yorku.ca/mack/HCIbook>

Credits

- Ben Bederson, UMD HCIL
- François Guimbretière, Cornell University

