History

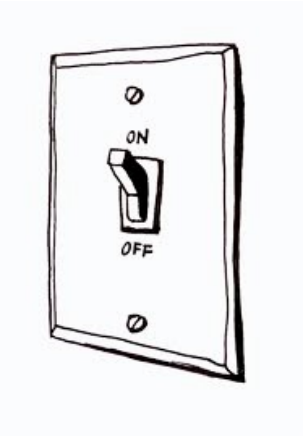
A (brief) history of interaction

Outline

- Major paradigms of interaction
  - Batch interfaces
  - Conversational interfaces
  - Graphical interfaces
- Visionaries who inspired advances
  - Vannevar Bush
  - Douglas Engelbart
  - Ivan Sutherland
  - Alan Kay

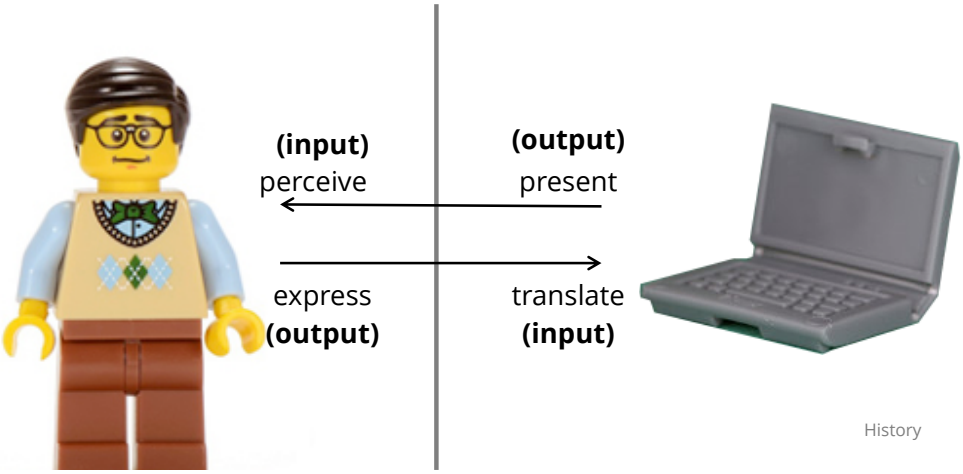
Interface vs. Interaction

- Interface refers to what the system presents to the user
  - it's what you can manipulate and what the system uses to present feedback
- Interaction refers to the sequence of actions a person expresses and the corresponding system responses
  - it unfolds over time
- "interaction requires an interface to occur"
- "to use an interface, there must be interaction"



The History of Interaction…

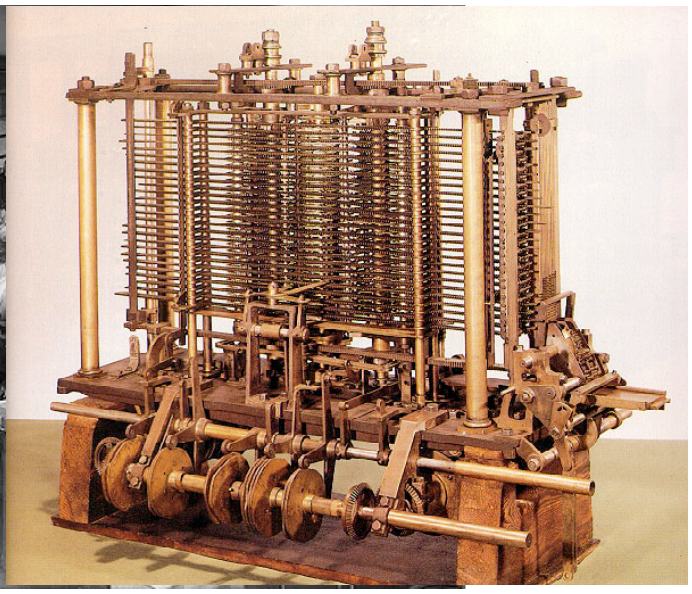
- History of interaction is the history of making the input and output languages of the machine closer to the input and output language of the user and their tasks
- Interaction has evolved from forms that favoured the machine (when its time was more valuable) to those that favour the user



Earliest “Computers”

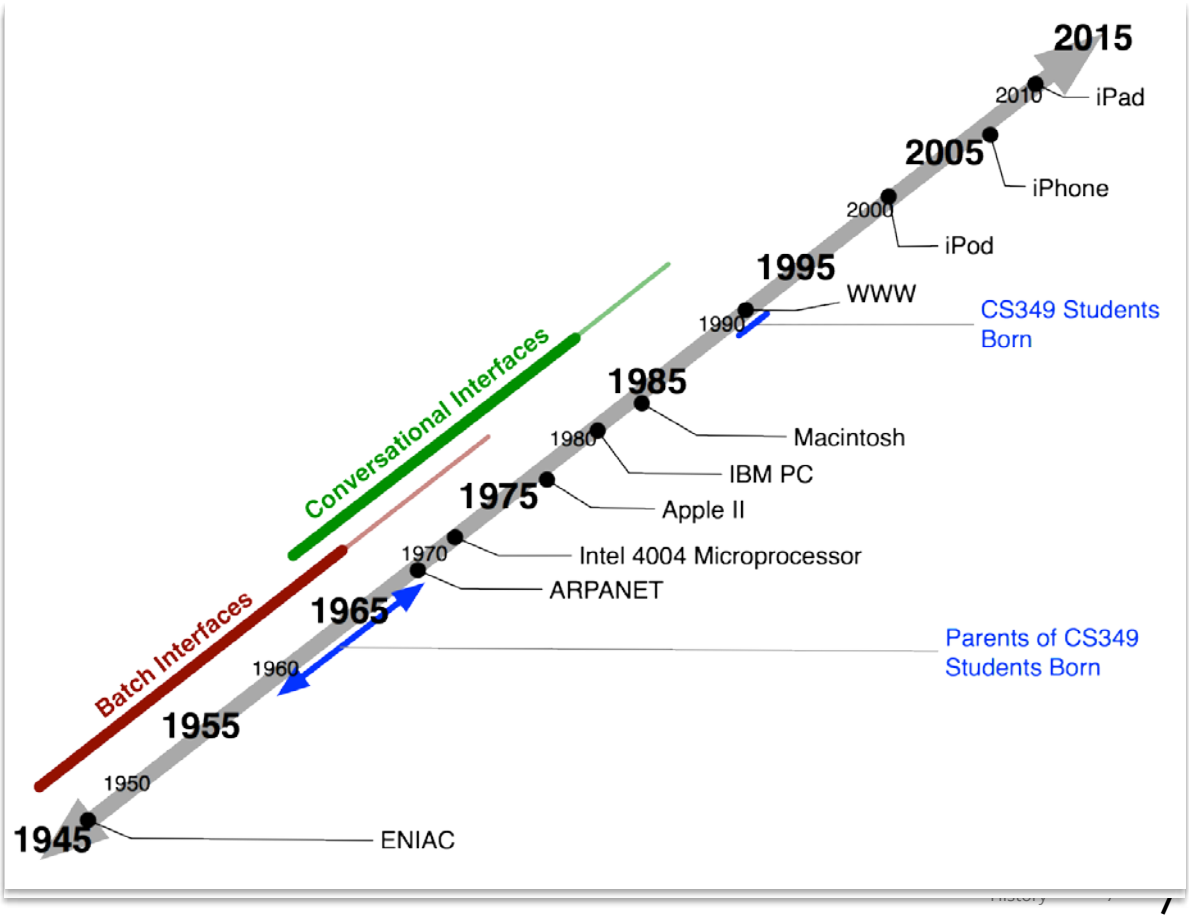
(what about an abacus?)

- Human computers (up to 1940s)
- Babbage’s Analytical Engine (designed mid 1800s)



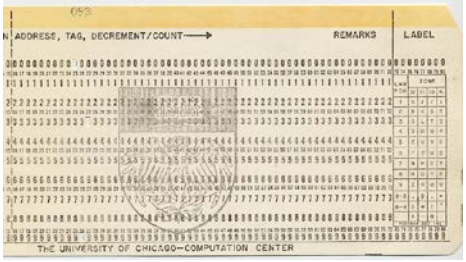
Dials, Knobs, and Lights (1940s)

Howard Aiken, IBM ASCC / Harvard Mark I



Batch Interface (1945-1965)

- Interaction style
  - Set of instructions prepared a priori, fed to computer via punch cards, paper tape, magnetic tape
  - Response typically received via paper printout
  - No real interaction possible as system executes instructions
  - Responses received in hours, days
- Users
  - Only used by highly trained individuals



Conversational Interface (1965 – 1985+)

- Interaction style
  - User types command, waits for response
  - Programs usually run to completion before response
  - Feedback can be given during execution
  - User can be prompted for information during execution
  - User is guided through heavily scripted / structured interaction
  - Examples: Bash Shell, Zork
- Users
  trained experts

```
[mkyong@localhost _node]$ du -lsh pattern_final
2.4G    pattern_final
[mkyong@localhost _node]$ du -lsh pattern3
726M    pattern3
[mkyong@localhost _node]$
```


Up a Tree **Score: 0** **Moves: 4**

>west
Forest
This is a forest, with trees in all directions around you.

>east
Forest
This is a dimly lit forest, with large trees all around. One particularly large tree with some low branches stands here.

>climb tree
Which do you mean, the tree or the large tree?

>climb large tree
Up a Tree
You are about 10 feet above the ground nestled among some large branches. The nearest branch above you is above your reach.
On the branch is a small birds nest.
In the bird's nest is a large egg encrusted with precious jewels, apparently scavenged somewhere by a childless songbird. The egg is covered with fine gold inlay, and ornamented in lapis lazuli and mother-of-pearl. Unlike most eggs, this one is hinged and has a delicate looking clasp holding it closed. The egg appears extremely fragile.

>

Zork
http://textadventures.co.uk/games/view/5zyoqrsugeopel3ffhz_vq/zork

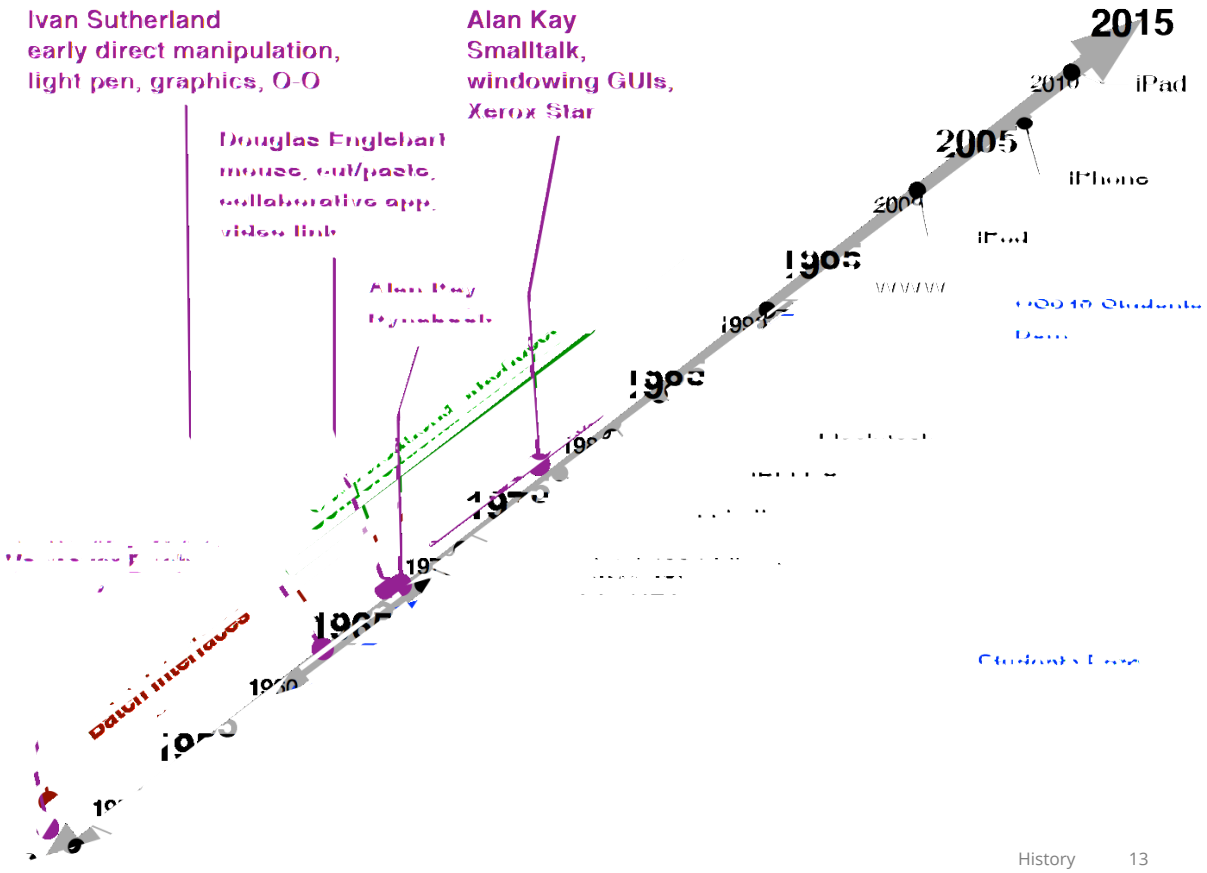
Command-Line Interface

- Advantages
  - Highly flexible: Can combine commands to create sophisticated sets of operations
- Disadvantages
  - Users need to understand the computer
  - I/O is in system language, not task language
  - Requires recall rather than recognition

- Consequences
  - System in control during execution: User cannot refine execution / make modifications during program execution

Recognizing User Needs

- Batch and command line interfaces require interaction language closer to the system than task
  - Onus on user to conform to system
- These interfaces were common at a time when the computer's time was more expensive than a person's time
- Some visionaries imagined a different form of interaction …

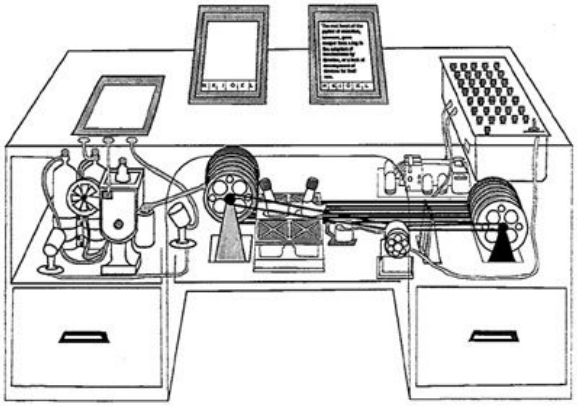


Vannevar Bush

- Headed Office of Scientific Research and Development
  - Manhattan project, other WWII science efforts
- 1945 article, “As We May Think” in The Atlantic
  - http://www.theatlantic.com/doc/194507/bush
  - inspires computer scientists to present day
- Goal was to augment human intellect

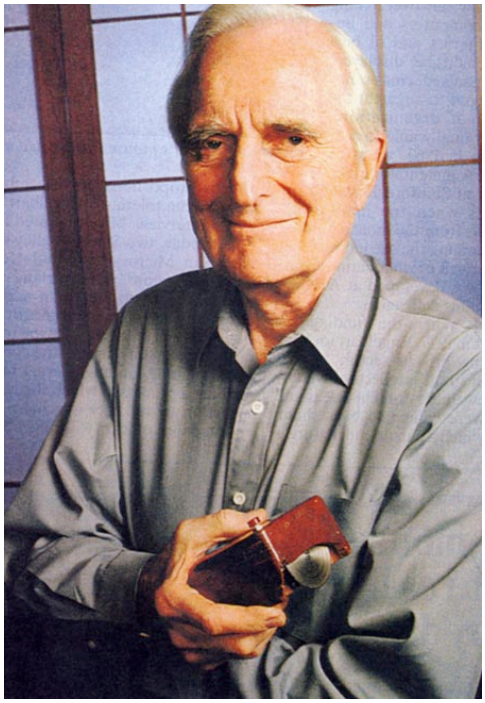
Bush's "Memex"

- "A memex is a device in which an individual stores all his books, records, and communications… It is an enlarged intimate supplement to his memory."
- Proposes associative links between content (hyperlinks)
- Dual display setup
- Direct annotation of stored content
- Proposes direct connection to nervous system
- But hardware a long way off



Douglas Engelbart

- Led team at Stanford Research Institute (SRI) created On-Line System (NLS) (~1968)
  - invented the mouse
  - implemented hypertext
  - introduced copy/paste
  - vision of computer-supported collaborative work

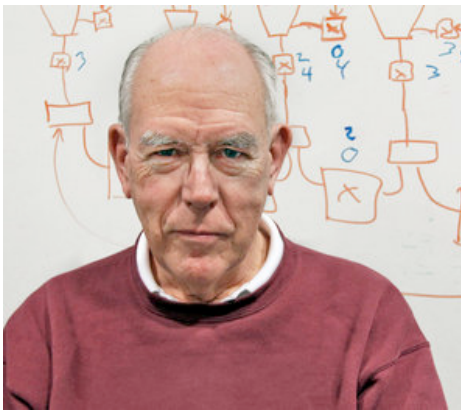


The NLS System “Mother of all Demos”

http://youtu.be/QBfTfrWcgy8?t=1m30s (intro, text editing, copy & paste)
http://youtu.be/QBfTfrWcgy8?t=25m48s (mouse)
http://youtu.be/QBfTfrWcgy8?t=28m43s (chorded keyboard)
http://youtu.be/QBfTfrWcgy8?t=32m9s (hardware)
http://youtu.be/QBfTfrWcgy8?t=47m46s (hypertext documentation)
http://youtu.be/QBfTfrWcgy8?t=56m1s (collaboration)
http://youtu.be/QBfTfrWcgy8?t=1h7m49s (mentions that Arpanet is coming)

Ivan Sutherland

- Sketchpad (~1963)
  - Light pen
  - Direct manipulation
  - Early graphical interface
- Expands computer domain to include artists, draftsmen, …
- Language of interface moves substantially closer to task domains



Ivan Sutherland's Sketchpad (~1963)

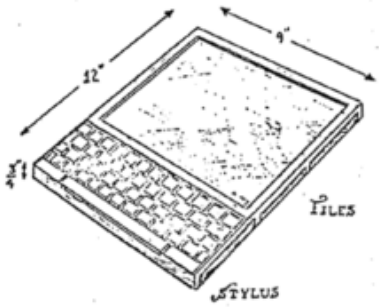
https://youtu.be/USyoT_Ha_bA?t=44s

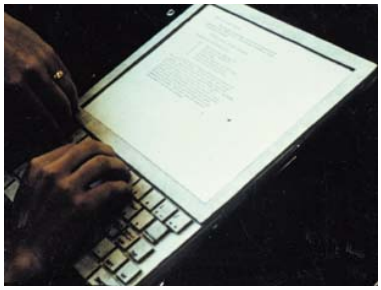
SAGE (light gun interaction)

- http://www.youtube.com/watch?v=iCCL4INQcFo

Alan Kay

- Pioneering work on
  - object-oriented programming (Smalltalk)
  - Xerox Star: graphical user interface
  - Dynabook: conceptual basis for laptops and tablet computers
- Quote: “The best way to predict the future is to invent it.”

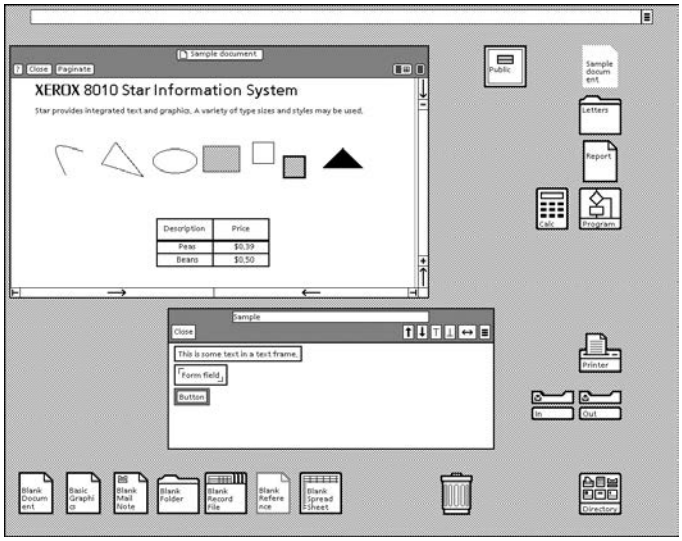




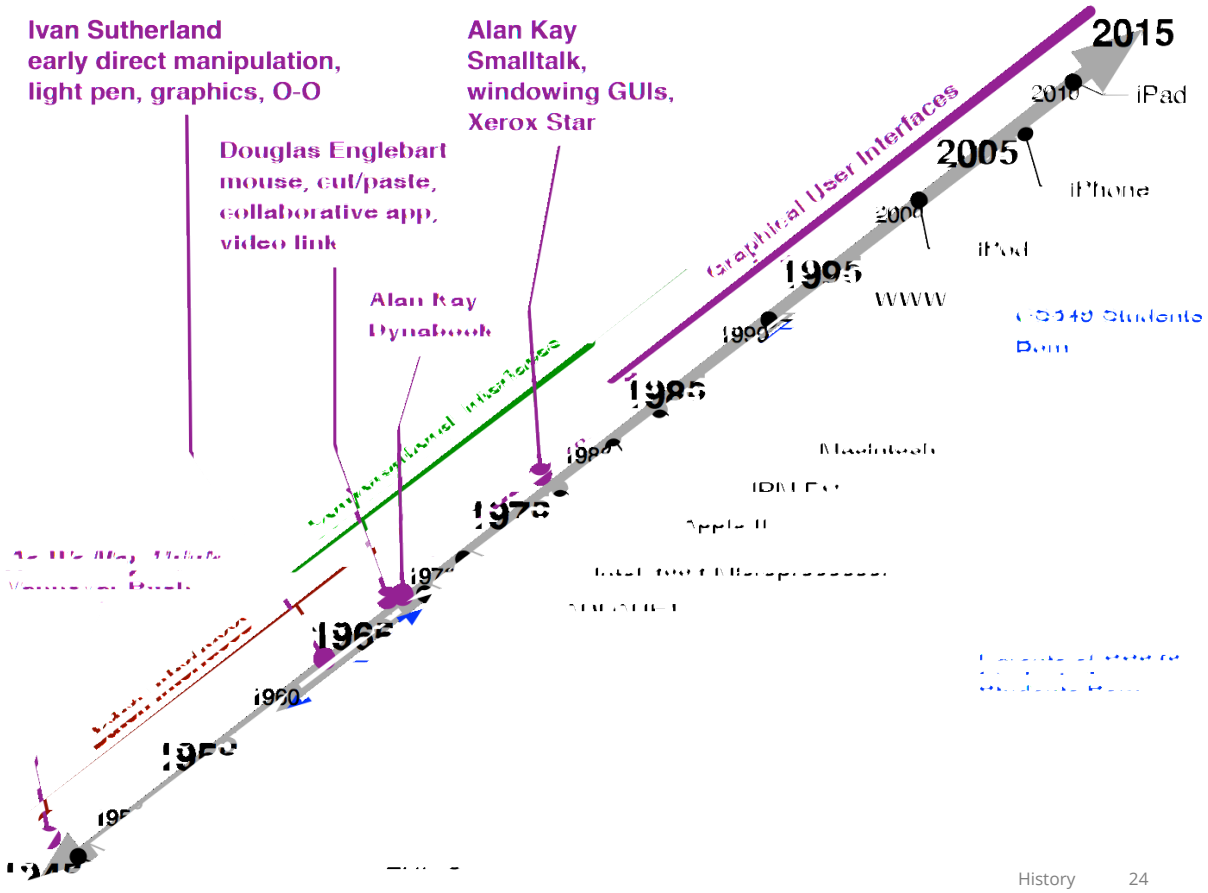
Dynabook (~1971)

Xerox Star Information System (~1981)

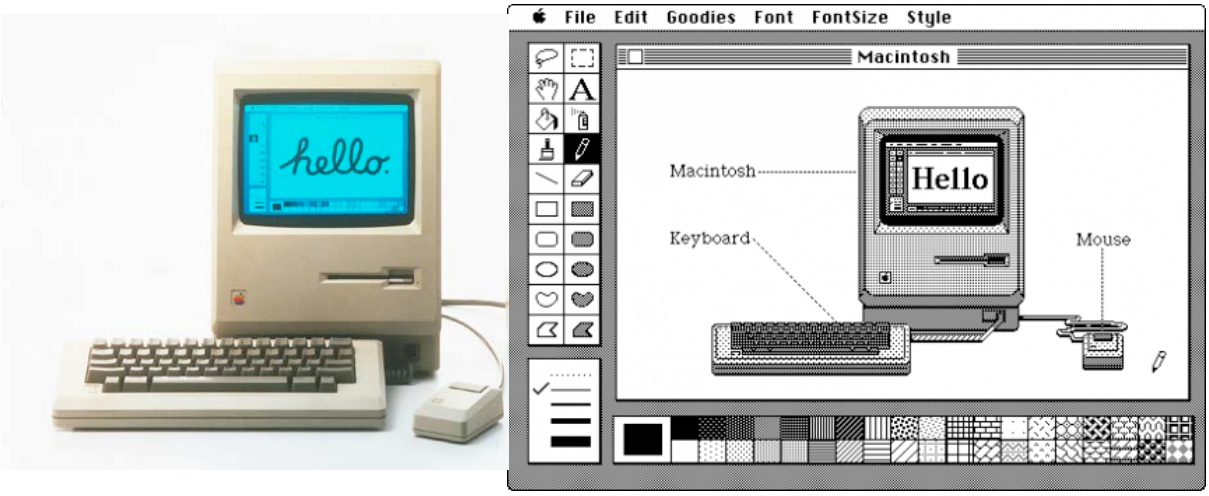
- First commercial computer with GUI
  - windows, icons, folders, mouse, (and Ethernet, file/print servers, email)
  - based on Xerox Alto research ~1974



Xerox Alto GUI Circuit Layout Program (~1974) dragging, copy, paste (around 3:30)
- http://youtu.be/uFh15NR30D0

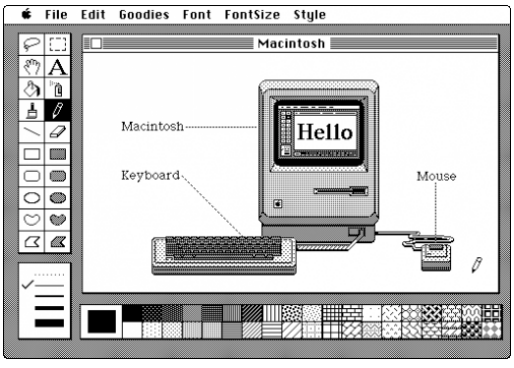


Graphical User Interfaces (1984 – present)



Graphical User Interface (GUI)

- Hardware interface
  - High resolution, high refresh graphics display
  - Keyboard
  - Pointing device (e.g., mouse)
- Typical instantiation: WIMP interface
  - Windows, Icons, Menus, and Pointer

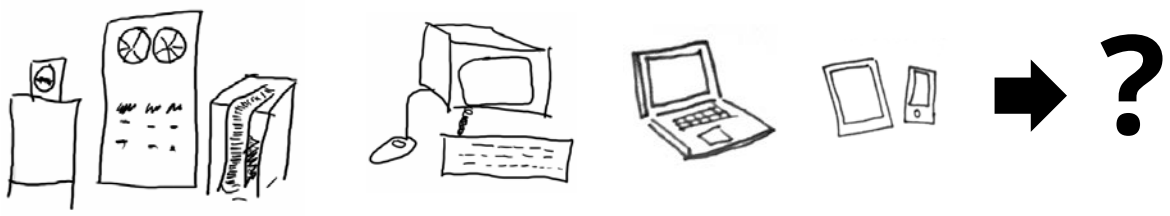


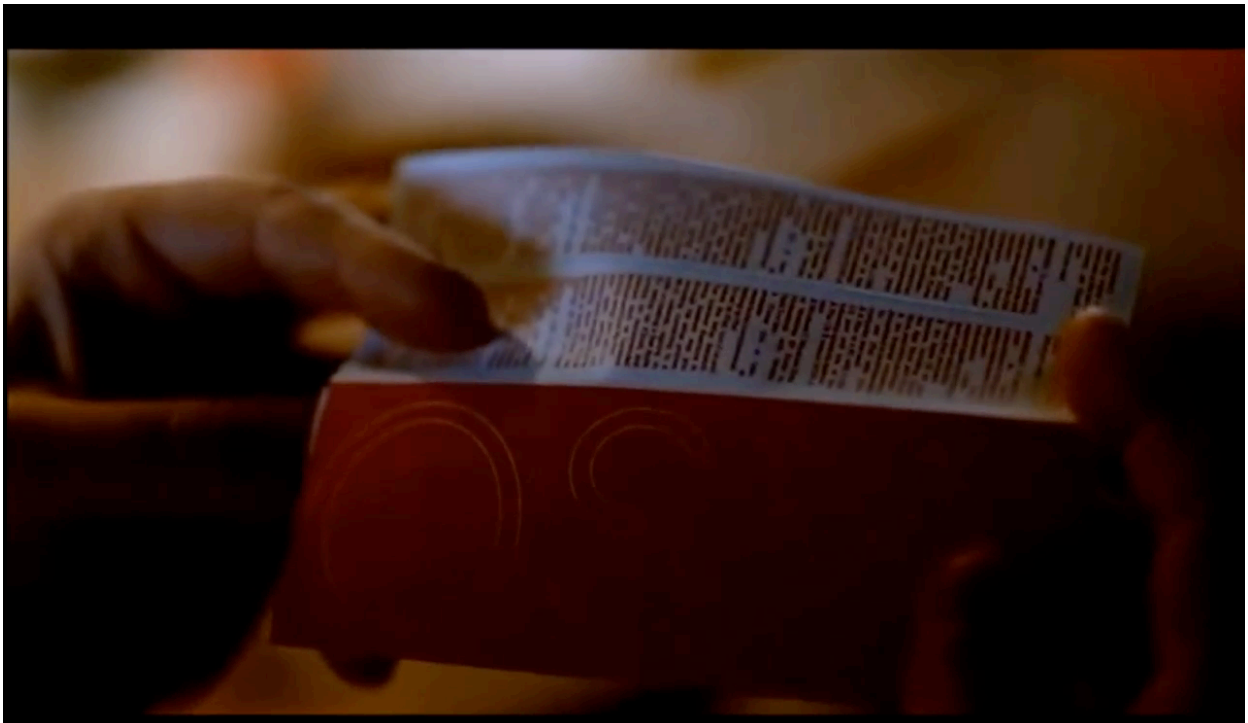
GUI Interaction style

- User in control
  - system waits for input, then responds
- Recognition over recall
  - enables discovery of options and experimentation
- Metaphors
  - make Interaction language closer to users' own language, closer to task domain
  - e.g. "desktop", "folder", "drag-and-drop",...
  - What does this mean and what are its consequences for interaction?
- GUI interaction opens interface up to broader audience

Future Interaction

- Where can we go from here?
- What other paradigms are possible?





Movie ”Her”

- https://www.youtube.com/watch?v=n1AjtlAje3o