CS 321: Introduction to HCI

Methods for Design, Prototyping and Evaluating User Interaction

Lecture 02: History & State of the Art in HCI

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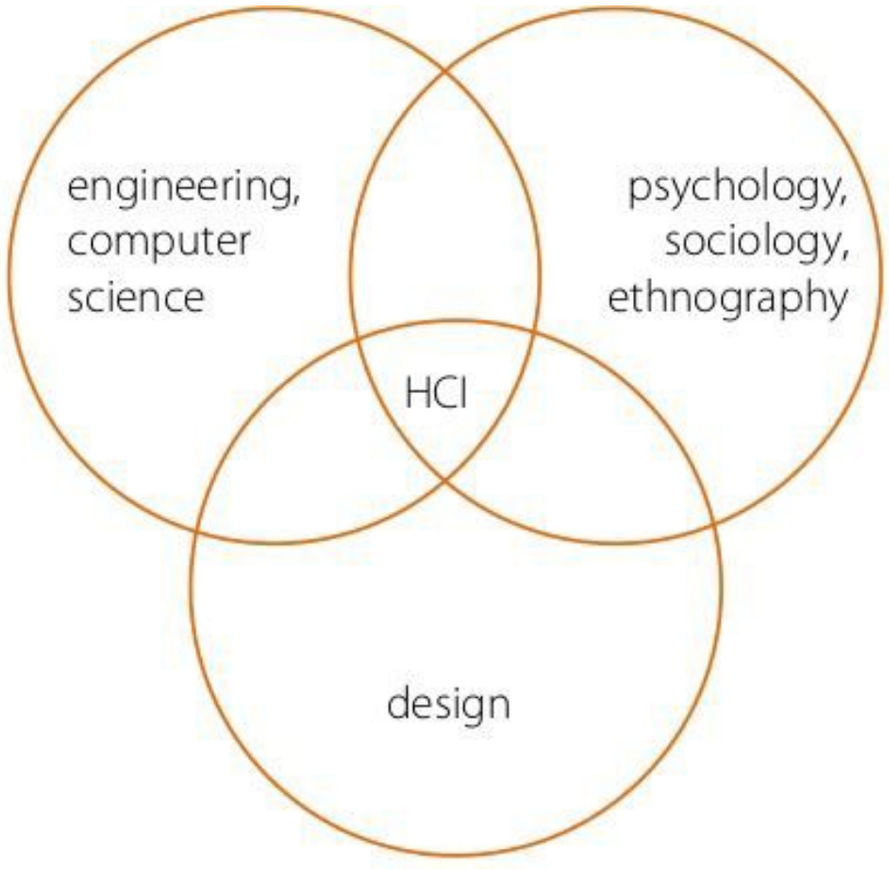
SIUE

What is HCI?

HCI (human-computer interaction) is the study of how people interact with computers and to what extent technology is or is not developed for successful interaction with human beings.



https://www.cs.bham.ac.uk/~rxb/Teaching/HCI%20II/intro.html

https://www.slideshare.net/agaszostek/history-and-future-of-human-computer-interaction-hci-and-interaction-design

HCI != Usability

A usable system is easy to learn, easy to remember how to use, effective, efficient, safe, and enjoyable to use.

Usability is only one part of HCI, but has been one of the main goals. HCI has also:

- developed **guidelines and standards** that support designers
- developed **methods** to evaluate the user experience of a given product/system
- used **mathematical models** to predict users' performance with a system (e.g., Fitt's law for mouse movement time, and models that predict search time or mental effort)
- investigated new **interaction paradigms** or new ways of integrating technology in our lives (think smart clothes, touch displays, VR/AR, voice-based interfaces …)

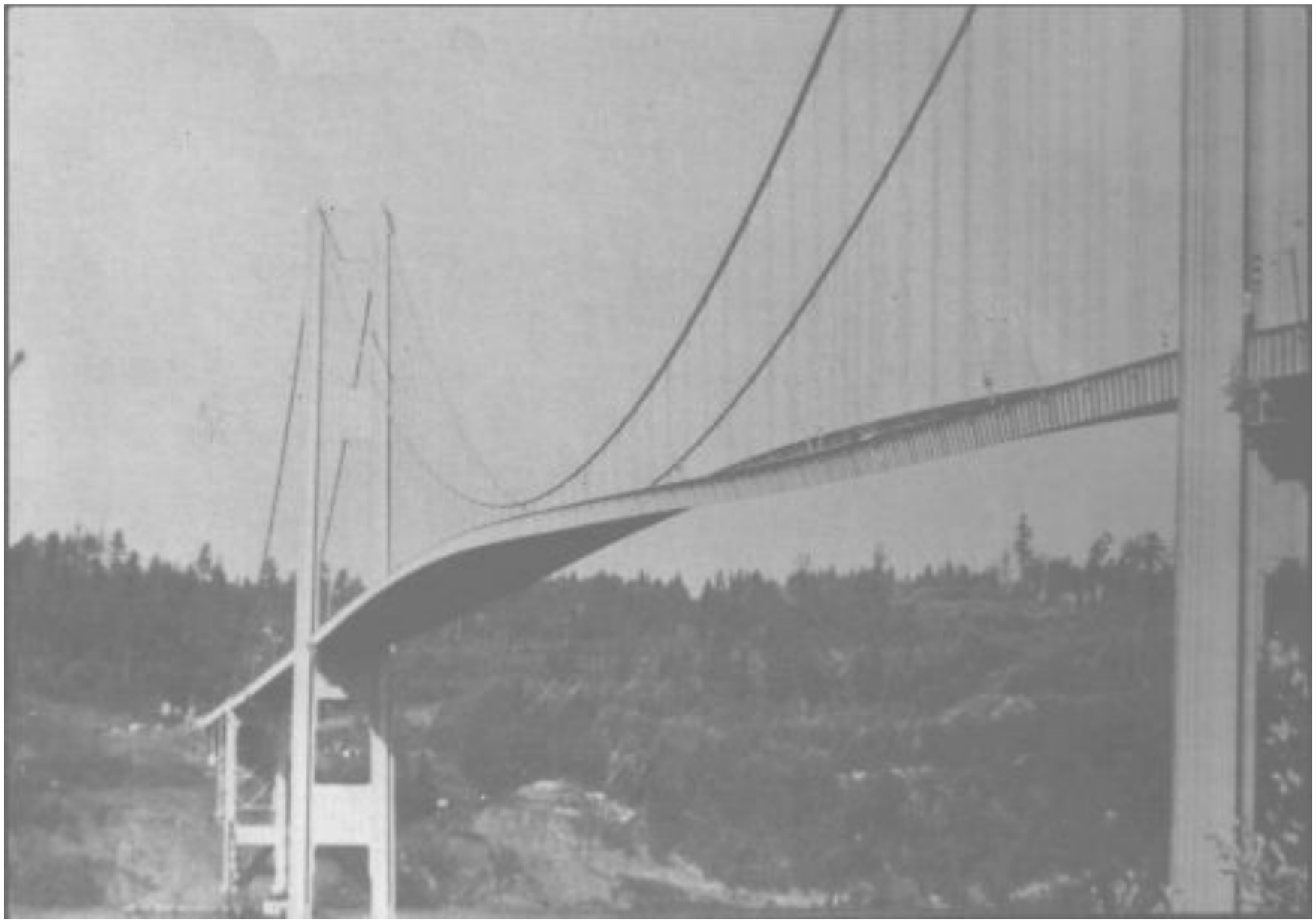
Boehm-Davis, Deborah A. "Discoveries and developments in human-computer interaction." *Human factors* 50.3 (2008): 560-564.

Why do we do HCI in CS?

Every engineering discipline includes the study of **breakdowns** and the design of improved / or new **solutions** that address those breakdowns

Why do we do HCI in CS?

Tacoma Narrows (nicknamed “Galloping Gertie”)



Why do we do HCI in CS?

Tacoma Narrows (nicknamed “Galloping Gertie”)

2-minute activity

Can you find a technology analogue to the collapse of the Tacoma bridge?

Inside Facebook's Myanmar operation

Hatebook

A REUTERS SPECIAL REPORT

Why do we do HCI in CS?

Understanding how and why **human interaction breaks down** is fundamental to designing better technology

This study must include computer scientists, as we are the ones creating/building the technology

HCI is an extension of traditional CS disciplines

We **design, implement, and evaluate** computing systems for particular tasks (e.g., parallel programming, network routing)

HCI **incorporates humans** into the computing system

- Humans as an additional constraint

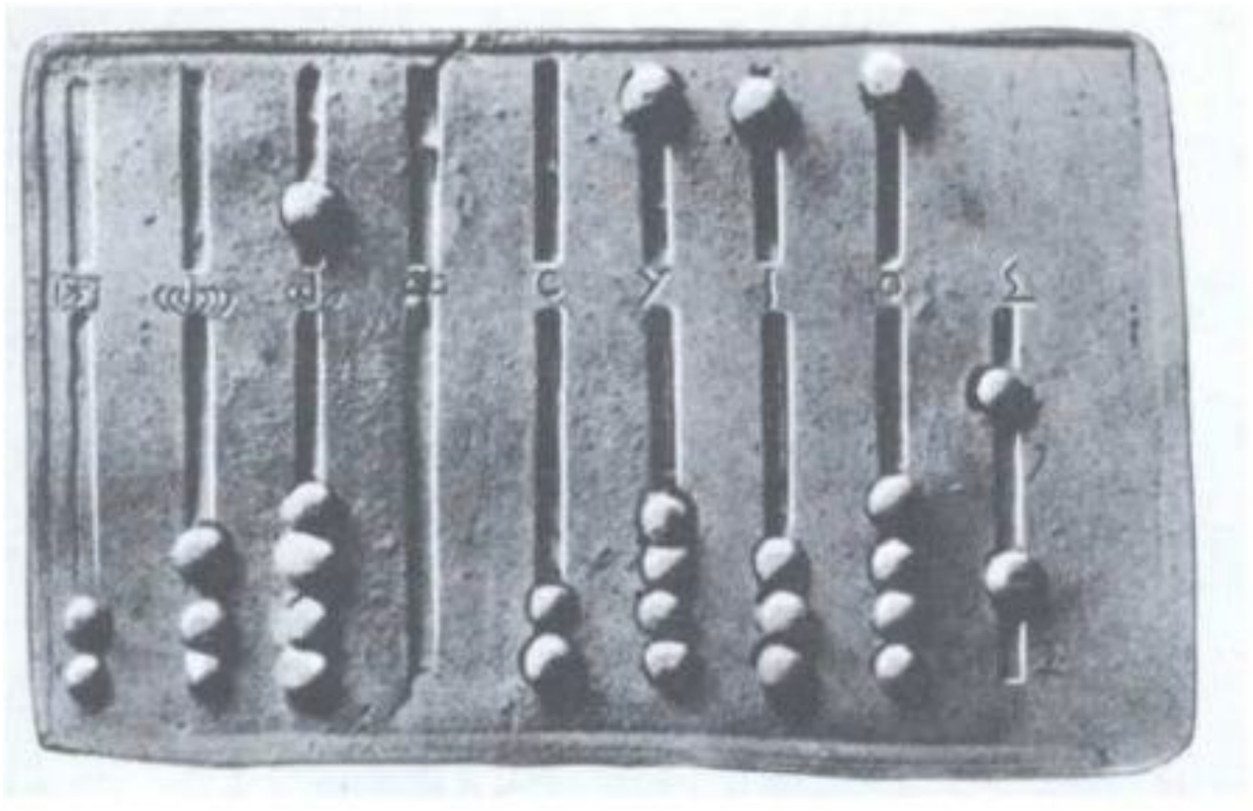
Any computer system must be designed taking into account

- the **physical** constraints of the machine (e.g., processor speed, networking capabilities)
- the **human** physical and mental constraints (e.g., attention, memory)
- (should we add, **social** level constraints?)

http://www.pgbovine.net/what-is-hci-research.htm

A history of HCI

Calculating devices in antiquity



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Konrad Zuse (1910-1995)

Invented the world’s first programmable computer (in 1941)

This remained the only working computer in Europe up to 1951

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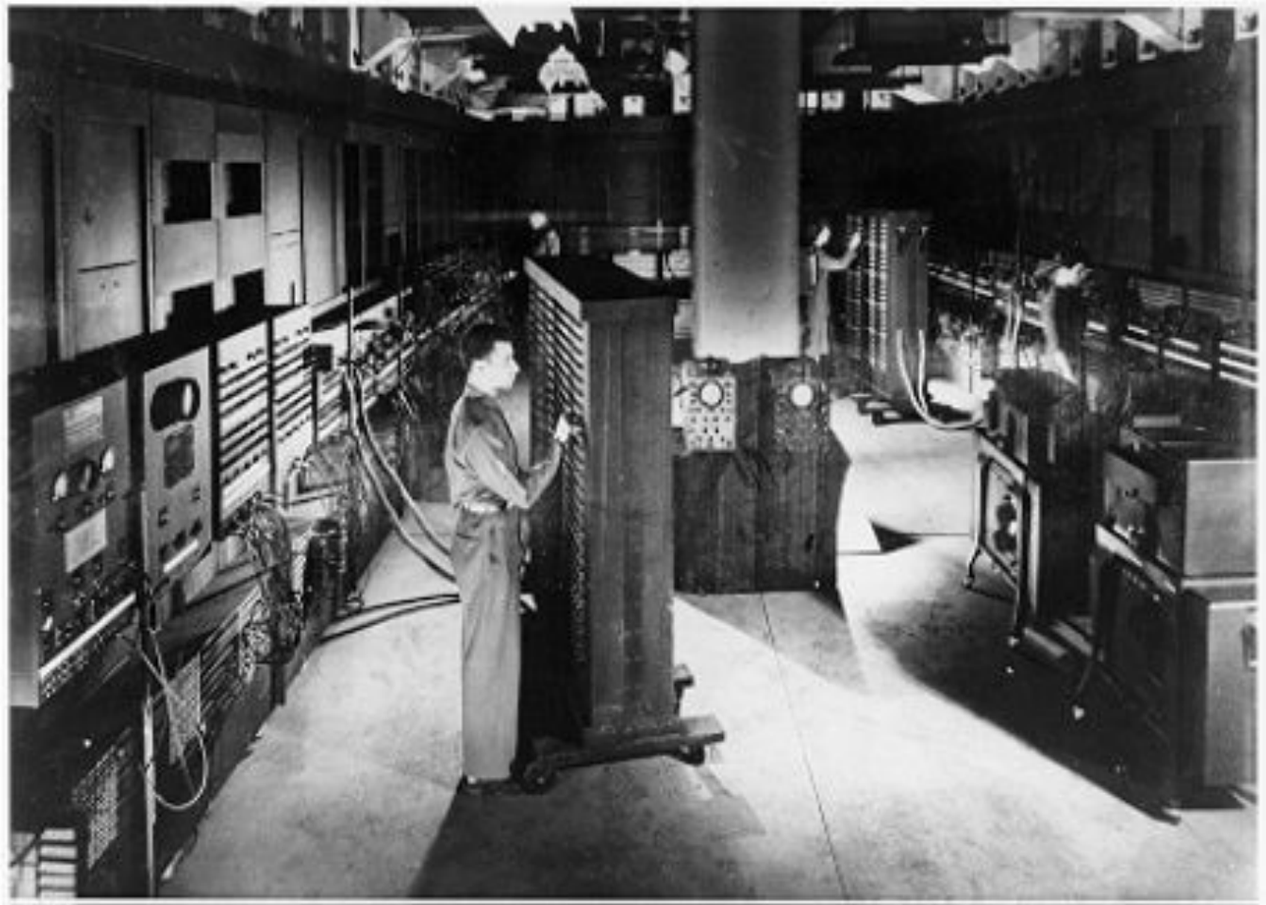
ENIAC (~1946)

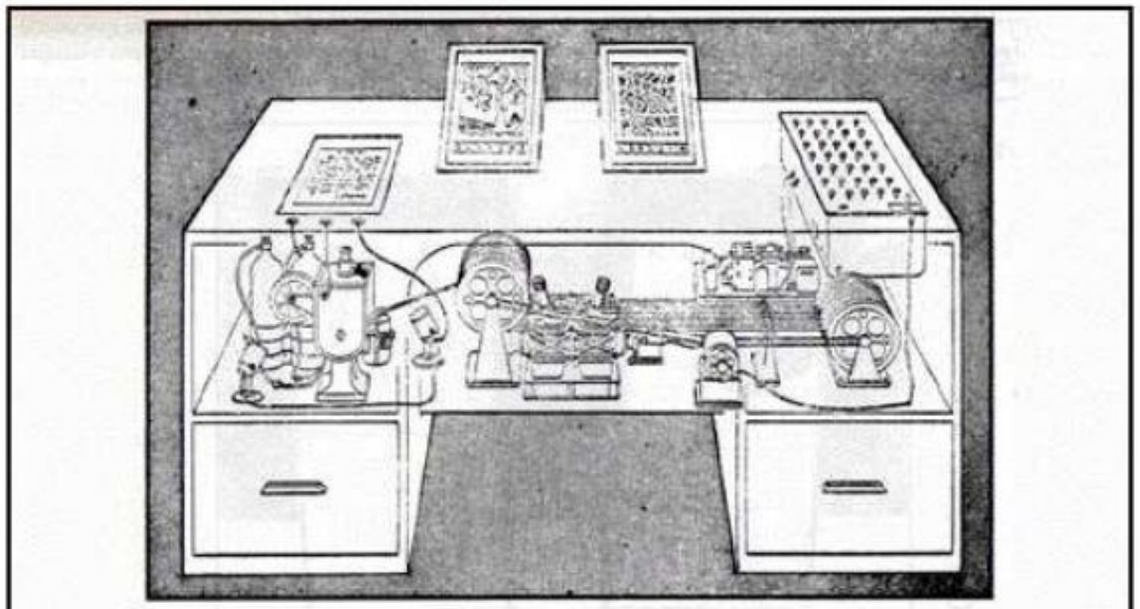
First electronic numerical integrator and computer in the US

Construction contract was signed in 1943

The first programmers of the ENIAC were six women (“Refrigerator Ladies”)



Memex (1945)



Memex in the form of a desk would instantly bring files and material on any subject to the operator's fingertips. Slanting translucent viewing screens magnify supermicrofilm filed by code numbers. At left is a mechanism which automatically photographs longhand notes, pictures and letters, then files them in the desk for future reference (*LIFE* 19(11), p. 123).

https://www.theatlantic.com/magazine/archive/1945/07/as-we-may-think/303881/

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. Alibrary of a million volumes could be compressed into one end of a desk.”

Memex (1945)

"wholly new forms of encyclopedias will appear, ready made with a mesh of **associative trails** running through them…"

Memex (1945)

Memex (1945)

“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”

SketchPad by Ivan Sutherland at MIT (1963)

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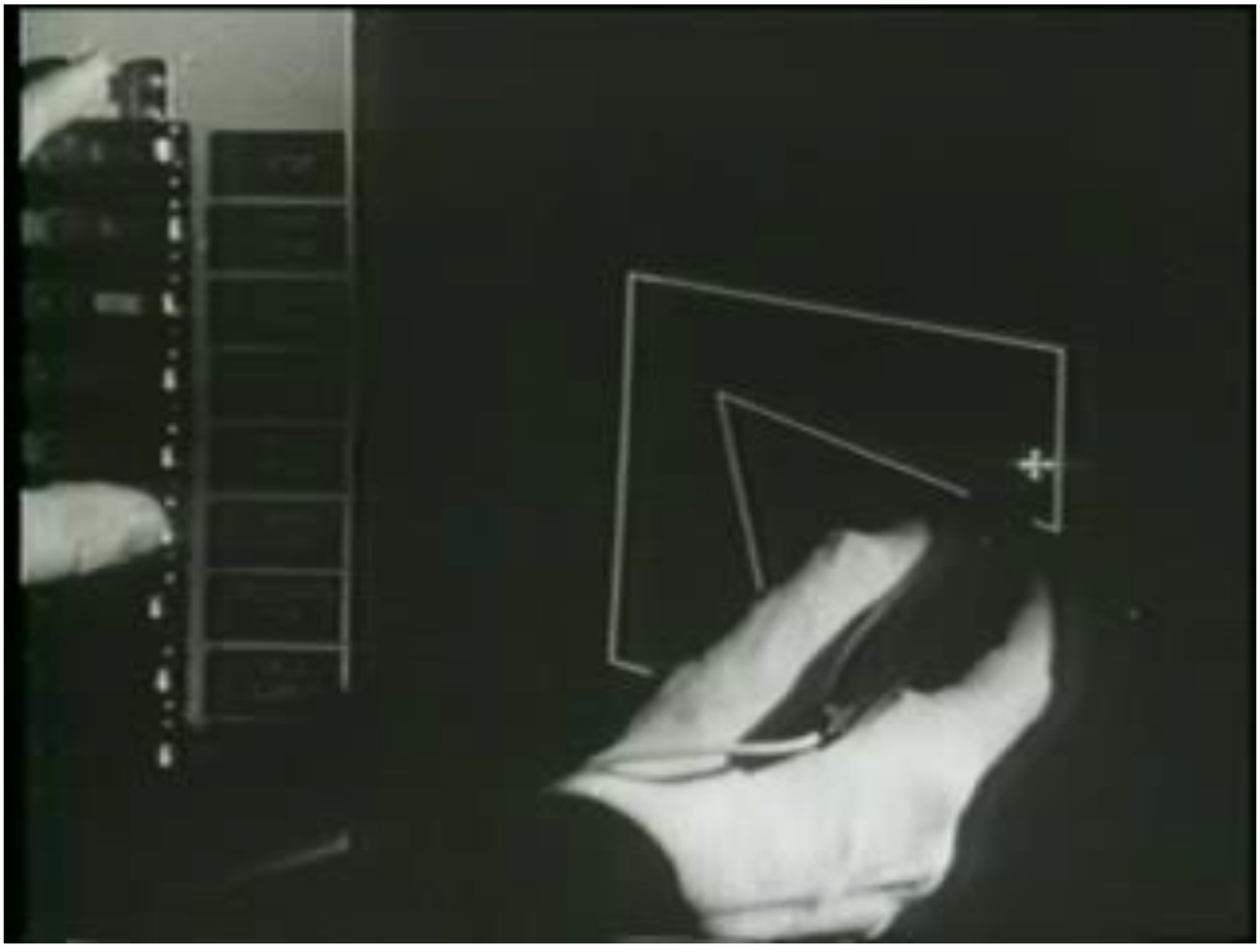
SketchPad by Ivan Sutherland



Video to Sketchpad from 1987

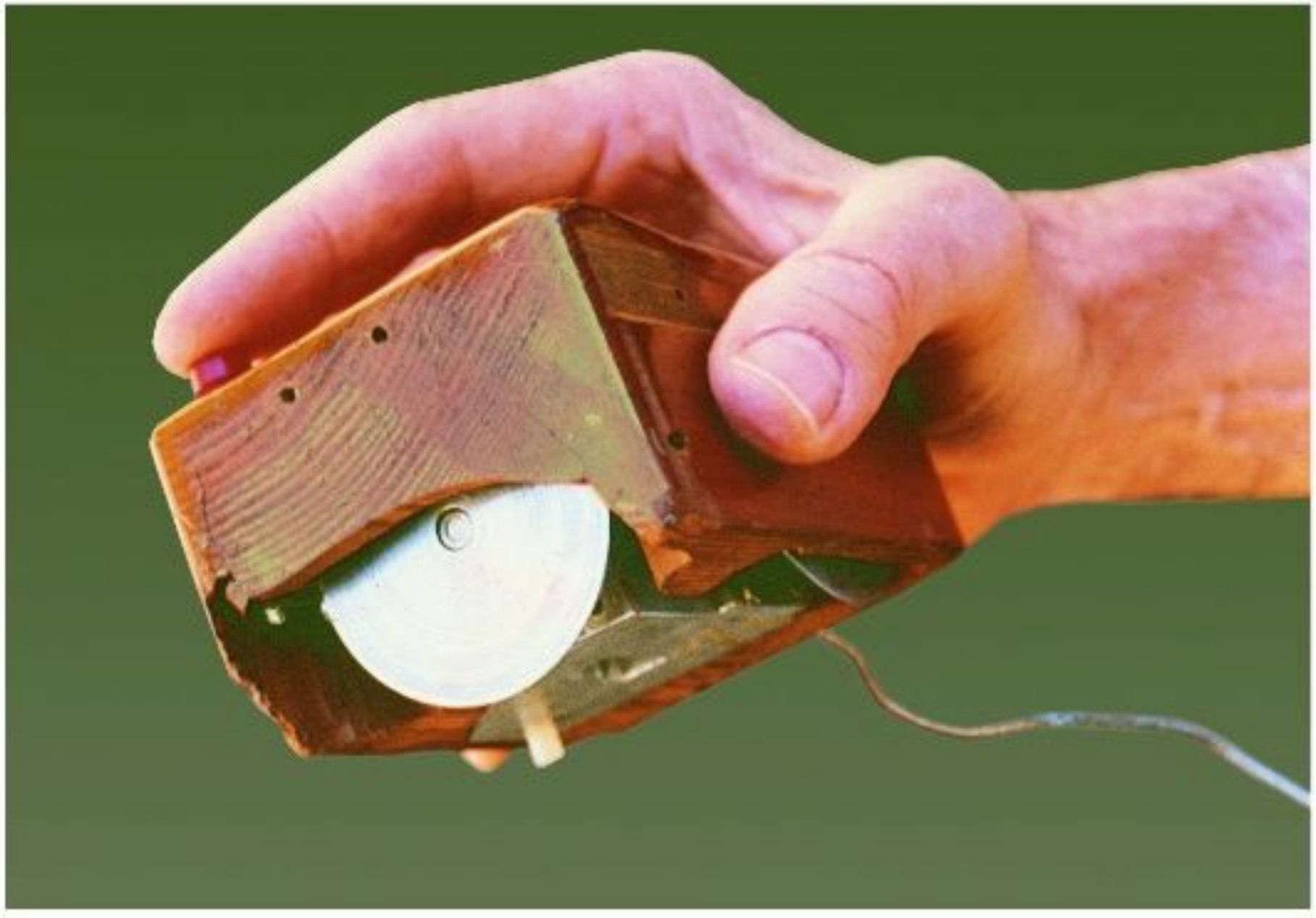
SketchPad by Ivan Sutherland at MIT (1963)

Direct manipulation of objects

SketchPad paved the way for the **Graphical** User Interface

Sutherland's PhD thesis also defined the terms "objects" and "instance"

SketchPad is the first **object-oriented** programming system



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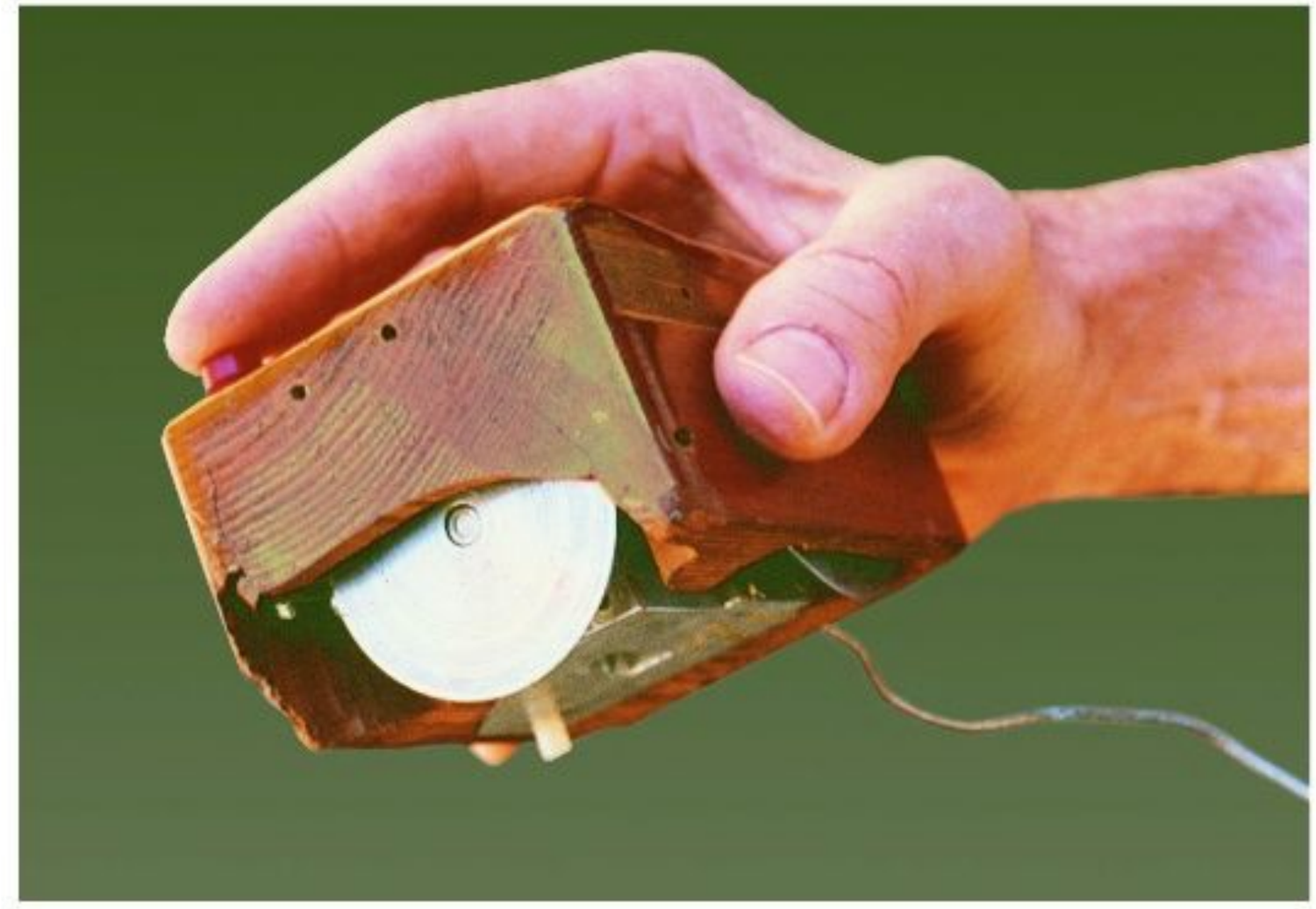
First mouse by Engelbard at Stanford (1963)



https://www.slideshare.net/agaszostek/history-and-future-of-human-computer-interaction-hci-and-interaction-design

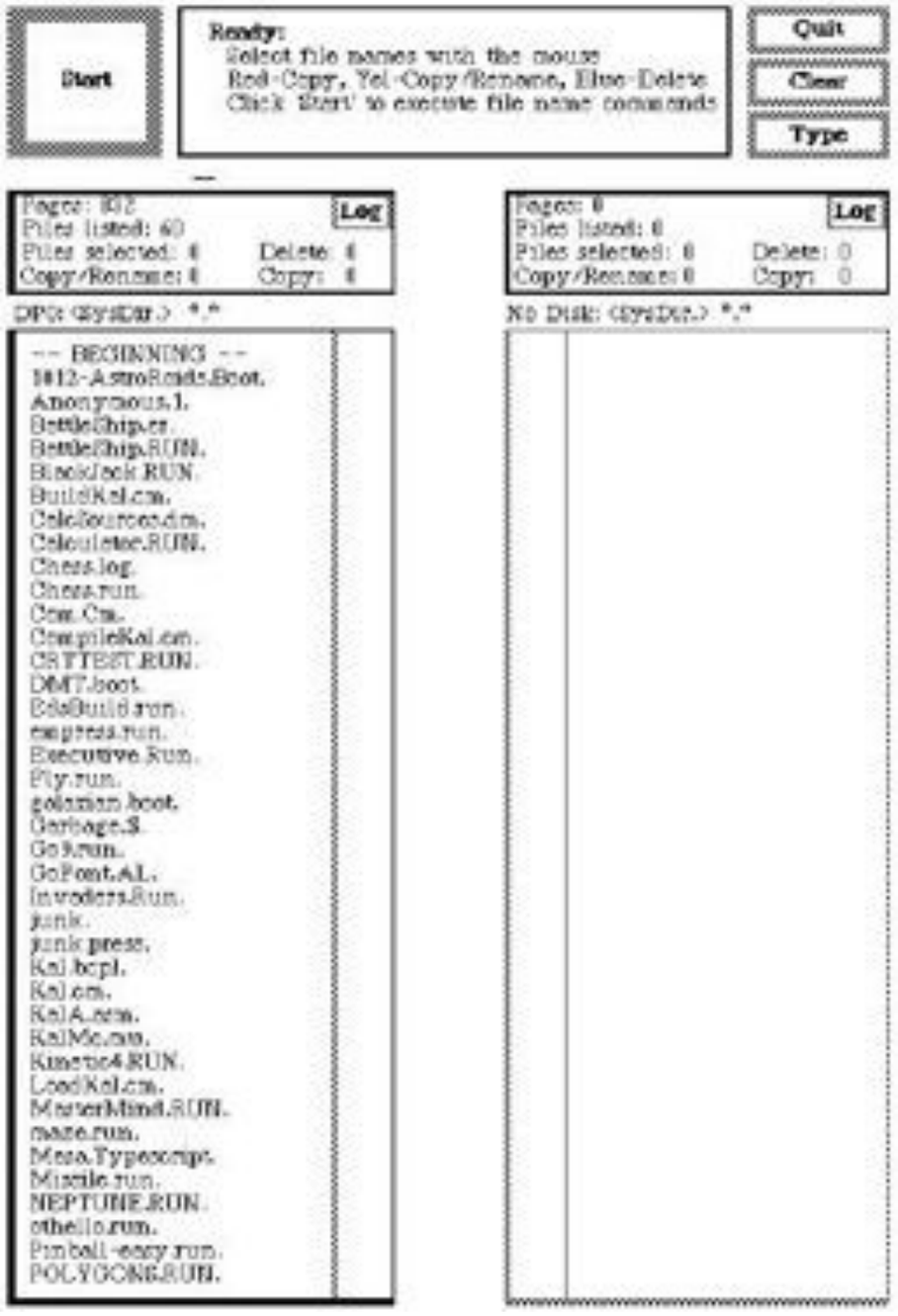
Nothing eventful happened in the next 10 years…

Dynabook

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

Xerox Alto (1973)

Xerox Alto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Ready:
Select file names with the mouse
Red-Copy, Yel-Copy/Rename, Blue-Delete
Click 'Start' to execute file name commands
Quit
Clear
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-- BEGINNING --
1812-AstroRoids.Boot.
Anonymous.1.
BattleShip.cr.
BattleShip.RUN.
BlackJack.RUN.
BuildKal.cm.
CalcSources.dm.
Calculator.RUN.
Chess.log.
Chess.run.
Com.Cm.
CompileKal.cm.
CRTTEST.RUN.
DMT.boot.
EdsBuild.run.
empress.run.
Executive.Run.
Fly.run.
goldman.boot.
Garbage.$.
Go9.run.
GoFont.AL.
Invaders.Run.
junk.
junk press.
Kal.bcpl.
Kal.cm.
KalA.asm.
KalMc.mu.
Kinetic4.RUN.
LoadKal.cm.
MasterMind.RUN.
maze.run.
Mess.Typescript.
Missile.run.
NEPTUNE.RUN.
othello.run.
Pinball-easy.run.
POLYGONS.RUN.

VisiCalc (1979)

VisiCalc was the **Killer App** for Personal Computers

Turned the microcomputer from a hobby for nerds into a serious thing

Because of it, IBM introduced the IBM PC 2 years later

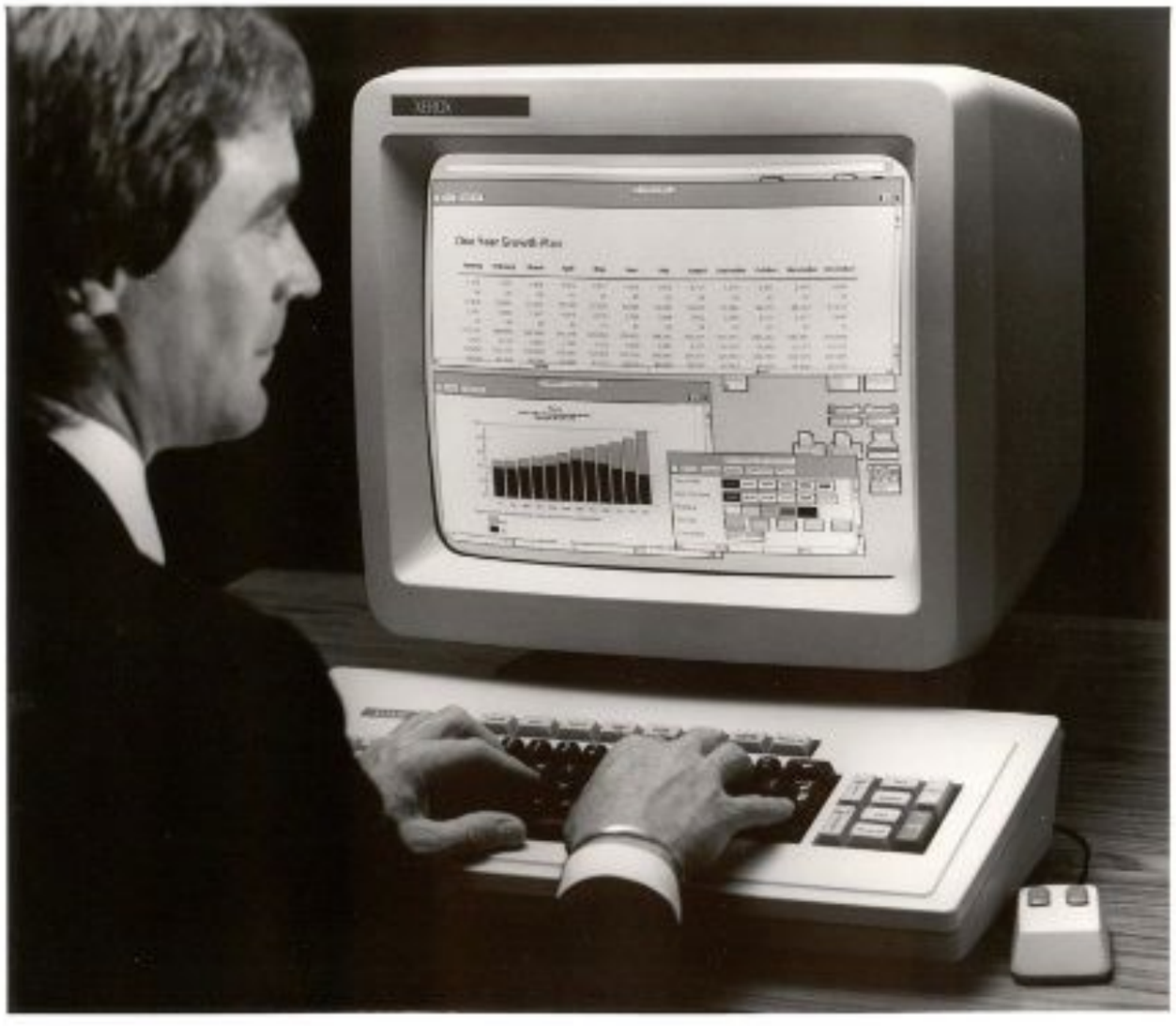
Suddenly, small and large business bought computers

With the emergence of personal computing in the late 1970s, everyone became a potential computer user…

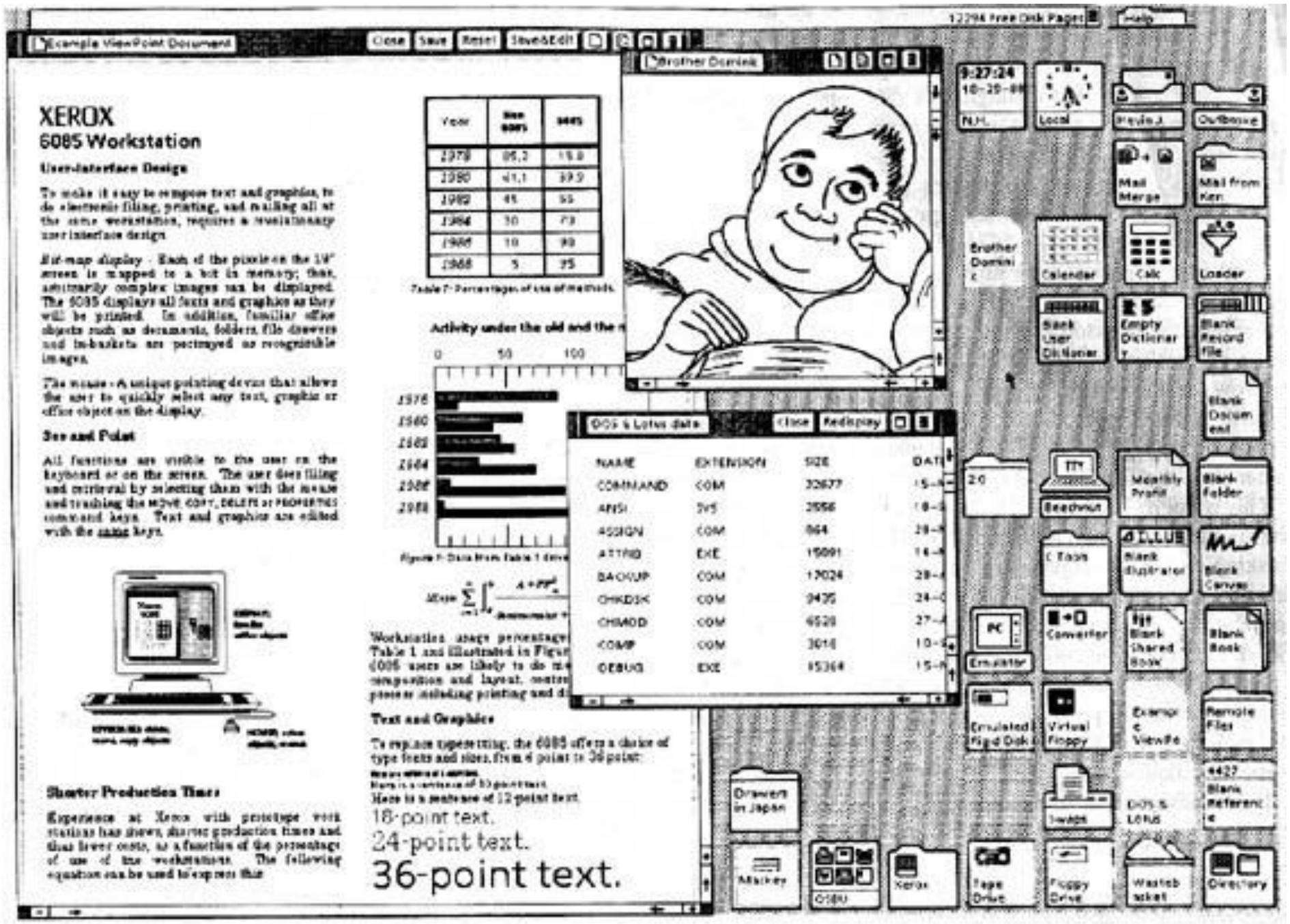
With the emergence of personal computing in the late 1970s, everyone became a potential computer user…

… but computer users still had to deal with arcane commands and system dialogs

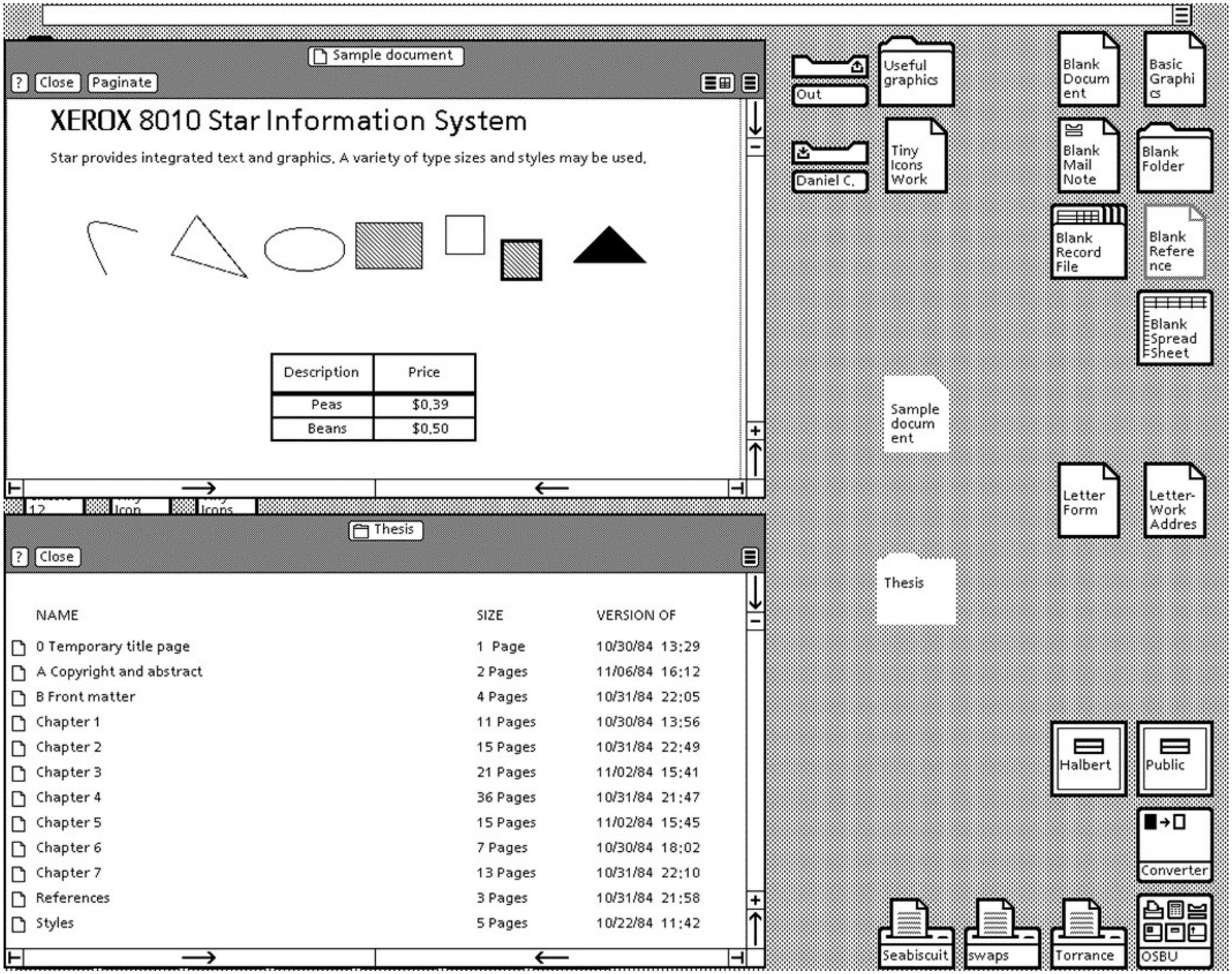
Xerox Star (1981)



Xerox Star (1981)



Xerox Star


Sample document
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XEROX 8010 Star Information System
Star provides integrated text and graphics. A variety of type sizes and styles may be used.
Description
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0 Temporary title page
1 Page
10/30/84 13:29
A Copyright and abstract
2 Pages
11/06/84 16:12
B Front matter
4 Pages
10/31/84 22:05
Chapter 1
11 Pages
10/30/84 13:56
Chapter 2
15 Pages
10/31/84 22:49
Chapter 3
21 Pages
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Chapter 4
36 Pages
10/31/84 21:47
Chapter 5
15 Pages
11/02/84 15:45
Chapter 6
7 Pages
10/30/84 18:02
Chapter 7
13 Pages
10/31/84 22:10
References
3 Pages
10/31/84 21:58
Styles
5 Pages
10/22/84 11:42
Out
Useful graphics
Daniel C.
Tiny Icons Work
Blank Document
Basic Graphics
Blank Mail Note
Blank Folder
Blank Record File
Blank Reference
Blank Spread Sheet
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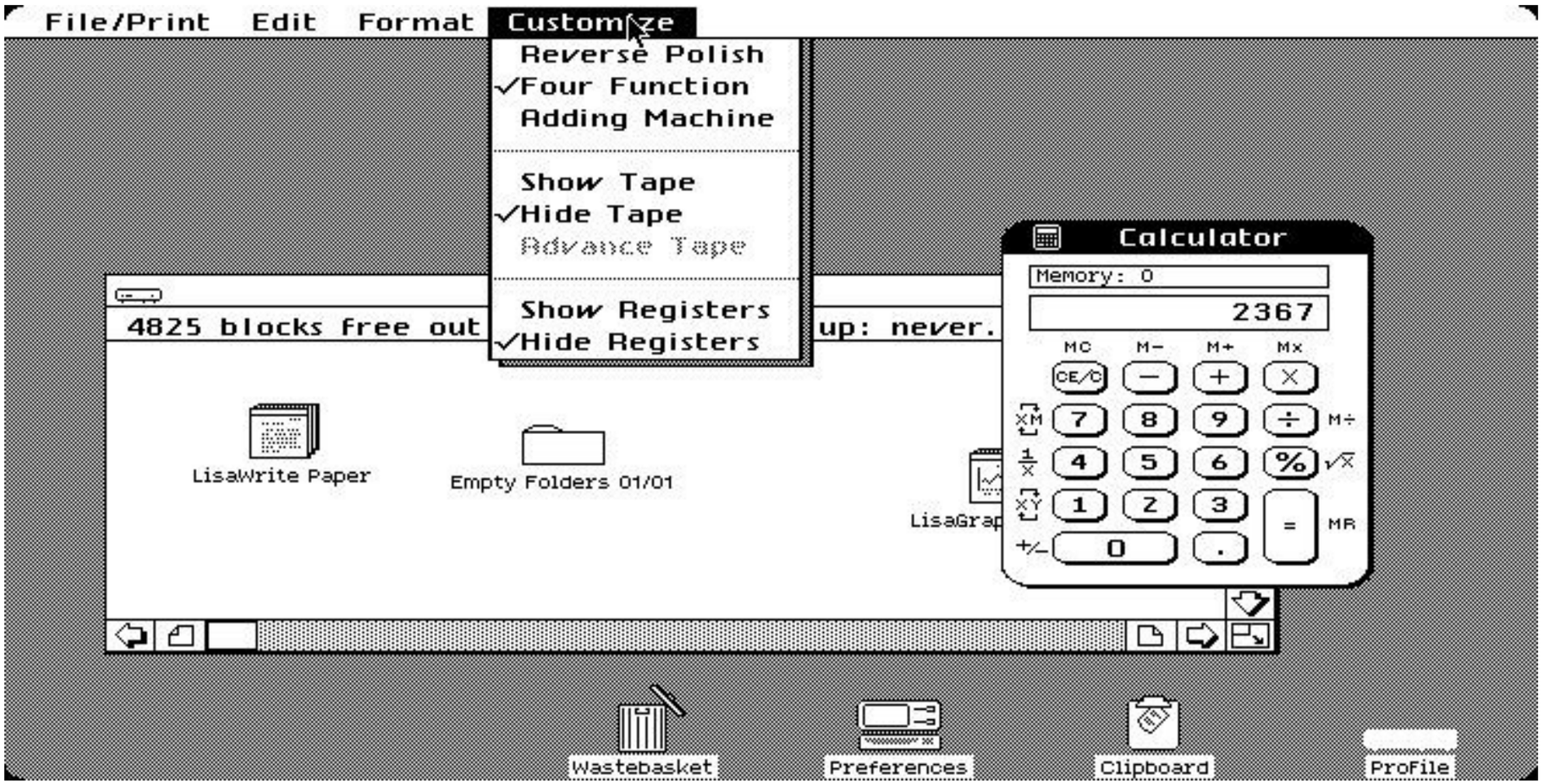
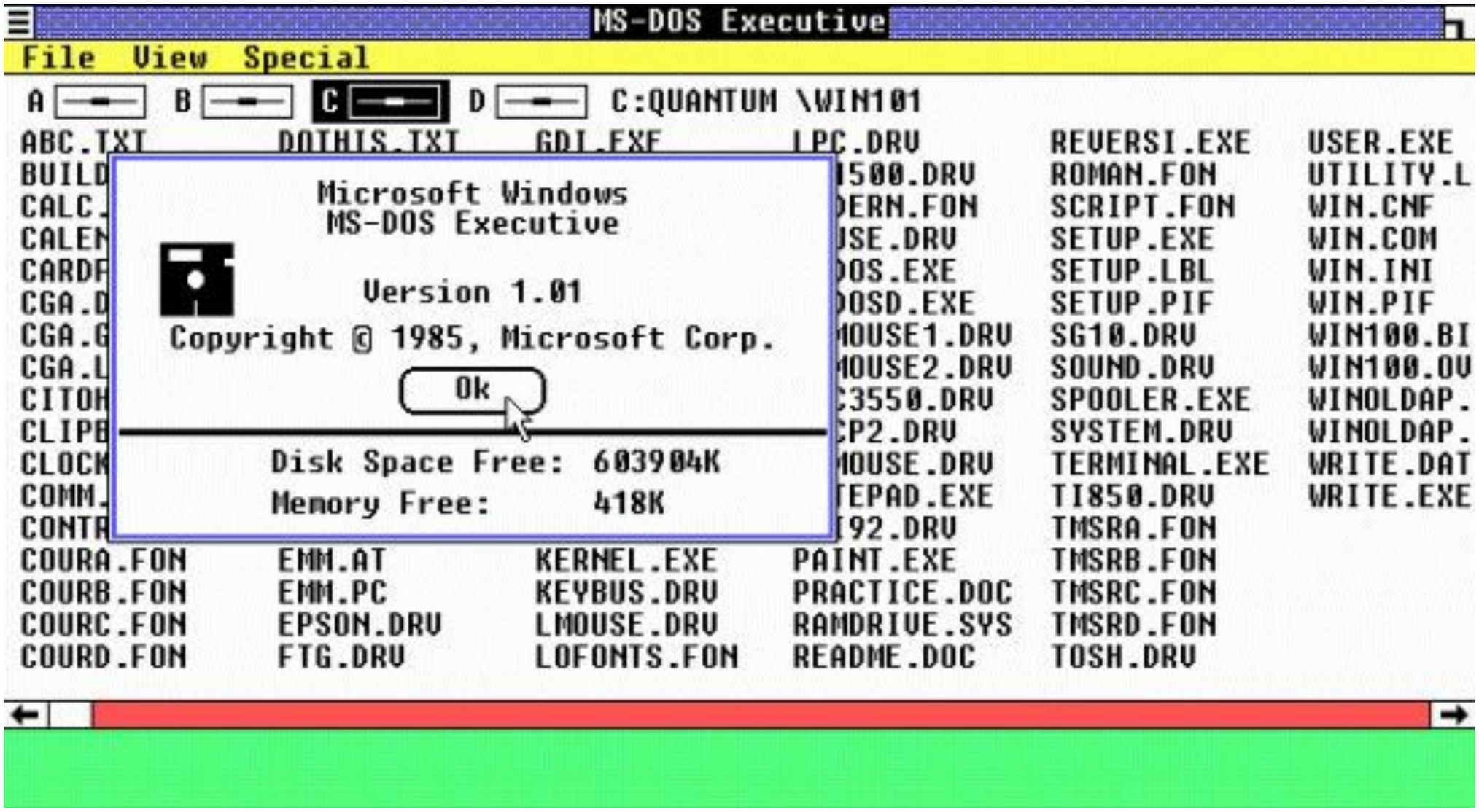
Apple Lisa (1981)

Apple Lisa (1981)

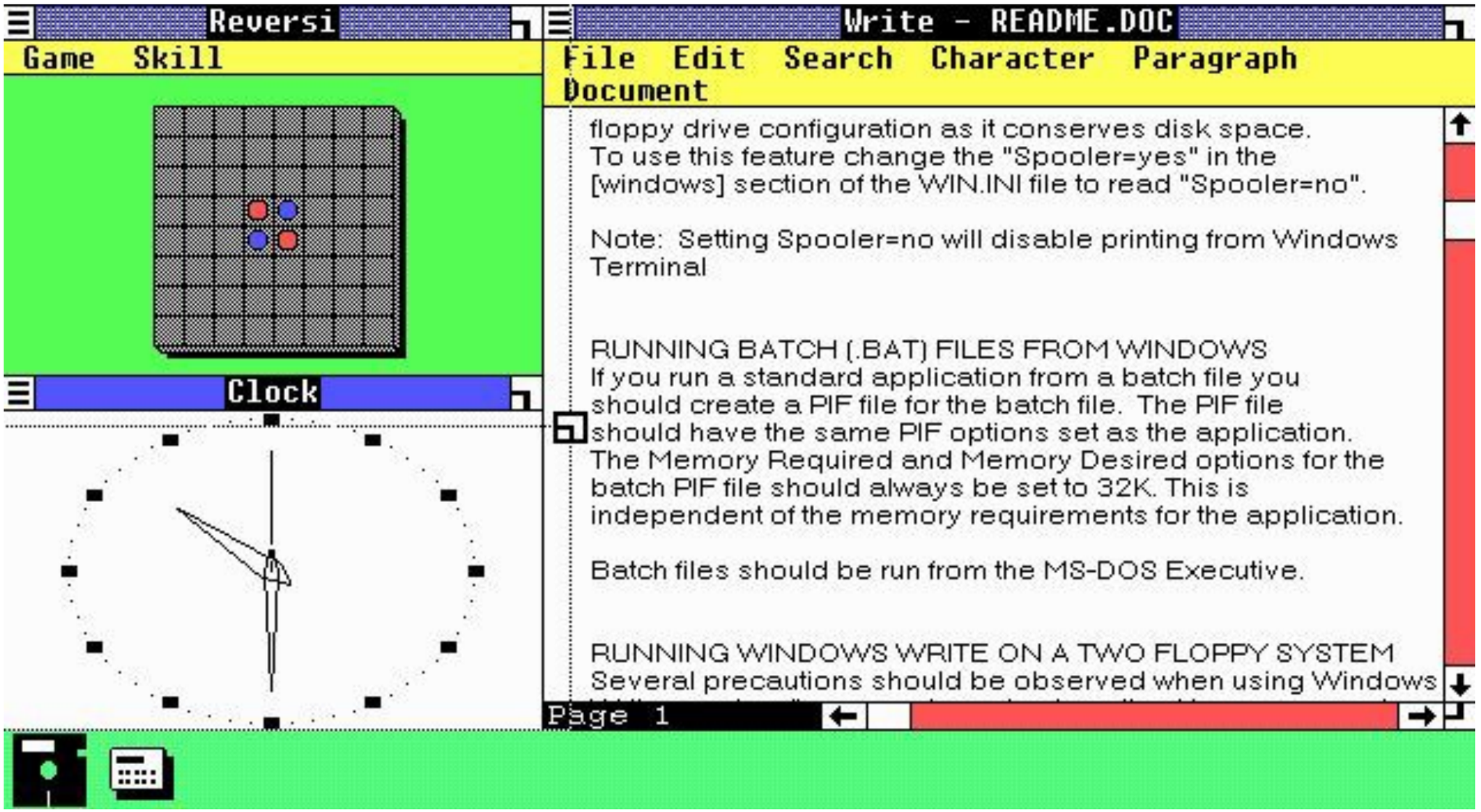


Apple Mac (1984)

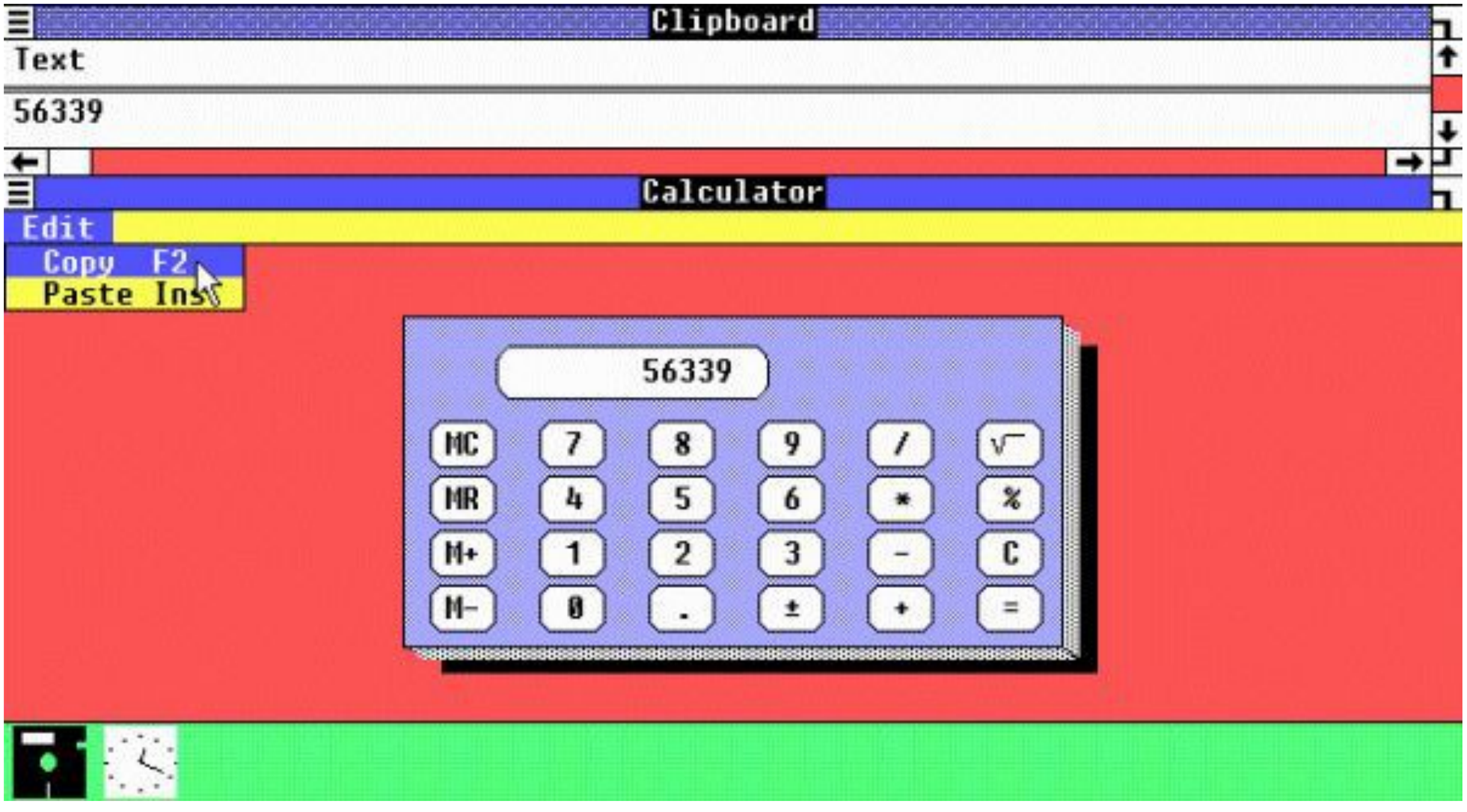
Windows 1.0 (1985)



Windows 1.0 (1985)



Windows 1.0 (1985)



Windows 2.0 (1987)

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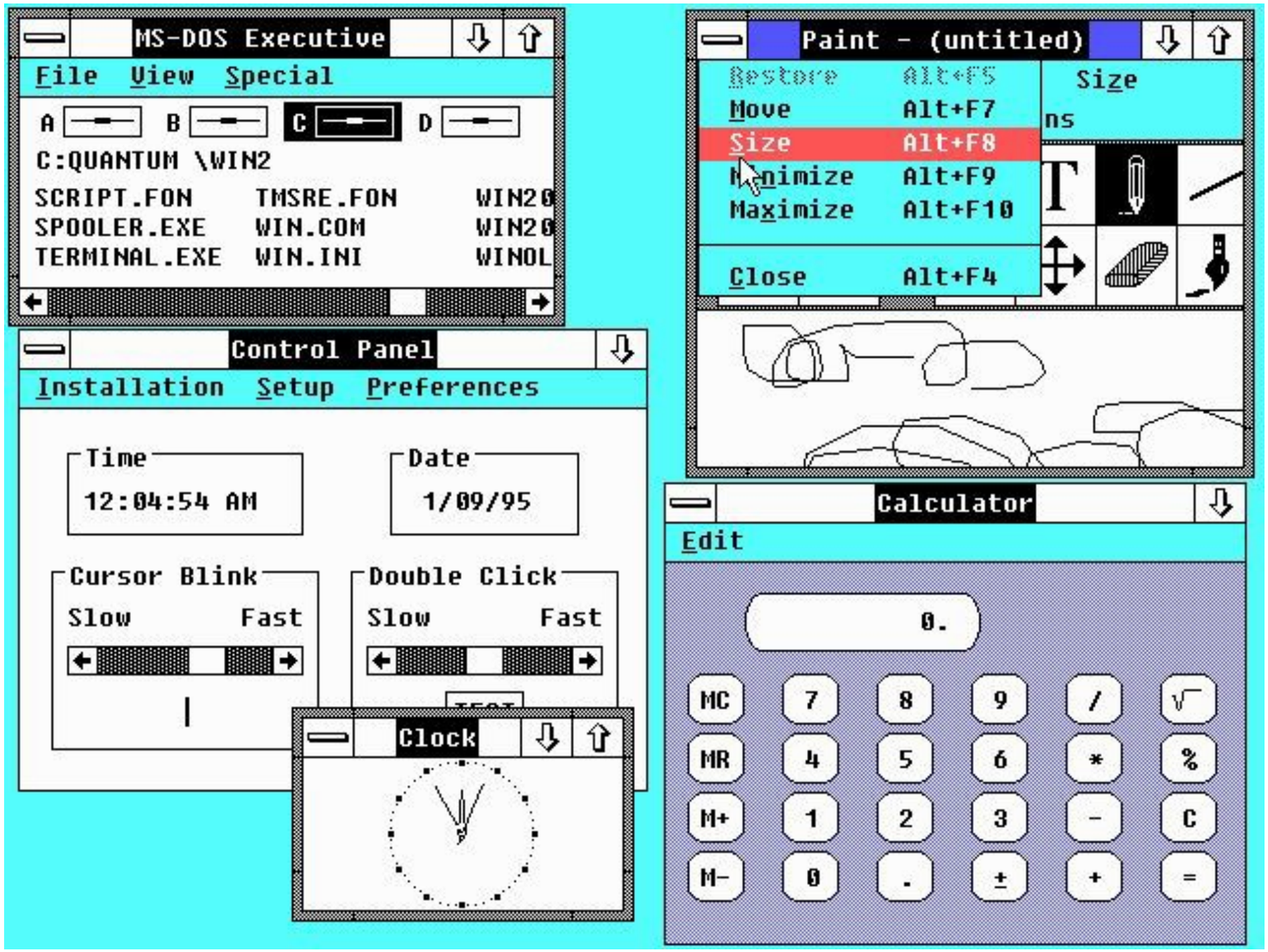
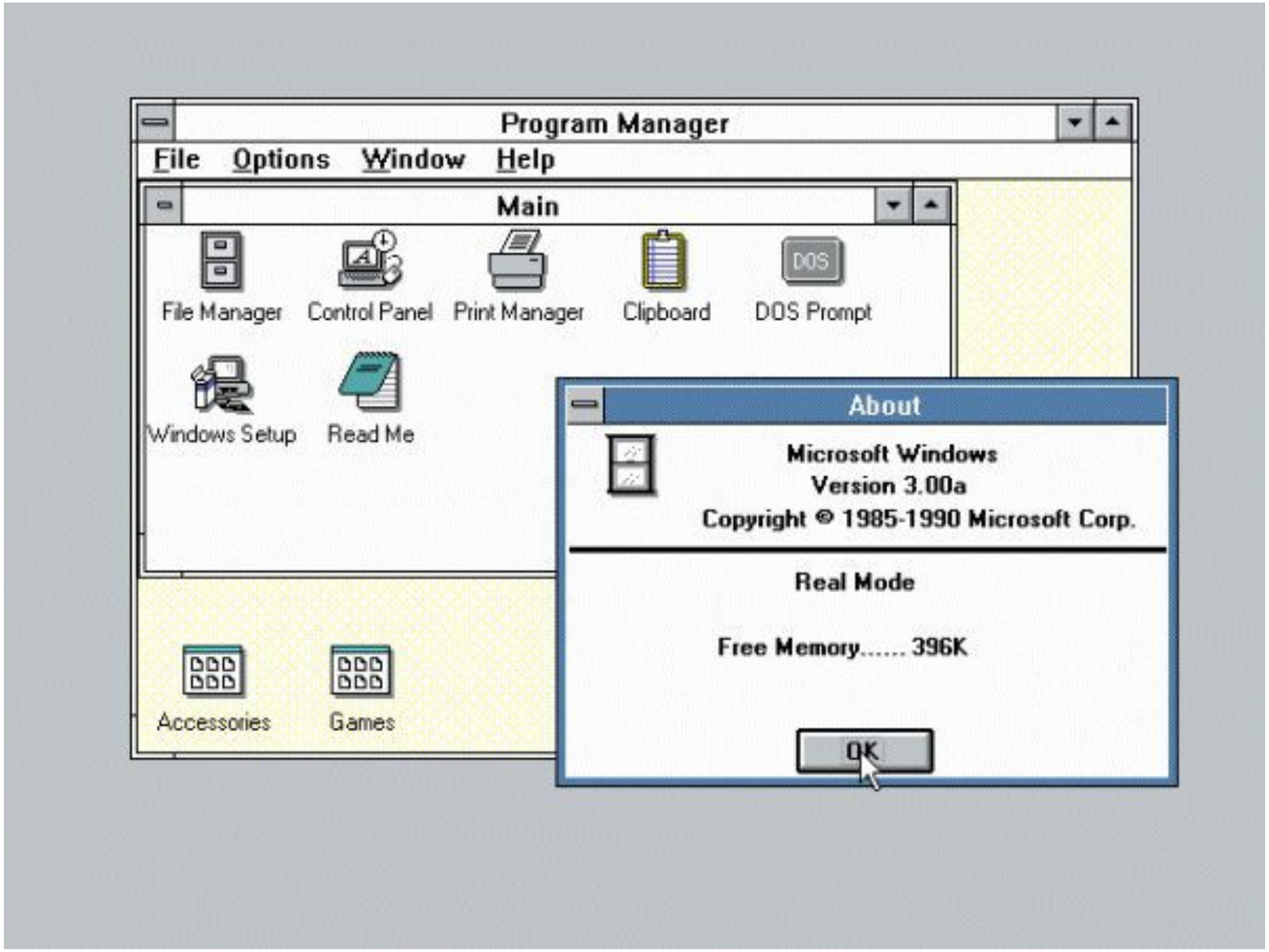
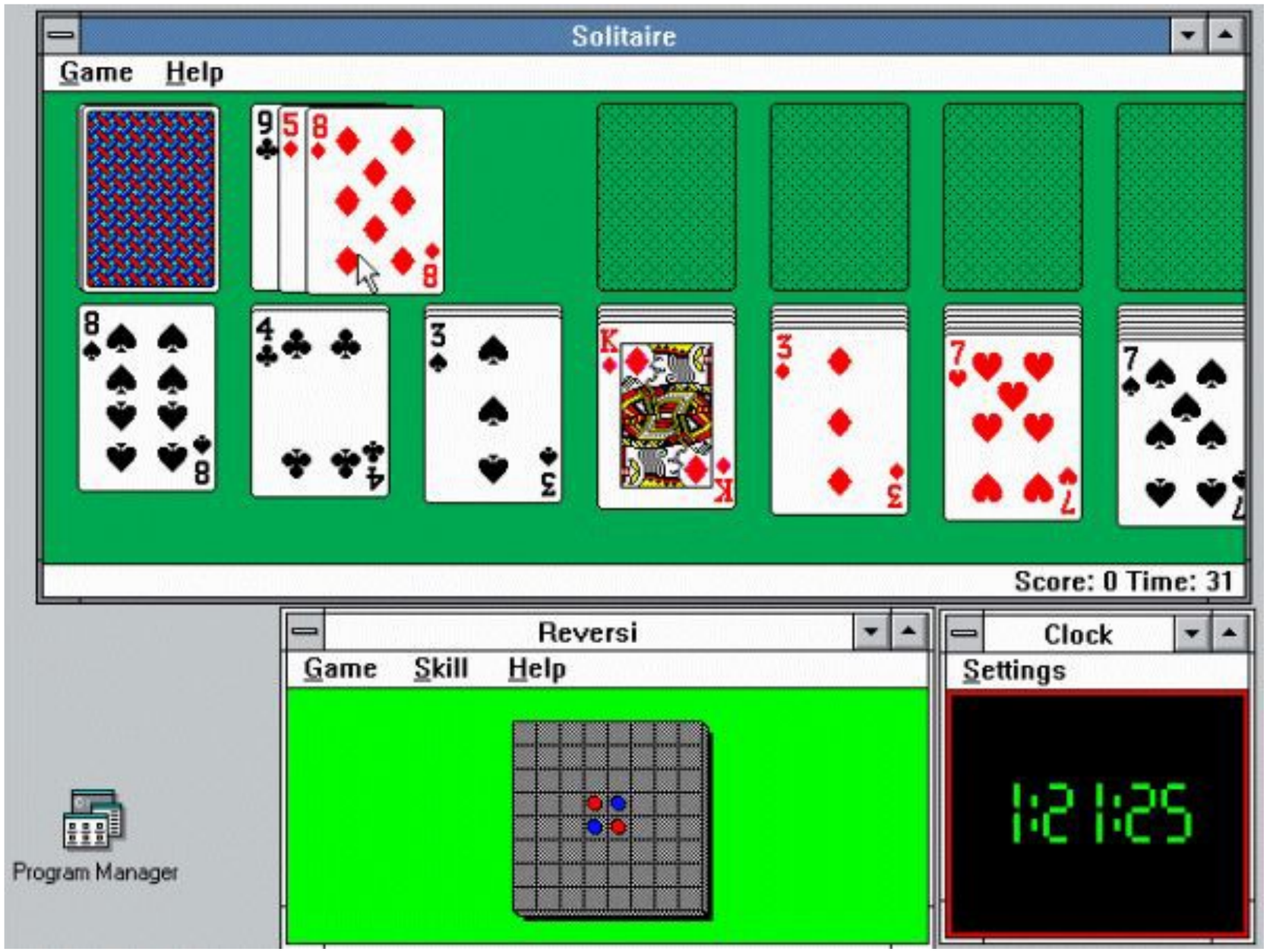


Windows 3.0 (1990)



Windows 3.0 (1990)



World Wide Web (1990)

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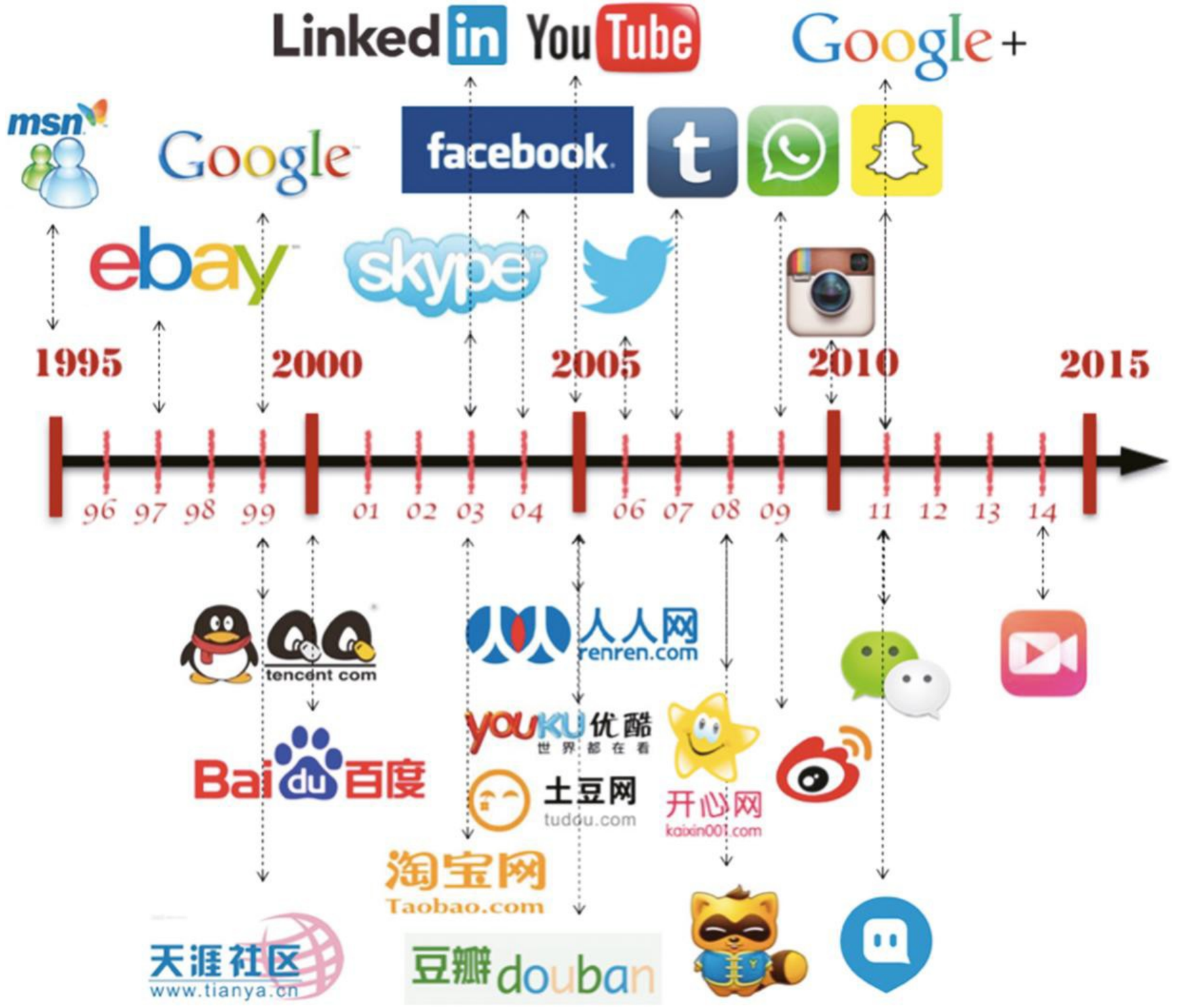
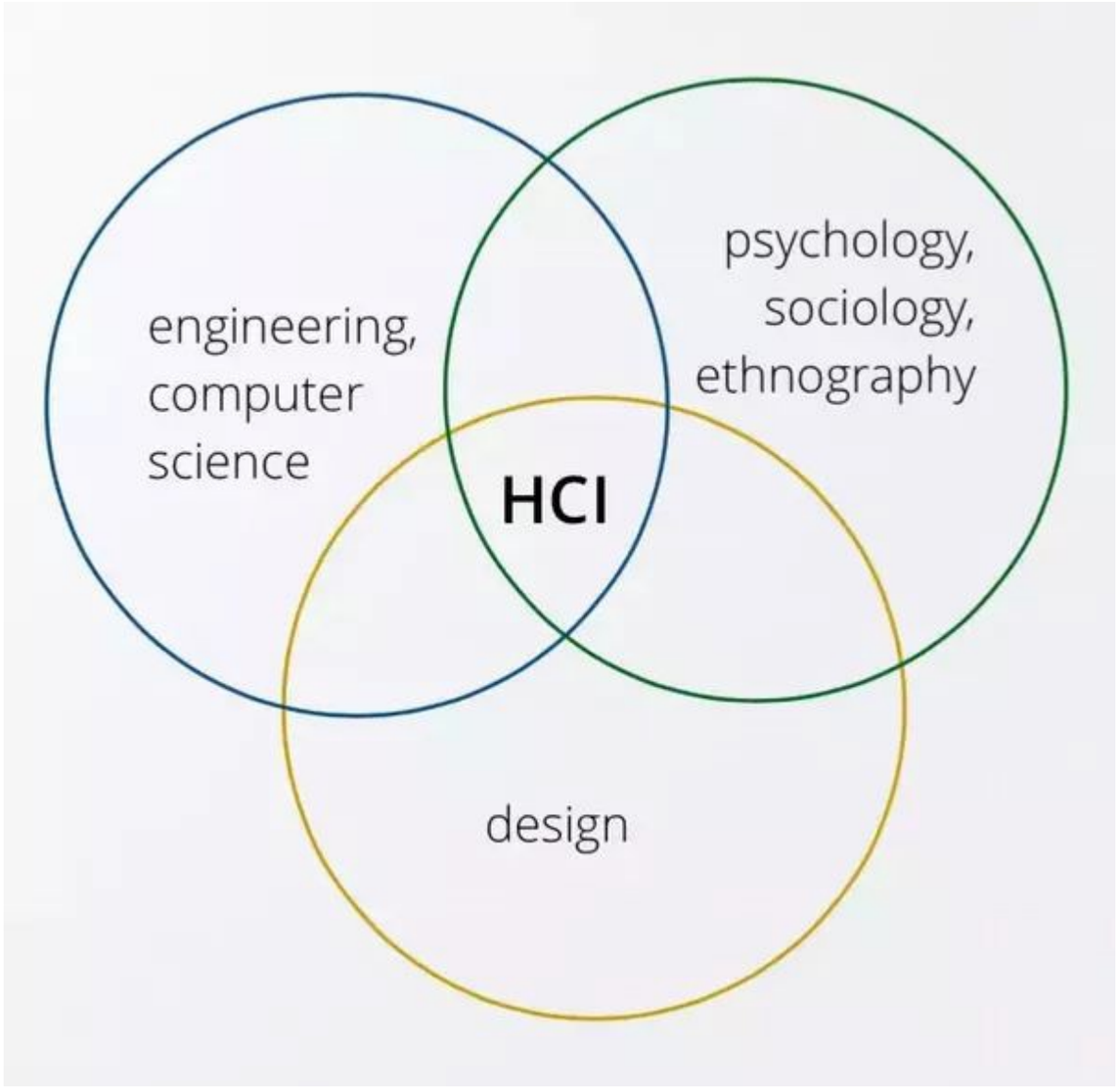


https://ucldigitalpress.co.uk/Book/Article/17/42/1216/



"HCI is concerned with understanding the influence technology has on how people think, value, feel, and relate and using this understanding to inform technology design." Wright & McCarthy (2008)

HCI’s impact on society

We can now use computers as an every-moment-partner

Less and less training is required for most application and devices

Some examples

- Touch screen: direct interaction with objects
- Voice control: for some people the only way to interact with computers

HCI’s impact on culture

Smartphones have changed how we spend our "empty times": should we read the news? answer emails? chat with friends? play "2 Dots"? should we just be bored?

Social Media have influenced how we stay in touch with each other and how find new friends and lovers.

Games, more than entertainment, can be used as social and even productive tools.

HCI’s impact on economy

Massive increase in productivity

HCI found how to speed up input and reduce its complexity

People can perform tasks faster than they used to

Reduced need for training

More people can use technology than ever before

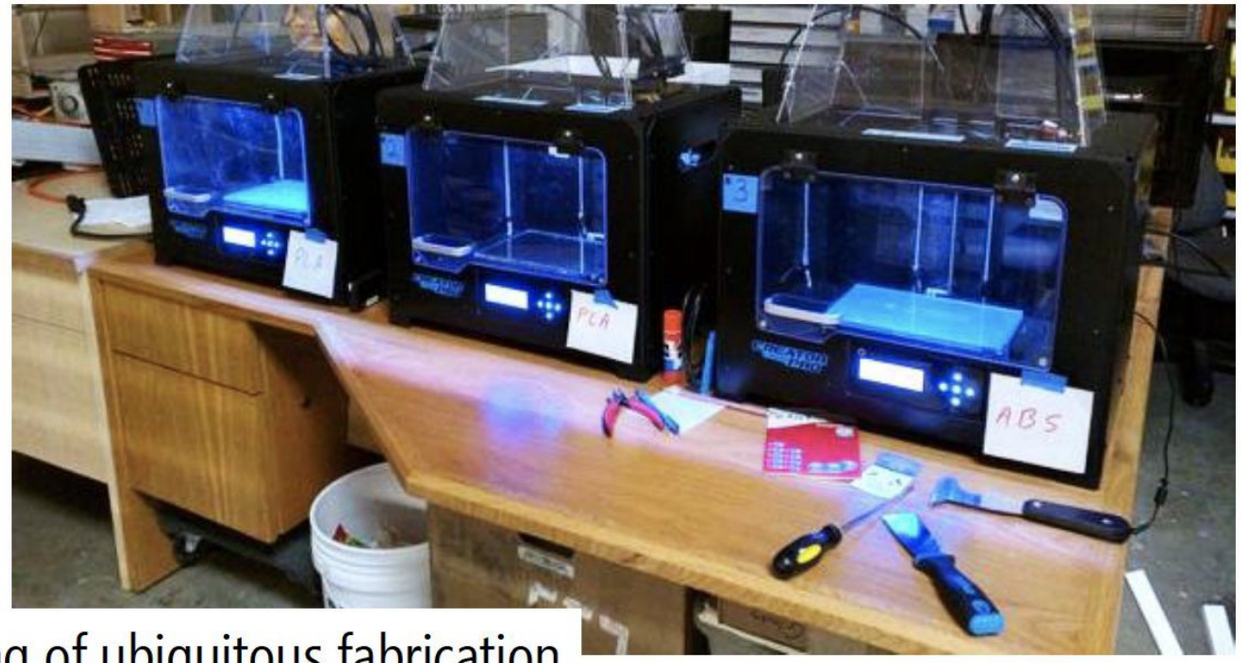
What now???

Fabrication (3D Printing) in HCI

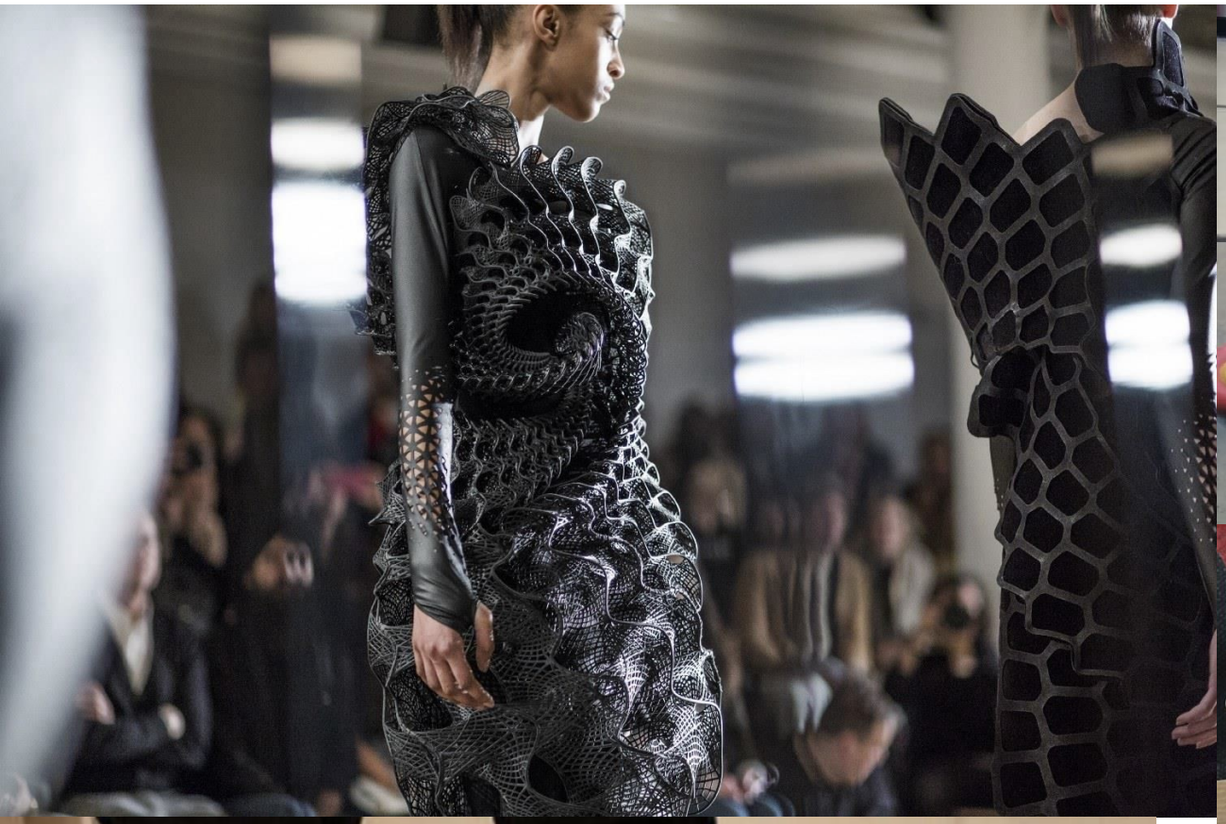
1987
The first commercial 3D printer
SLA-1 printer by 3D Systems Inc.
Invented by Charles Hull

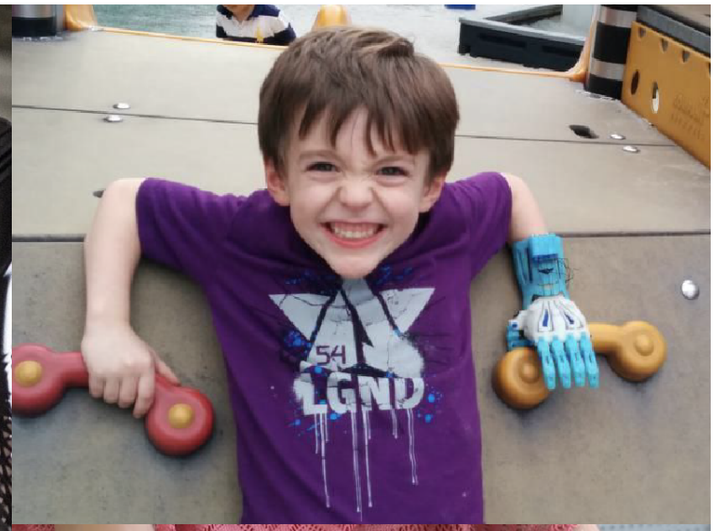
1992
The first commercial FDM printer
3D Modeler by Stratasys, Inc.
Invented by Scott & Lisa Crump

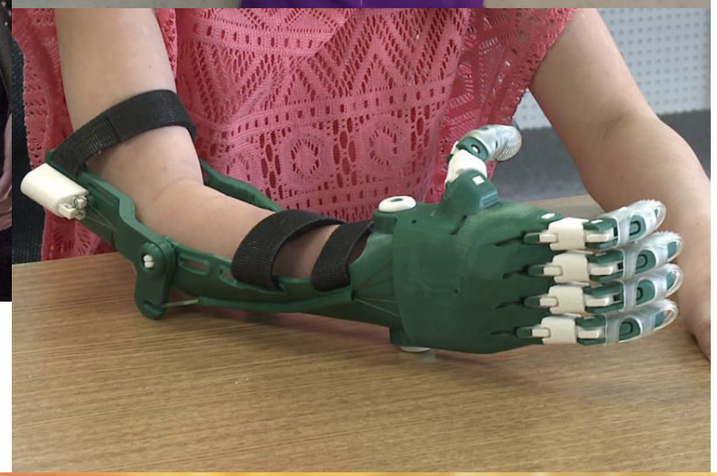
“The idea for the technology came to Crump in 1988 when he decided to make a **toy frog for his young daughter using a glue gun loaded with a mixture of polyethylene and candle wax**. He thought of creating the shape layer by layer and of a way to automate the process. In April 1992, Stratasys sold its first product, the 3D Modeler.”

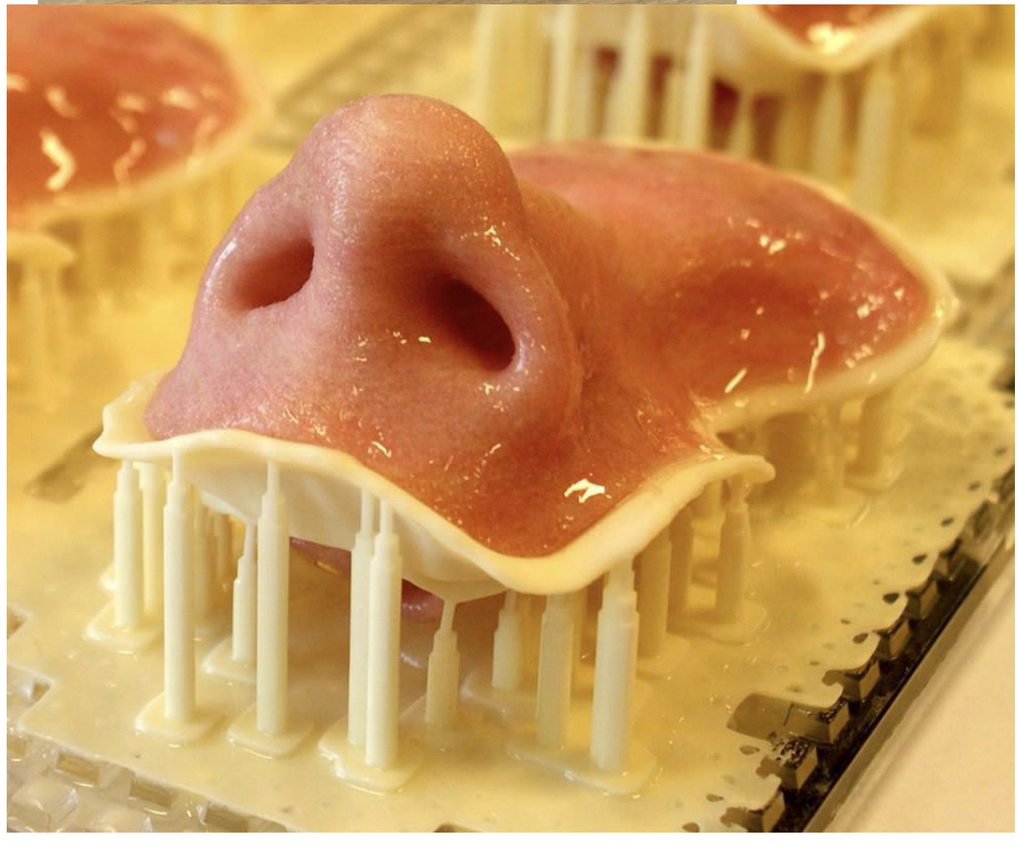


2009 marked the beginning of ubiquitous fabrication



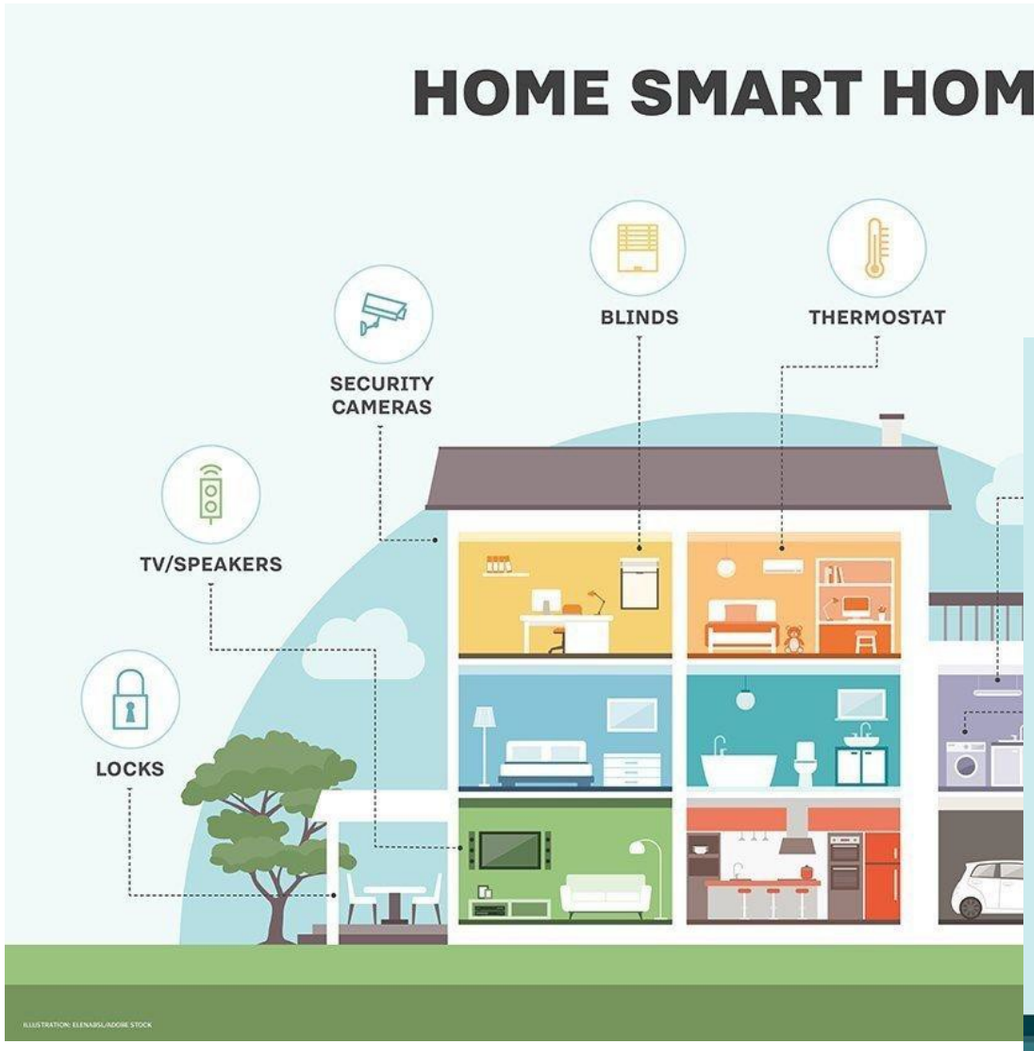

54
LGND

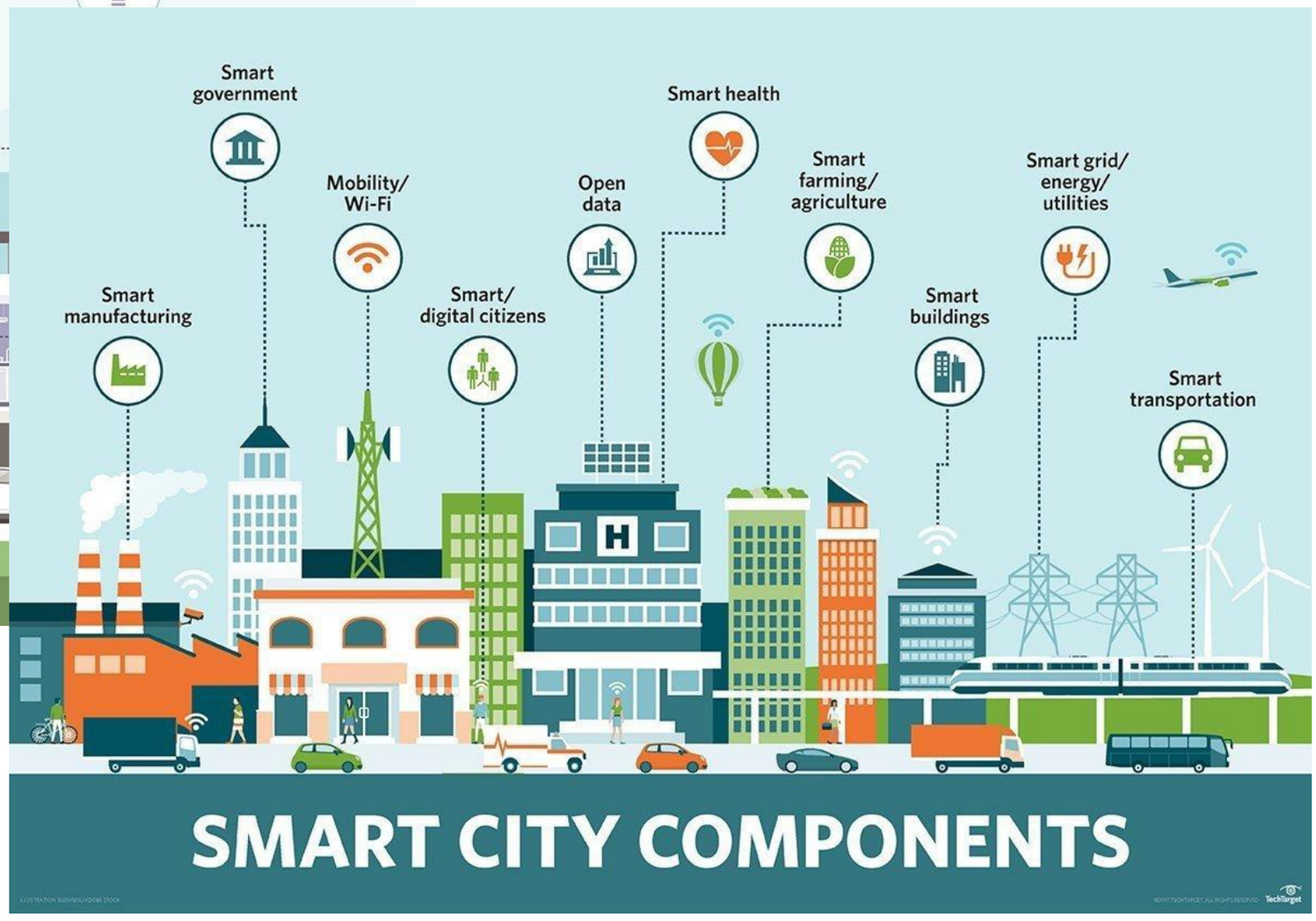




3D Printing pancakes using FDM

Society as the next platform





https://internetofthingsagenda.techtarget.com

And beyond (VR/AR)

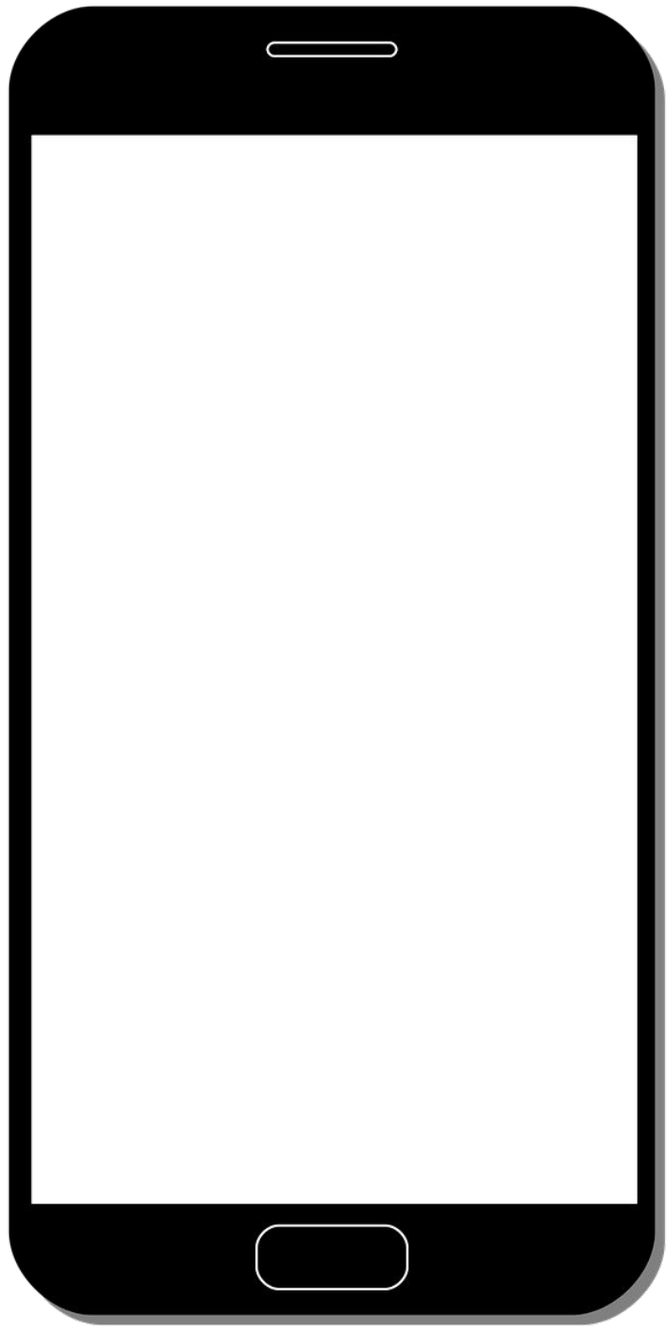
Activity

Activity (10 minutes)

In light of the next steps of socio-technology:

How would you reimagine this thing?

TASK: In pairs (randomly assigned), create an innovative concept that will push our pocket devices into the future of interactive technology!

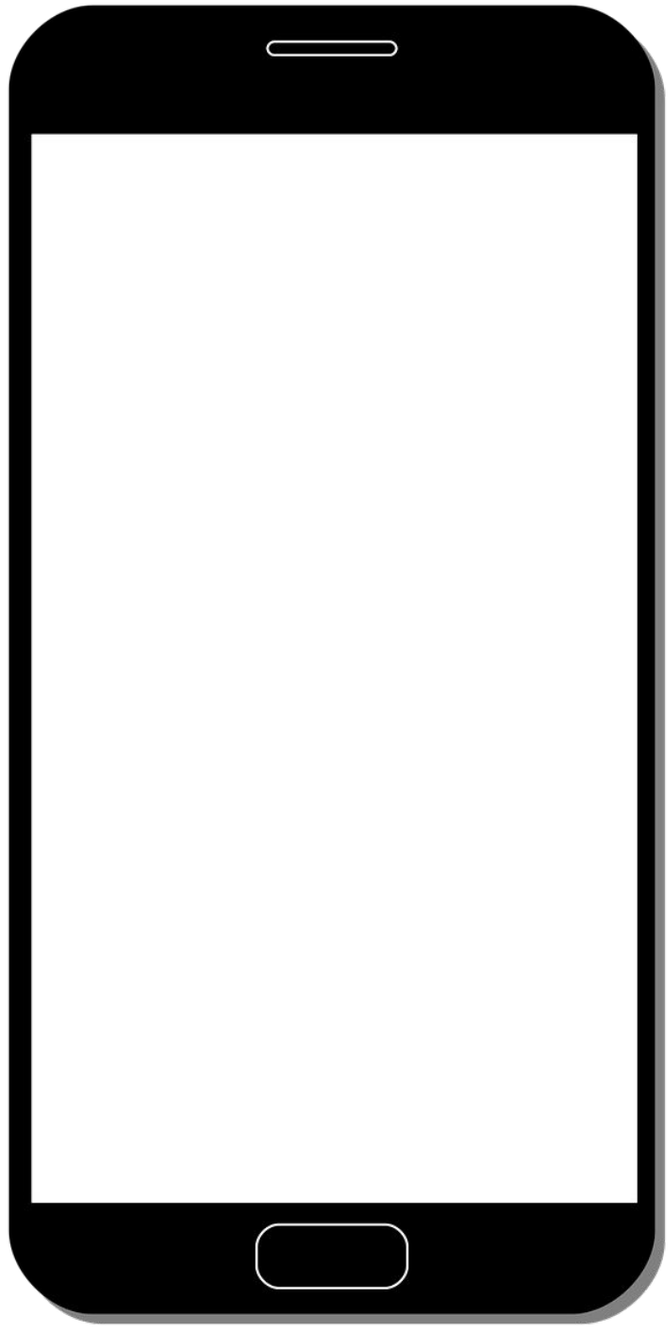


Reflection

What did you come up with?

What were the challenges?

How did your process differ from what you did on Tuesday?



Questions and thoughts?