

# CSI 60: User Interface Design

Historical Perspective

4/18/2012

**Berkeley**  
UNIVERSITY OF CALIFORNIA

Due Monday

**Pilot Usability Study (Apr 23)**

Refine your implementation

Evaluate your implementation

## Topics

### Precursors

1940's Early Visions

1960's Visionary Demos

1970's Personal Computing

1980's Graphical User Interfaces

Mobile Computing

### Precursors

## Astrolabe (Middle Ages)

Convenient interface to complex computation



## Astrolabe Video

Tom Wujec, TED 2009

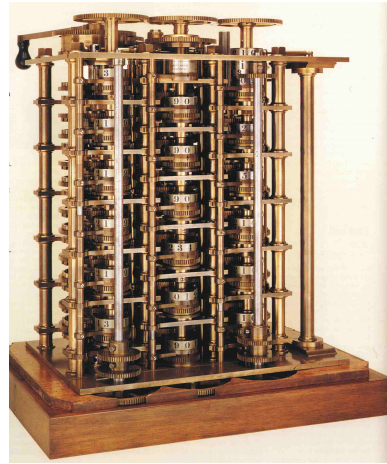
[http://www.ted.com/talks/lang/eng/tom\\_wujec\\_demos\\_the\\_13th\\_century\\_astrolabe.html](http://www.ted.com/talks/lang/eng/tom_wujec_demos_the_13th_century_astrolabe.html)

Segments starting at: 01:20, 04:30

## Mechanical Control & Computation



Jacquard Loom (1804)



Babbage Difference Engine (1849)

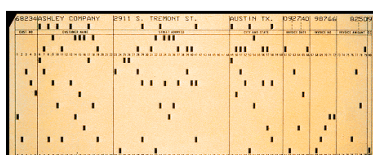
## Babbage Difference Engine Video

<http://www.youtube.com/watch?v=0anlyVGeWOI>

## Hollerith Punch Cards (1890)

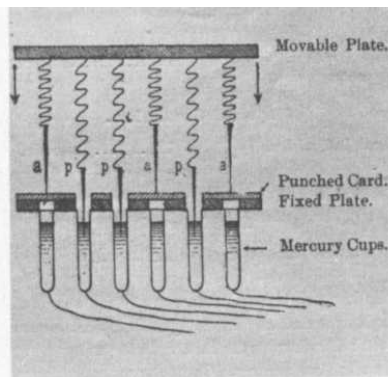
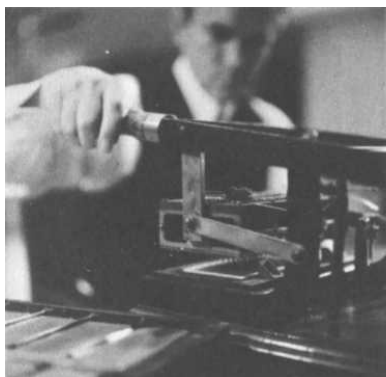


From Computer Desktop Encyclopedia  
© 2000 The Computer Language Co. Inc.



Hollerith Electric Tabulator, US Census Bureau, Washington, DC, 1908,  
Photograph by Waldon Fawcett. Library of Congress, LC-USZ62-45687.

## Hollerith Punch Cards (1890)



Computer History Museum video:  
<http://www.youtube.com/watch?v=9HXjLW7v-II>

## Teletype (ca. 1910)

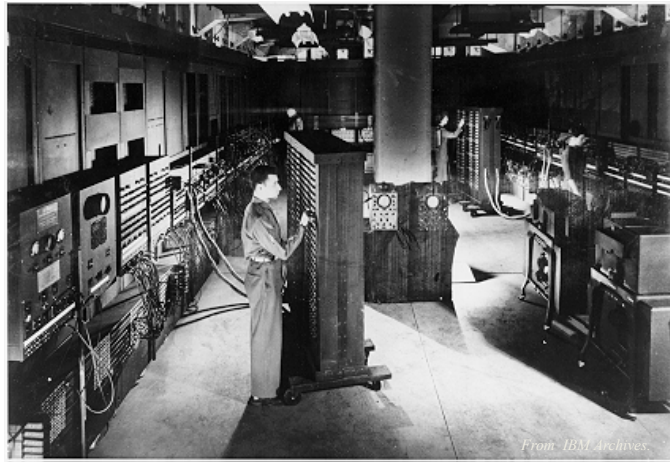


<http://www.youtube.com/watch?v=niYDegpfAs>  
<http://www.youtube.com/watch?v=Ml00ngVwrcU>

## 1940's Early Visions

## ENIAC (1943)

World's first numerical integrator and computer

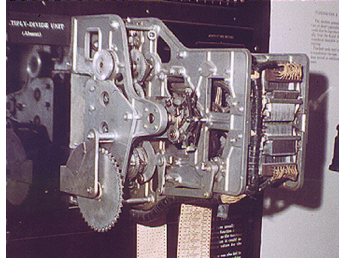


## Harvard Mark I (1944)



55 feet long, 8 feet high, 5 tons

## Harvard Mark I (1944)



### Hardware

Physical switches (before microprocessors)

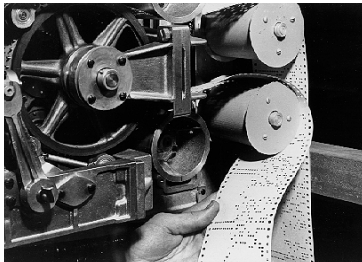
Paper tape

### Uses

Ballistics calculations

Simple arithmetic & fixed calculations (before programs)

3 seconds to multiply



## Adm. Grace Murray Hopper



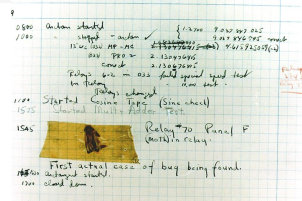
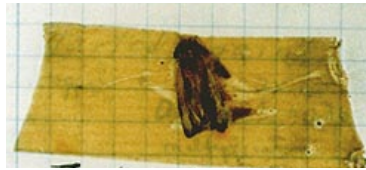
First programmer of Mark I



## Adm. Grace Murray Hopper



First programmer of Mark I



Filed first bug report

## Vannevar Bush

Name rhymes with "Beaver"

Faculty member MIT

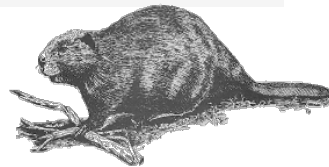
Coordinated WWII effort  
with 6000 US scientists

Social contract for science

Federal government funds universities

Universities do basic research

Research helps economy & national defense



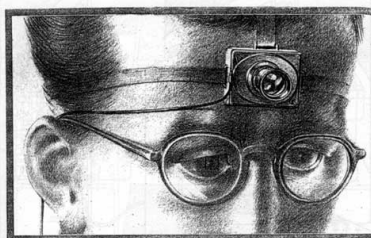
1890 - 1974

# As We May Think

Published in the *Atlantic Monthly* in 1945

What will the computer of the future look like?

- Wearable cameras for photographic records
- Encyclopedia Britannica for a nickel
- Automatic transcripts of speech
- Memex
- Trails of discovery
- Direct capture of nerve impulses



A scientist for the future records his thoughts with a 'top camera' which will photograph him, the photo being in the product of the light beam that will

## AS WE MAY THINK

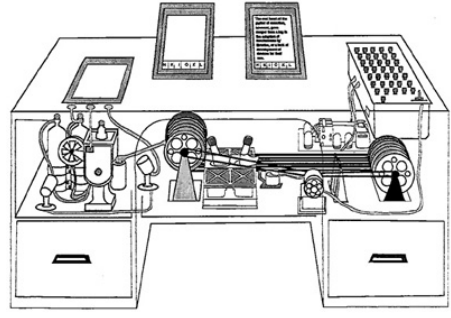
A TOP U. S. SCIENTIST FORESEES A POSSIBLE FUTURE WORLD IN WHICH MAN-MADE MACHINES WILL START TO THINK

by VANNEVAR BUSH  
 Director for the Office of Scientific Research and Development

THIS MAN HAS A 'COMPUTER' which has been a word which all have heard a great deal in the past. The scientist, leaving his old professional responsibilities to the hands of a machine which has been partly of human work, is now busy endeavoring to work in effective possibility. What are the scientists to do with the machine, and particularly the mechanical computer, that can be built to do anything, for that the work has hardly required them to have the old tools? Many of them have been able to carry on their own research in their familiar professional laboratories. Their activities remain much the same as in the past, and they have been able to do their work as well as ever. But the machine is now being built for the use of people who have had to do with the machine in their work. They have done their part in the machine, and they are now ready to take the machine over. They have worked in combined effort with the physicist of our time. They have done their part in the machine, and they are now ready to take the machine over. They have done their part in the machine, and they are now ready to take the machine over.

# Memex

- Store all personal books, records, communications
- Items retrieved through indexing, keywords, cross references,...
- Can annotate text with margin notes, comments...
- Can construct a trail through the material and save it
- Acts as an external memory



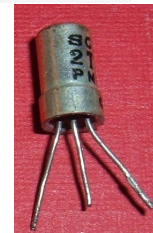
## 1960's Visionary Demos

### Context - Computing in 1960s

- Transistor (1948)
- ARPA (1958)
- Timesharing (1950s)
- Terminals and keyboards



Vacuum Tube



Transistor

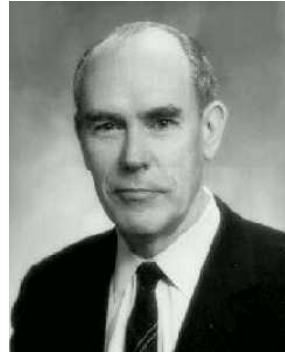
Computers still primarily for scientists and engineers

## Ivan Sutherland (1938 - )

Established Computer Graphics

Turing award 1988

Now a fellow at Sun and until recently a visiting Professor at Berkeley



## Sketchpad (1963)

Ivan E Sutherland's PhD thesis

Modern pen-based system

CAD design

3D modeling

**Key: Interactivity**

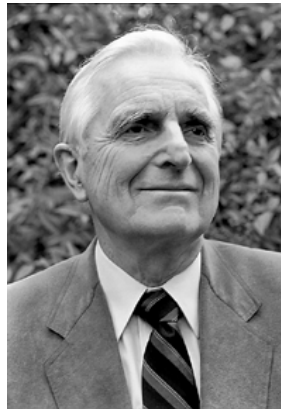
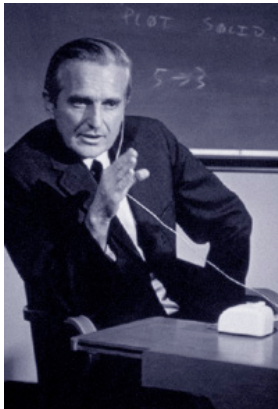
Real-time computing was non-existent



Video: 4:30 - 9:18



## Doug Engelbart (1925 - )



**Strongly influenced by Bush**

How would you implement the Memex in 1963?

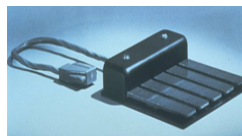
## NLS: oNLine System (1968)

1968 Fall Joint Computer Conference (SF)

Demonstrated NLS to 1000 computer scientists

Video screen, chording keyboard, mouse, videoconferencing,  
hyperlinking, word processing, email,

User testing



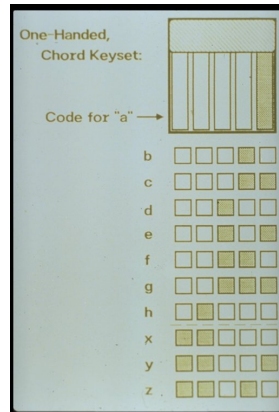
Video: 10:54 - 17:00

BOUNDARIES

### 8. Historic Video: A Research Centre for Augmenting Human Intellect

Contact:  
Douglas C. Engelbart  
Bootstrap Institute  
6505 Kaiser Dr.  
Freemont, CA 94555, USA  
email: [DCE@bootstrap.org](mailto:DCE@bootstrap.org)

## Chording Keyboard and Mouse



Advantages/Disdvantages?

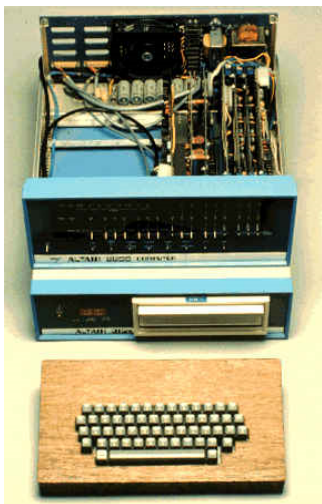




## 1970's Personal Computing



## Altair (1975)

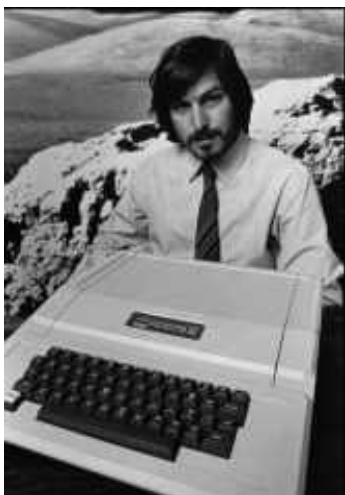


## Apple I (1976)



© 1992 Smithsonian Institution

# Personal Computers



Apple II 1977



IBM PC 1981

# VisiCalc (Bricklin, 1979)

9 10

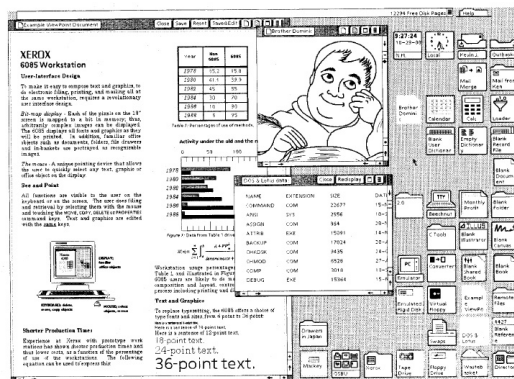
**A VISICALC™ Screen:**

Annotations for the VisiCalc screen include:

- Current Entry's coordinates
- Entry Type: V for value, L for label, R for repeating label
- Recalculation Order indicator: if R, across rows; if C, over columns
- Memory Indicator: how many K memory available; if flashing M, out of room
- Direction Indicator: if ., arrow keys will move cursor up and down; if ^, arrow keys will move cursor left and right
- Explicit Format indication
- Entry Contents
- Left Justified Format (FL)
- General Format (FG)
- Repeating Label (R-)
- Label Entry
- Dollars and Cents Format (FB)
- Integer Format (FI)
- Graph Format (F\*)
- Value Entry
- Cursor
- Two windows when the screen is split
- Right Justified Format (FR)
- Edit Line: flashing block means waiting input

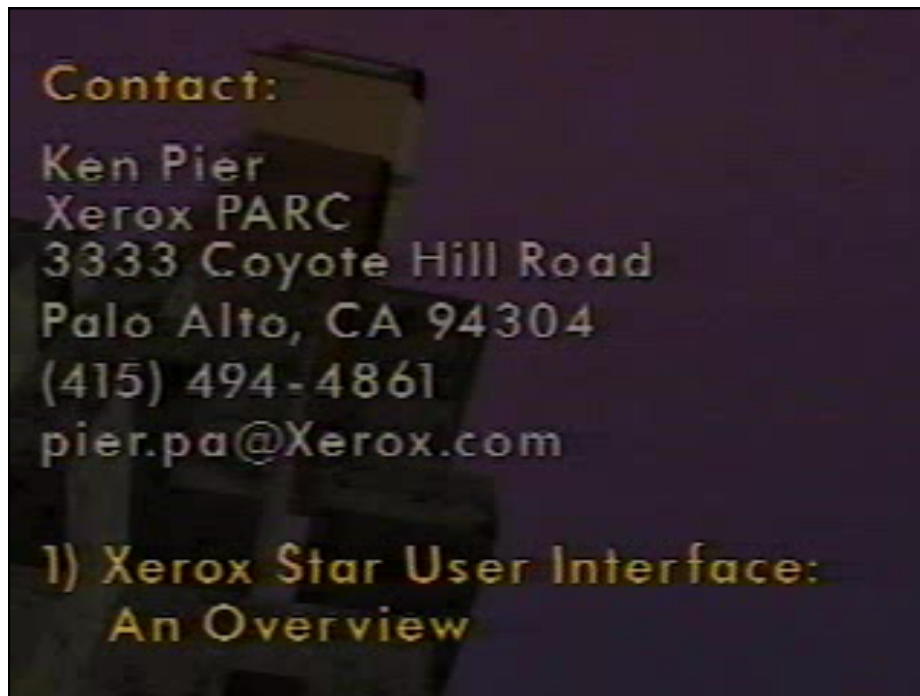
# 1980's Graphical User Interfaces

## Xerox Star (1982)



Bitmapped display, windows, icons, menus, pointer, desktop, direct manipulation, WYSIWYG ...

Video: 1:11 – 8:20



## Designing the Star

### Design team developed new methodology

- Task analysis
- Wide range of users
- Usage scenarios
- Decomposition of design:
  - Display and control interface
  - User's conceptual model
- Many prototyping cycles

### User centered design



## Star → Mac

But the Star was expensive and slow (\$25k).

Steve Jobs visits PARC in 1979

Sees Alto (precursor to Star)

Lisa ships in 1983 at \$10,000,

1-button mouse

Menu bar (instead of pop-up menus)

Fails in marketplace



Macintosh ships in 1984 at \$2500

Most consistent WIMP UI

Look and feel guidelines

Personal computing market  
changes for good



## History of Mobile Computing

(see slide deck #2)