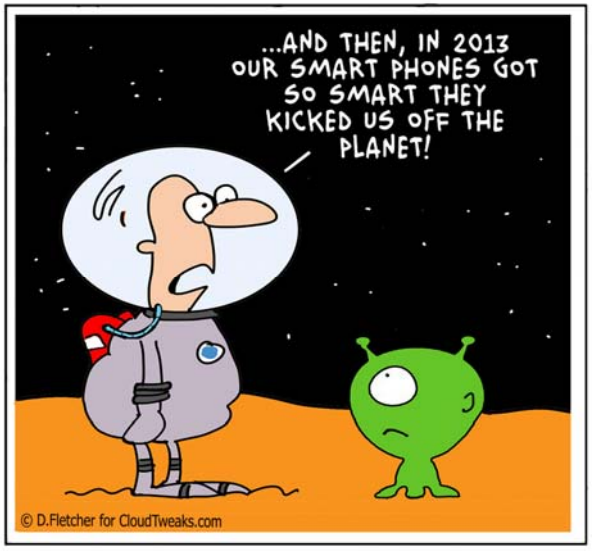
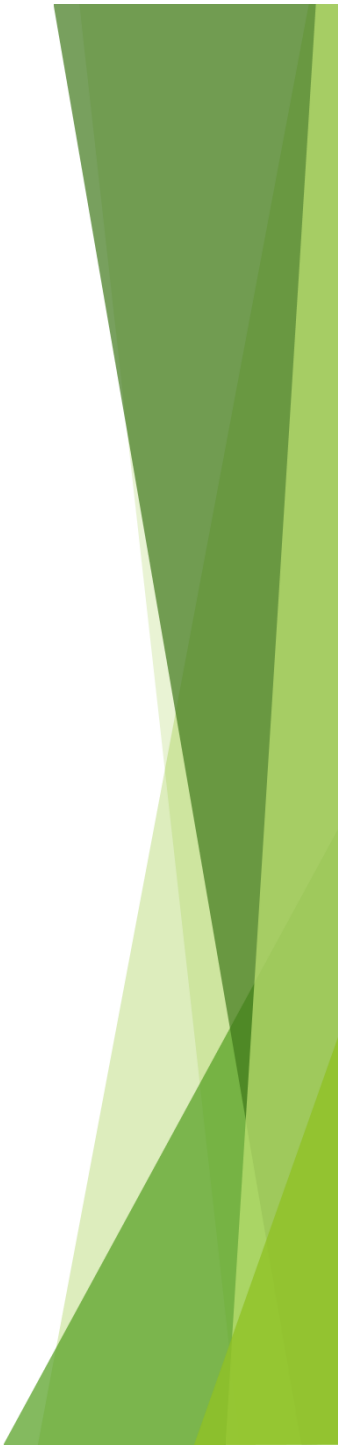
History of Computing

Lecture 27 – COMPSCI111/111G SS 2018



Today's lecture

- The history of computing, focusing on the personal computer (PC)
  - The first computers
  - Computers in WWII
  - 1950s - 1980s: from the room to the desk
  - 1980s – 2000s: the computer becomes personal
  - Future of the PC



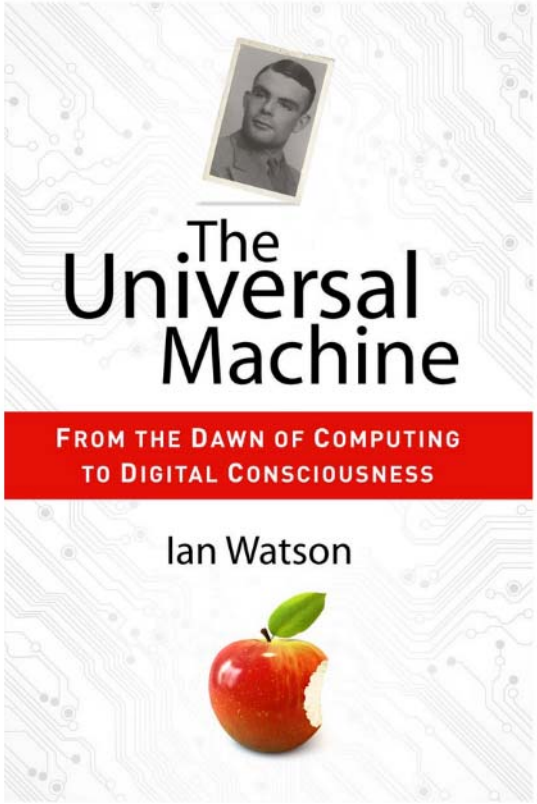
Why bother?!

- Knowing the history of computing gives us:
  - A better understanding of how computers work
  - An appreciation how quickly computing technology has developed
  - Insights into the future of computing

Computer Science timeline

Helpful resources

- “The Universal Machine” by Assoc Prof Ian Watson

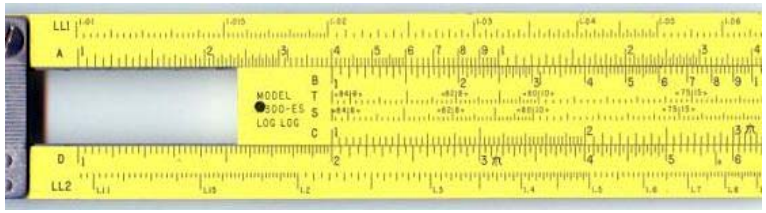


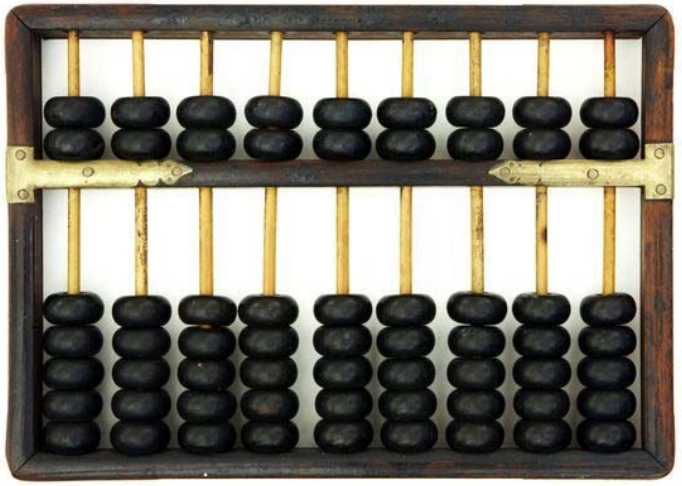
Helpful resources

- Computer Science Department's Computing History displays
- Website explaining the displays: https://www.cs.auckland.ac.nz/historydisplays/

The first computers

- People were the first computers, performing calculations by hand to produce tables of mathematical results (eg. ordinance tables)
- Devices were developed to assist calculations, some of which are still used today.
- Ultimate goal was to have a machine do the calculations. 2 advantages:
  - Speed
  - Accuracy



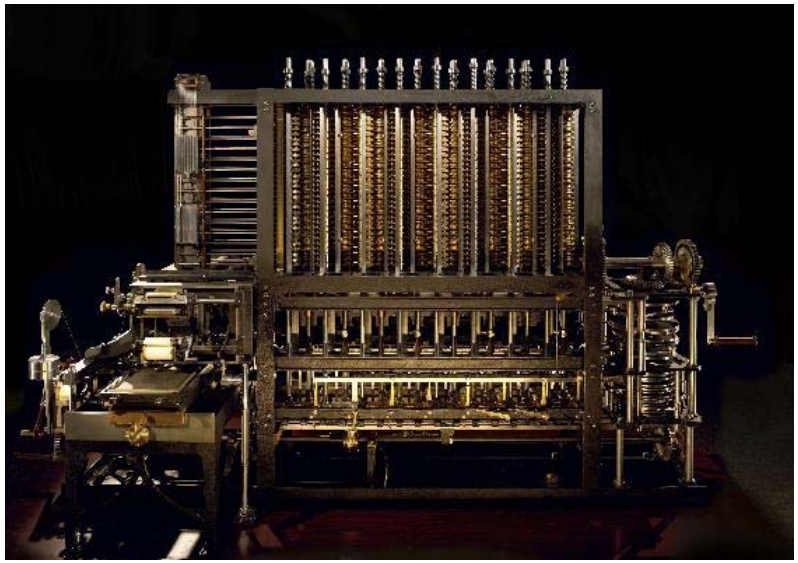


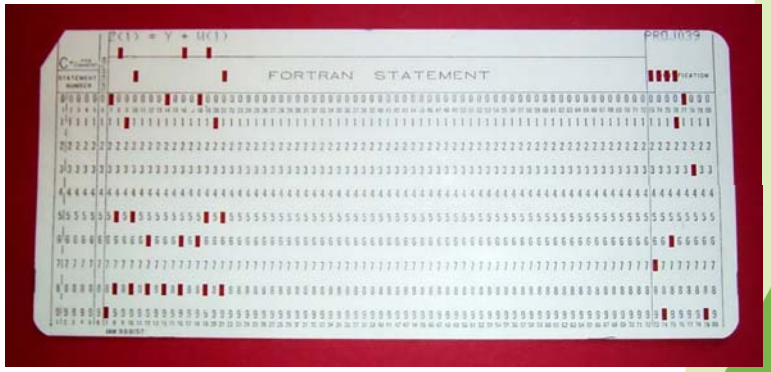
Analytical Engine

In 1832, Charles Babbage designed the Analytical Engine

- a mechanical general purpose programmable computer
- Programs and data on punch cards.
- A store (i.e. memory) for holding 1000 numbers of 40 decimal digits
- The arithmetical unit called the “mill” would be able to perform all four arithmetic operations, comparisons and square roots

Cost, construction challenges and the Engine’s size meant it was never built





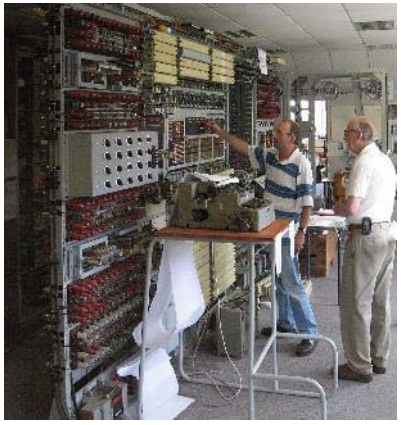
The first computers

- It took clerks 8 years to manually compile the results of the 1880 US census
- The **Electric Tabulating System** designed by Herman Hollerith compiled the 1890 Census results in 2½ years rather than a decade!
- Over the 1800's and early 1900's, computing machines were designed and refined
- In 1924, Computing-Tabulating-Recording Company (CTR) was renamed **International Business Machines Corporation (IBM)**

Computers in WWII

- IBM and Harvard built the Harvard Mark 1 to calculate artillery tables for the US military
- In Bletchley Park, computers were used to break encrypted German radio messages
  - Alan Turing developed the **Bombe** in 1939 to decode Enigma messages
  - Tommy Flowers developed **Colossus** to decode Lorenz messages

Rotating drums on the Bombe



Using a reconstruction of Colossus

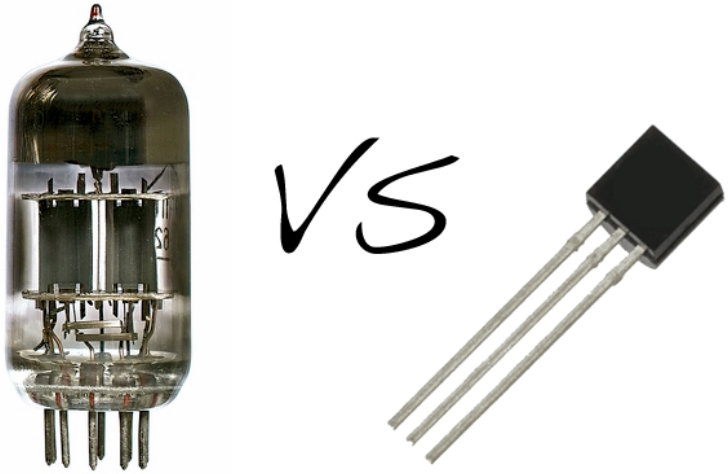
The 1950's and 1

- Mainframes such as the UNIVAC and the IBM 701 were the only computers available
- Mainframes were very expensive, took up a lot of room and were difficult to operate

IBM 701 operator's console

The 1960's

- IBM became the dominant computer manufacturer, producing successful computers like the IBM 7090
- Invention of the transistor, which replaced vacuum tubes, made computers smaller, faster and more reliable

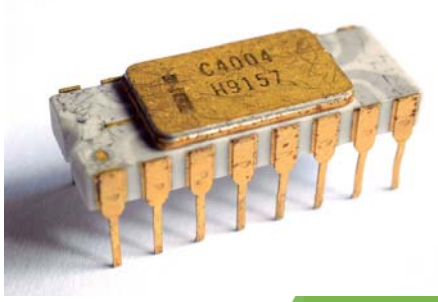


The 1970's

- Palo-Alto Research Centre (PARC)
  - Opened by Xerox in 1969
  - Created things used by modern computers; eg. mouse, GUI, laser printer

- Terminals and time-sharing systems
  - Users worked on a terminal connected to a main computer
  - Each user's processing was completed in a short slice of time on the main computer. To the user, it seemed like they had full use of the main computer

- First microprocessor – the Intel 4004
  - Intel founded in 1968 by Gordon Moore and Robert Noyce
  - Intel 4004 released in 1971, followed by the Intel 8080 in 1974



The 1970's

- MITS releases the Altair in 1975
  - Founded by Ed Roberts, MITS originally produced calculators
  - The Altair was a kitset computer that buyers had to assemble
  - Initially, users had to toggle the front switches to load programs into the Altair's memory
- Microsoft founded in 1975
  - Bill Gates and Paul Allen developed a BASIC interpreter for the Altair

The 1970's

- Apple founded in 1976
  - Steve Jobs and Steve Wozniak initially sold the Apple I kitset
  - Apple II was the first successful personal computer
    - First sold in 1977
    - Features: colour graphics, slots for third-party cards
- VisiCalc released in 1979
  - Developed by Dan Bricklin and Bob Frankston of VisiCorp
  - First spreadsheet program
  - VisiCalc was initially released on the Apple II. It became the computer's **killer app**, making the Apple II very popular
  - VisiCalc was killed by Lotus 1-2-3

The 1980's

- Microsoft purchased QDOS in 1981 from Seattle Computer Products
  - "one of the shrewdest business deals of the century…" – *The Universal Machine*
- QDOS was renamed MS-DOS and licensed to IBM
  - PC-DOS was the operating system for the IBM PC, released in 1981
- Other manufacturers reverse-engineered the IBM PC's proprietary BIOS and produced 'IBM clones'
  - Crucially, Microsoft was able to license MS-DOS to other manufacturers, meaning they could compete with IBM
  - This eroded IBM's market dominance and made Microsoft very profitable

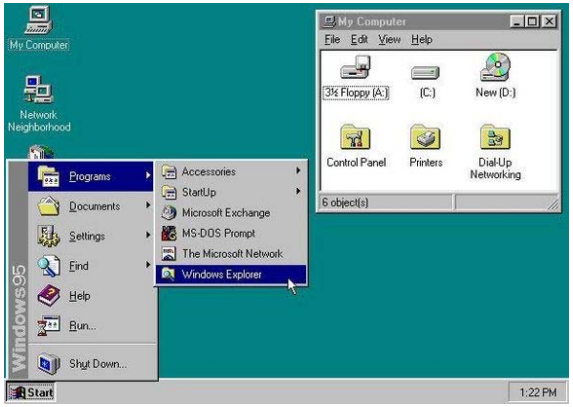
The 1980's

- In 1984, Apple released the Macintosh; the PC with a GUI (based on the Alto)

- "For the first time a person could buy a computer, take it home, take it out of the box, turn it on and use it without having to learn and type complex and arcane commands." -*The Universal Machine*

The 1990's

- Microsoft releases Microsoft Office (1990) and Windows 95, followed by Windows 98



- Apple releases the iMac in 1998

The 1990's

- Personal Digital Assistants (PDAs) were popular in the 1990s because they were portable
  - Common features included a touchscreen display, web browser, music player and apps
- Psion's Series 3, released in 1991, was the first 'real' PDA

- The IBM Simon, released in 1994, was the first device with PDA and cellphone functionality

The 1990's

- Other popular PDA brands included:

Palm

Blackberry

Apple

Nokia

The 2000's

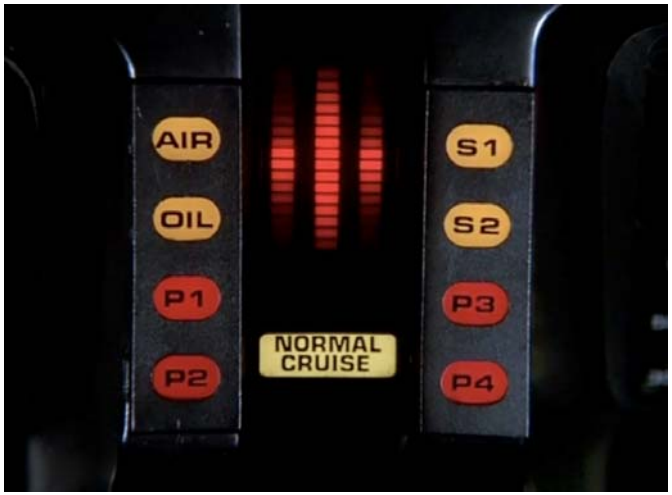
- Laptops become more powerful and portable (lighter and better battery life)
- Growing popularity of different ways of interacting with computers; gestures, voice commands, touchscreens
- Greater availability of fast Internet connections opens new uses for our PCs

The 2000's

- Apple releases the iPhone in 2007 and the iPad in 2010, creating new categories of personal computing devices
- The variety of fixed (eg. desktops) and mobile (eg. tablets) computing devices we have today brings us closer to an era of "ubiquitous computing"

The future of the PC

- The end of the desktop PC with the rise of:
  - Mobile computing
  - Cloud computing
- Computers get even more personal – wearable tech, embedded tech
- Computers that are artificially intelligent?



Questions

- Give two advantages of transistors over vacuum tubes
- What did other PC manufacturers have to reverse-engineer in order to create ‘IBM clones’?
- Name two new ways (apart from the mouse and keyboard) to interact with computers

Summary

- The first computers were people, followed by very large electromechanical devices
- Key technologies such as transistors and microprocessors helped to reduce size and cost
- Software, such as MS-DOS and VisiCalc, were important to the success of early personal computers
- Over time, computing technology has become smaller, cheaper, more user-friendly, more powerful