The History of Computer Science

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Before 1900

- People had been using mechanical devices to aid calculation for thousands of years
  - Examples
    - the abacus probably existed in Babylonia (present-day Iraq) about 3000 B.C.E
    - Ancient Greeks developed some very sophisticated analog computers.
People of Early CS

- John Napier- invented Napier's rods (sometimes called "Napier's bones") in 1610 to simplify the task of multiplication.
- Blaise Pascal- in 1641 built a mechanical adding machine.
- Gottfried Wilhelm Leibniz- advocated use of the binary system for doing calculations.
- Charles Babbage- worked on two mechanical devices: the Difference Engine and the Analytical Engine (a precursor of the modern digital computer).
More People From Early Years

- Joseph-Marie Jacquard- invented a loom that could weave complicated patterns described by holes in punched cards
- William Stanley Jevons- built a machine in 1869 to solve logic problems
- Herman Hollerith- invented the modern punched card for use in a machine he designed to help tabulate the 1890 census.
- Top Right- Napier
- Top Left- Jacquard’s loom
- Bottom- Pascal’s electronic adding machine
1900-1939: The Rise Of Mathematics

- Some special-purpose calculating machines were built
- Examples:
  - 1919- E. O. Carissan designed and had built a marvelous mechanical device for factoring integers and testing them for primality
  - Leonardo Torres y Quevedo (1852-1936) built some electromechanical calculating devices, including one that played simple chess endgames
1928- David Hilbert addressed the International Congress of Mathematicians. He posed three questions: (1) Is mathematics complete; i.e. can every mathematical statement be either proved or disproved? (2) Is mathematics consistent, that is, is it true that statements such as "0 = 1" cannot be proved by valid methods? (3) Is mathematics decidable, that is, is there a mechanical method that can be applied to any mathematical assertion and (at least in principle) will eventually tell whether that assertion is true or not?

1931- Kurt Gödel answered Hilbert's first two questions

1936- Alan Turing provided a solution to Hilbert's third question by constructing a formal model of a computer -- the Turing machine -- and showing that there were problems such a machine could not solve.
The calculations required for ballistics during World War II spurred the development of the general-purpose electronic digital computer.

1944- Howard H. Aiken built the Mark I electromechanical computer, with the assistance of IBM.

Military code-breaking also led to computational projects.

The British built a computing device, the Colossus, to assist with code-breaking.

1939- John Vincent Atanasoff and Clifford Berry designed and built an electronic computer for solving systems of linear equations.

John William Mauchly with J. Presper Eckert, Jr. designed and built the ENIAC, a general-purpose electronic computer originally intended for artillery calculations.
More About Early Comps...

- ENIAC was built at the Moore School at the University of Pennsylvania, and was finished in 1946.
- Konrad Zuse built the first operational, general-purpose, program-controlled calculator, the Z3, in 1941.
- In 1945, Vannevar Bush published a surprisingly prescient article in the Atlantic Monthly about the ways information processing would affect the society of the future. (Another copy of the Bush article appears here.)
- Maurice Wilkes built the EDSAC, sometimes called the first stored-program digital computer.
- The invention of the transistor in 1947 by John Bardeen, Walter Brattain, and William Shockley transformed the computer and made possible the microprocessor revolution.
1950’s

- Grace Murray Hopper - invented the notion of a compiler in 1951
- Earlier, in 1947, Hopper found the first computer "bug" -- a real one -- a moth that had gotten into the Harvard Mark II
- John Backus developed the first FORTRAN compiler in April 1957
- LISP, a list-processing language for artificial intelligence programming, was invented by John McCarthy about 1958
- Jack Kilby and Robert Noyce invented the integrated circuit in 1959
- German military used the Enigma machine during World War II for communication they thought to be secret.
- The large-scale decryption of Enigma traffic at Bletchley Park was an important factor that contributed to Allied victory in WWII.
1950’s

- Edsger Dijkstra invented an efficient algorithm for shortest paths in graphs
- He also invented an efficient algorithm for the minimum spanning tree
- In a famous paper that appeared in the journal Mind in 1950, Alan Turing introduced the Turing Test, one of the first efforts in the field of artificial intelligence. He proposed a definition of "thinking" or "consciousness" using a game: a tester would have to decide, on the basis of written conversation, whether the entity in the next room responding to the tester's queries was a human or a computer. If this distinction could not be made, then it could be fairly said that the computer was "thinking"
1960's

- In the 1960's, computer science came into its own as a discipline
- The term was coined by George Forsythe, a numerical analyst
- The first computer science department was formed at Purdue University in 1962. The first person to receive a Ph. D. from a computer science department was Richard Wexelblat, at the University of Pennsylvania, in December 1965
- Operating systems saw major advances
  - Fred Brooks at IBM designed System/360, a line of different computers with the same architecture and instruction set, from small machine to top-of-the-line. Edsger Dijkstra at Eindhoven designed the THE multiprogramming system
- At the end of the decade, ARPAnet, a precursor to today's Internet, began to be constructed
- Many new programming languages were invented, such as BASIC
- Proving correctness of programs using formal methods also began to be more important in this decade
- Douglas C. Englebart invents the computer mouse in 1968
- Ted Hoff and Federico Faggin at Intel designed the first microprocessor in 1969-1971
1970's

- Unix, a very influential operating system, was developed at Bell Laboratories by Ken Thompson and Dennis Ritchie.
- Brian Kernighan and Ritchie together developed C, an influential programming language.
- Other new programming languages, such as Pascal (invented by Niklaus Wirth) and Ada (developed by a team led by Jean Ichbiah), arose.
- The supercomputer- Seymour Cray designed the CRAY-1, which was first shipped in March 1976.
  - It could perform 160 million operations in a second. The Cray XMP came out in 1982.
- There were also major advances in algorithms and computational complexity.
1980’s

- The personal computer - Steve Wozniak and Steve Jobs, founders of Apple Computer
- The first computer viruses are developed in 1981
- In 1981, the first truly successful portable computer was marketed, the Osborne I
- 1984 - Apple first marketed the Macintosh computer
- 1987 - US National Science Foundation started NSFnet, precursor to part of today's Internet
1990’s and Beyond...

- Quantum computing gets a boost with the discovery by Peter Shor that integer factorization can be performed efficiently on a (theoretical) quantum computer.
- The "Information Superhighway" links more and more computers worldwide.
- Computers get smaller and smaller; the birth of nano-technology
- The Deep Blue chess machine (IBM) beats the world chess champion, Garry Kasparov
References

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