Computer Fundamentals

Lecture # 1:

Introduction to Computer & History

Today's Aim

- Introduction to Computer
- Some early age machines
- First computer programmer

What is Computer?

- Computer is a machine that takes input, processes it and gives the output.

- A computer can do nothing by itself, but once it is told how to do a job, it does it much faster than a human being.

History

- The word `computer` was first recorded in 1613 to refer to a person who carried out calculations

- From the end of the 19th century the word began to describe a machine that carries out computations

- 150–100 BC
  - Early mechanical calculating devices include the 'abacus', the 'slide rule' the 'astrolabe' and the 'Antikythera mechanism'

History

- **Al-Jazari's 'Castle Clock'**
  - The "castle clock", an astronomical clock invented by Al-Jazari in 1206, is considered to be the earliest programmable analog computer.
  - It displayed a crescent moon-shaped pointer traveling across a gateway causing automatic doors to open every hour, and five robotic musicians who played music when struck by levers operated by a camshaft attached to a water wheel.
  - The length of day and night could be re-programmed to compensate for the changing lengths of day and night throughout the year.

History

- ## Wilhelm Schickard's Mechanical Calculator
  - Wilhelm Schickard's 1623 device was the first of a number of mechanical calculators constructed by European engineers, but none fit the modern definition of a computer, because they could not be programmed.

- ## Jacquard's loom (Fabric Weaving Machine)
  - In 1801, Joseph Marie Jacquard made an improvement to the textile loom by introducing a series of punched paper cards as a template which allowed his loom to weave intricate patterns automatically.
  - The use of punched cards to define woven patterns can be viewed as an early, limited form of programmability.

History

- Babbage's "Analytical Engine"
  - In 1837, Charles Babbage was the first to design a fully programmable mechanical computer, his analytical engine.
  - Babbage's Design could never complete because of his Limited finances and Babbage's inability to resist tinkering with the design.

History

- Herman Hollerith (Tabulator & Key Punch Machines)

    - In the late 1880s Herman Hollerith invented the recording of data on a machine readable medium, the punch cards (first he tried the paper tape).

    - Prior uses of machine readable media had been for control, not data.

    - To process these punched cards he invented the tabulator, and the key punch machines

History

- These three inventions (punch cards, tabulator & Key Punch machine) were the foundation of the modern information processing industry

- Large-scale automated data processing of punched cards was performed for the 1890 United States Census by Hollerith's company, which later became the core of IBM

History

- Ada Byron's computer program
  - 1800s, Ada Byron, English Mathematician
  - Wrote first program in the history of Computers
  - Wrote the program for the still unbuilt Analytic Engine
  - Recognized the importance of looping

History

- **The Turing Machine**

  - Alan Turing is widely regarded to be the father of modern computer science.

  - In 1936 Turing provided an influential formalization of the concept of the algorithm and computation with the Turing machine

History

- ## Stibitz's Model K

  - George Stibitz is internationally recognized as a father of the modern digital computer

  - At Bell Labs in November 1937, Stibitz invented and built a relay-based calculator which he named as the "Model K" (for "kitchen table", on which he had assembled it)

  - It was the first to use binary circuits to perform an arithmetic operation

Characteristics of some early Digital Computers

- ## Zuse Z3 (Germany)
  - May 1941
  - Used Binary Number System
  - Computing Mechanism was Electro-Mechanical
  - Program-controlled by punched film stock
  - Had passed the Turing Test

Characteristics of some early Digital Computers

- **Atanasoff–Berry Computer (US)**
  - 1942
  - Used Binary Number System
  - Computing Mechanism was Electronic
  - Not Programmable (Single Purpose)
  - Had not passed the Turing Test

Characteristics of some early Digital Computers

- **Colossus Mark 1 (UK)**
  - February 1944
  - Used Binary Number System
  - Computing Mechanism was Electronic
  - Program-controlled by patch cables and switches
  - Had not passed the Turing Test

Characteristics of some early Digital Computers

- ## Harvard Mark I – IBM ASCC (US)
  - May 1944
  - Used Decimal Number System
  - Computing Mechanism was Electro-Mechanical
  - Program-controlled by 24-channel punched paper tape
  - Had not passed the Turing Test

Characteristics of some early Digital Computers

- **Colossus Mark 2 (UK)**
  - June 1944
  - Used Binary Number System
  - Computing Mechanism was Electronic
  - Program-controlled by patch cables and switches
  - Had not passed the Turing Test

Characteristics of some early Digital Computers

- ENIAC (US)
  - July 1946
  - Used Decimal Number System
  - Computing Mechanism was Electronic
  - Program-controlled by patch cables and switches
  - Had passed the Turing Test

Characteristics of some early Digital Computers

- **Manchester Small-Scale Experimental Machine (UK)**
  - June 1948
  - Used Binary Number System
  - Computing Mechanism was Electronic
  - Stored-program in Williams cathode ray tube memory
  - Had passed the Turing Test

Characteristics of some early Digital Computers

- Modified ENIAC (US)
  - September 1948
  - Used Decimal Number System
  - Computing Mechanism was Electronic
  - Program-controlled by patch cables and switches plus a primitive read-only stored programming mechanism using the Function Tables as program ROM
  - Had passed the Turing Test

Characteristics of some early Digital Computers

- **EDSAC (UK)**
  - May 1949
  - Used Binary Number System
  - Computing Mechanism was Electronic
  - Stored-program in mercury delay line memory
  - Had passed the Turing Test

Characteristics of some early Digital Computers

- **Manchester Mark 1 (UK)**
  - October 1949
  - Used Binary Number System
  - Computing Mechanism was Electronic
  - Stored-program in Williams cathode ray tube memory and magnetic drum memory
  - Had passed the Turing Test

Characteristics of some early Digital Computers

- ## CSIRAC (Australia)
  - November 1949
  - Used Binary Number System
  - Computing Mechanism was Electronic
  - Stored-program in mercury delay line memory
  - Had passed the Turing Test