

Sri Maheshwari CCE

.....Computer Knowledge

knowledge
is power!

Shift

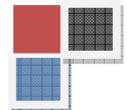


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COMPUTERS AND BASIC CONCEPTS

INTRODUCTION

The word '**compute**' means '**to calculate**'. We all are familiar with calculations in our life and do mathematical operations like **addition, subtraction, multiplication**, etc. Simpler calculations take less time. But complex calculations take much longer time. Another factor is accuracy in calculations. So man explored with the **idea to develop a machine which can perform this type of arithmetic calculation faster and with full accuracy**. This gave birth to a device or machine called '**computer**'.

WHAT IS A COMPUTER?

Computer is an electronic device, which can do arithmetic calculations faster. How ever modern computer it does much more than that. It is a machine capable of **solving problems and manipulating data. It accepts data, processes the data by doing some mathematical and logical operations and gives us the desired output as information.**

Computer can be defined in terms of its functions. It there fore

- i) Accepts data
- ii) Stores data,
- iii) Process data as desired,
- iv) Retrieve the stored data as and when required
- v) Prints the result in desired format.

CHARACTERISTICS OF COMPUTER

Speed

✓ It takes few minutes for the computer to process huge amount of data and give the result. A typical computer can perform millions (1,000,000) of instructions and even more per second. Therefore, we determine the speed of computer in terms of **microsecond (10⁻⁶ part of a second)** or **nano second (10⁻⁹ part of a second)**.

Accuracy

✓ The degree of accuracy of computer is very high and every calculation **is performed with the same accuracy**. The accuracy level is determined on the basis of design of computer. Whatever the errors that are committed by a computer are **due to human and inaccurate data feed**. If given right data, it always give the right result with accuracy.

Diligence

✓ A computer is free from tiredness, lack of concentration, fatigue, etc. It can work for hours without creating any error. If millions of calculations are to be performed, a computer will perform every calculation with **the same accuracy**. Due to this capability computer has diligence than humans.

Versatility.

✓ It means the capacity to perform **completely any or different type of work**. Computer has the power of **storing any amount of information or data at any length of time**. Any information can be **stored and recalled as long as we require it, for any numbers of years**.

✓ **No IQ**-Computer is a dumb machine and it cannot do any work without instruction from the user. It performs the instructions at tremendous speed and with accuracy as long as it is given

right instructions in right sequence.

4 **Storage**-The Computer has an in-built memory where it can store a large amount of data. We can also store data in secondary storage devices such as **floppies**, which can be kept outside computer and **can be carried to other computers (called Portability)**.

HISTORY OF COMPUTERS

Following were some of the path-breaking inventions in the field of computing devices.

✓ **Calculating Machines**-The first calculating device called **ABACUS** was developed by the **Egyptian and Chinese people**. The word **ABACUS** means calculating board. It consisted of sticks in horizontal positions on which were inserted sets of pebbles. A modern form of ABACUS which is used to teach children simple calculations has a number of horizontal bars each having **ten beads. Horizontal bars represent units, tens, hundreds, etc.**

✓ **Napier's bones**-English mathematician John Napier built a mechanical device for the purpose of multiplication in 1617 A D. The device was known as Napier's bones.

✓ **Slide Rule**-English mathematician Edmund Gunter developed the slide rule. This machine could perform operations like addition, subtraction, multiplication, and division. It was widely used in Europe in 16th century.

✓ **Pascal's Adding and Subtraction Machine**-Blaise Pascal had developed a machine at the age of 19 that could add and subtract. The machine consisted of wheels, gears and cylinders.

✓ **Leibniz's Multiplication and Dividing Machine**-The German philosopher and mathematician Gottfried Leibniz built around 1673 a mechanical device that could both multiply and divide.

✓ **Babbage's Analytical Engine**-It was in the year 1823 that a famous English man **Charles Babbage** built a mechanical machine to do complex mathematical calculations. It was called **difference engine**. Later he developed a general-purpose calculating machine called **analytical engine**. For this invention he was later came to be known as the **father of computer**.

✓ **Mechanical and Electrical Calculator**-In the beginning of 19th century the **mechanical calculator** was developed to perform all sorts of mathematical calculations. Up to the 1960s it was widely used. Later the rotating part of mechanical calculator was replaced by **electric motor**. So it was called the **electrical calculator**.

✓ **Modern Electronic Calculator**-The electronic calculator used in 1960 s was run with electron tubes, which was quite bulky. Later it was replaced with **transistors** and as a result the size of calculators became small. After the advent of Computers not only it can compute all kinds of mathematical computations and mathematical functions but also have become capable of storing **some data** permanently.

GENERATIONS OF COMPUTERS

The period, during which the **evolution of computer** took place, can be divided into **five** distinct phases known as **Generations of Computers**. Each phase is distinguished from others on the basis of the type of **switching circuits** used.

First Generation Computers (1940-1956)

First generation computers used **Thermion valves**. These computers were large in size and writing programs on them was difficult. Some of the computers of this generation were:

✓ **ENIAC**: It was the first electronic computer built in 1946 at University of Pennsylvania, USA by **John Eckert and John Mauchy**. It was named **Electronic Numerical Integrator and Calculator (ENIAC)**.

✓ **EDVAC**: It stands for **Electronic Discrete Variable Automatic Computer** and was developed in 1950. **The concept of storing data and instructions inside the computer was introduced here**. This allowed much faster operation since the computer had rapid access to both data and instructions. The other advantage of storing instruction was that computer could do logical decision internally.

OTHER IMPORTANT COMPUTERS OF FIRST GENERATION

- ✓ **EDSAC:** It stands for **Electronic Delay Storage Automatic Computer** and was developed by **M.V. Wilkes** at Cambridge University in 1949.
- ✓ **UNIVAC-1: Ecker and Mauchly** produced it in 1951 by Universal Accounting Computer setup.

CHARACTERISTICS OF 1ST GENERATION COMPUTERS

- ✓ These computers uses **vacuum tube for data processing and storage**
- ✓ They had a memory size of **20bytes speed of 5mbps**
- ✓ They produced a lot of heat
- ✓ It required large space for installation.
- ✓ The programming capability was quite low.
- ✓ These computers were unreliable slow and could not work fast with a lot of data
- ✓ They **uses punch card for data storage**
- ✓ The programmes were machine dependent
- ✓ First generation computers used to consume a lot of power

Second Generation Computers (1956-1963)

Around 1955 a device called **Transistor replaced the bulky electric tubes in the first generation computer.** It is in the second generation that the **concept of Central Processing Unit (CPU), memory, programming language and input and output units were developed.** The programming languages such as **COBOL, FORTRAN** were developed during this period. Some of the computers of the Second Generation were

- ✓ **IBM 1620:** Its size was smaller as compared to First Generation computers and mostly used for scientific purpose.
- ✓ **IBM 1401:** Its size was small to medium and used for business applications.
- ✓ **CDC 3600:** Its size was large and is used for scientific purposes.

Characteristics of 2nd generation computers

- ❖ Were capable of translating, process and store data
- ❖ Had got memory size of 32bytes speed of 10mbps
- ❖ Were reliable compared to first generation computers
- ❖ Produced less heat compared to first generation computers
- ❖ They uses punch card for data storage
- ❖ Consumed less energy compared to first generation computers

Third Generation Computers (1964-1971)

The third generation computers were introduced in 1964. They used **Integrated Circuits (ICs).** These ICs are popularly known as **Chips. A single IC has many transistors, registers and capacitors built on a single thin chip of silicon called 'semi conductor'.** So the size of the computer got further reduced. Some of the computers developed during this period were **IBM-360, ICL-1900, IBM-370, and VAX-750.** Higher level language such as **BASIC (Beginners All purpose Symbolic Instruction Code)** was developed during this period. Computers of this generation were small in size, low cost, large memory and processing speed is very high.

- ❖ They used **integrated circuit(ICs.)** to store data
- ❖ The integrated circuit consisted of many transistors
- ❖ Used storage disk for **data storage e.g. magnetic disks, tapes**
- ❖ Third generation computers **were more reliable** compared to other previous generations
- ❖ For the first time, instead of **punched cards and printouts,** users interacted with third generation computers through **keyboards and monitors and interfaced with an operating system**

Fourth Generation Computers (1971-Present)

The present day computers that we see today are the fourth generation computers that started around 1975. It uses **large scale Integrated Circuits (LSIC)** built on a single silicon chip called **microprocessors**. The **microprocessor** brought the fourth generation of computers, as thousands of integrated circuits were built onto a single silicon chip. What in the first generation filled an entire room could now fit in the palm of the hand. Due to the development of microprocessor it is possible to place computer's **central processing unit (CPU)** on single chip. These computers are called **microcomputers**. Fourth generation computers also saw the development of **Graphical User Interface (GUI), the mouse and other handheld devices**.

Fifth Generation Computer (Present and beyond)

The computers of the years beyond 1990s and presently being developed systems are said to be Fifth Generation computers. **Very large scale Integrated Circuits (VLSIC)** replaced LSICs. The speed is extremely high in fifth generation computer. Apart from this it can perform **parallel processing**. The concept of **Artificial intelligence** has been introduced to allow the computer to take its own decision. **Quantum computation** and molecular and **nanotechnology** will radically change the face of computers in years to come. The goal of fifth-generation computing is to develop devices that respond to **natural language** input and are capable of learning and self-organization.

Classification of Computers

Classification of the computers may be based on **either their principles of operation or their configuration**.

Classification based on Principles of Operation

Based on the **principles of operation**, computers are classified into three types, analog computers, digital computers and hybrid computers.

1) ANALOG COMPUTER

An analog computer, processes or Measures physical quantities that vary continuously, such as variations in temperature, speed, pressure, or the amount of current flowing through on electrical conductor etc. **Analogue computer does not compute directly with numbers; rather it measures, continuous physical magnitudes** (e.g., pressure, temperature, voltage, speed, etc.) Analog computers are used for a wide variety of industrial and scientific applications that require the **quantifying continuously varying data**. Slide rule, thermometers pressure gauge, speedometer etc are often cited as examples of analogue computers.

2) DIGITAL COMPUTER

Digital computer, On the other hand **operates on digital data such as numbers**. They represent data in discrete form. They convert all inputs into numbers before processing them. It uses **binary number system** in which there are only two digits 0 and 1. These types of computers are more accurate than the analogue computers since there is no analogous representation. **All modern electronic computers** are examples of digital computers.

3) HYBRID COMPUTER

A hybrid computing system is a **combination of desirable features of analog and digital computers**. It is mostly used for automatic operations of complicated physical processes and machines. Now-a-days analog-to-digital and digital-to-analog converters are used for transforming the data into suitable form for either type of computation. For example, in hospital's automated intensive care unit, analog devices might measure the patient's temperature, blood pressure (**Which are physical quantities**). These measurements which are in analog then will be converted into numbers and supplied in digital format or shown as a result in a computer.

CLASSIFICATION OF COMPUTERS BASED ON CONFIGURATION

By configuration, we mean the **size, speed of doing computation and storage capacity of a**