

Chapter 2

HISTORICAL DEVELOPMENT OF COMPUTERS

Outline

- History of Computers
- Generations of Computers
- Types of Computers

History of Computers

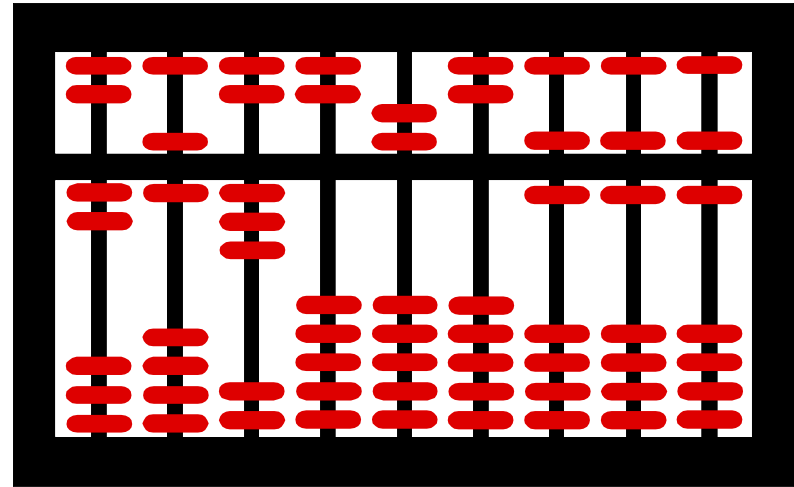
- A computer is a machine that works with data and information in the form of numbers.
- People from the beginning of time, and throughout the years, have invented and continue to invent things that help them count.

History of Computer:

The Abacus (base 5)

(in ancient Babylon, China, Europe)

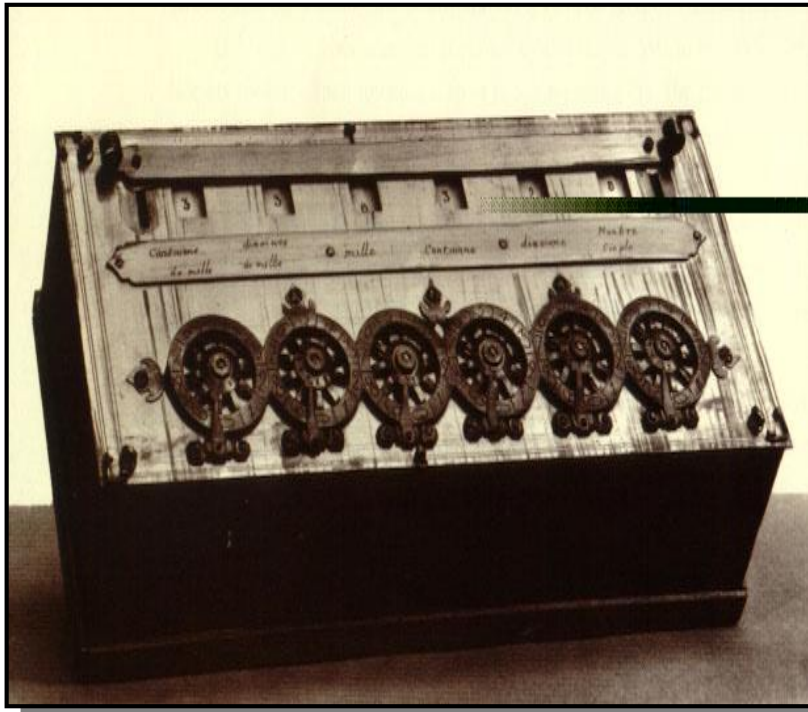
- The *abacus* also called a counting frame.



Ancient time

Blaise Pascal (1650)

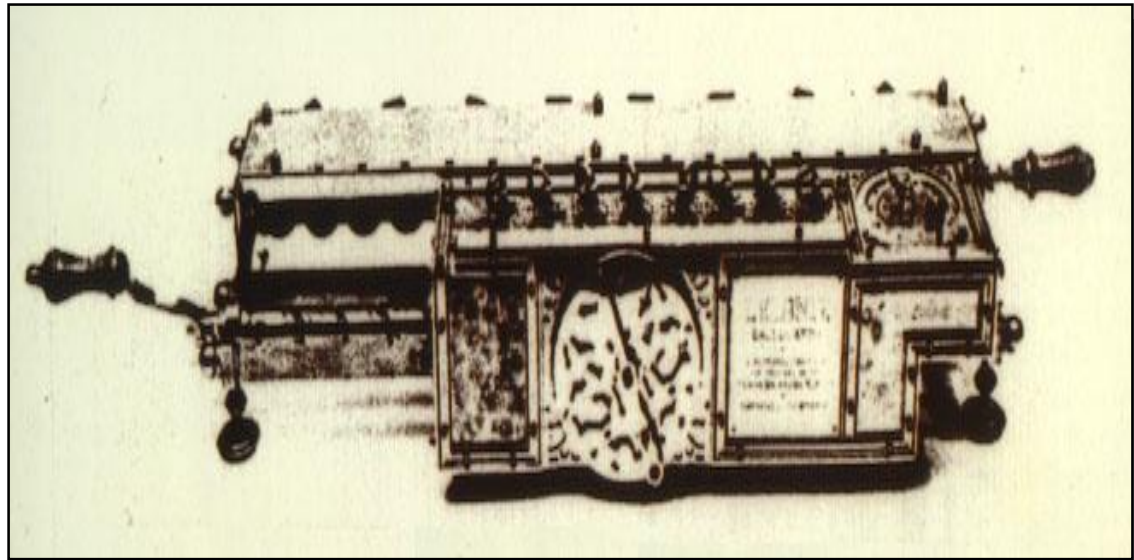
The **Pascaline** is a mechanical calculating device invented by the French philosopher and mathematician Blaise Pascal in 1642 (+)



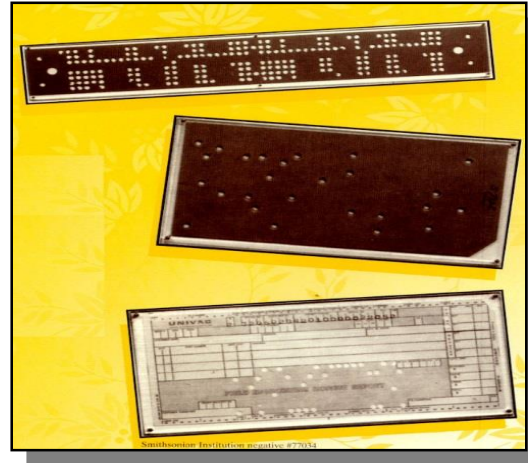
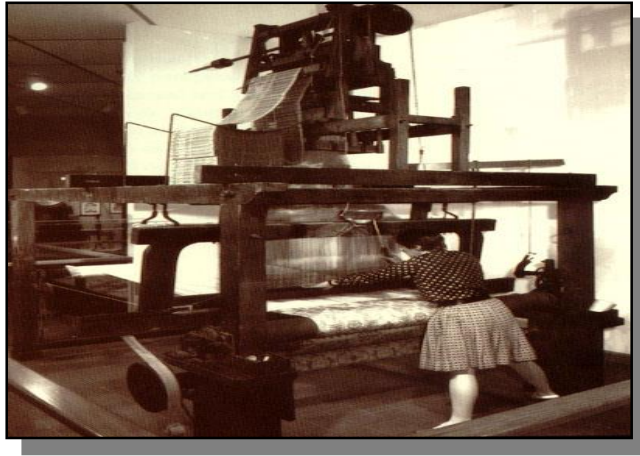
The Leibniz Wheel (1673)

- **The Leibniz Wheel** was invented by the famous mathematician Leibniz in 1673.

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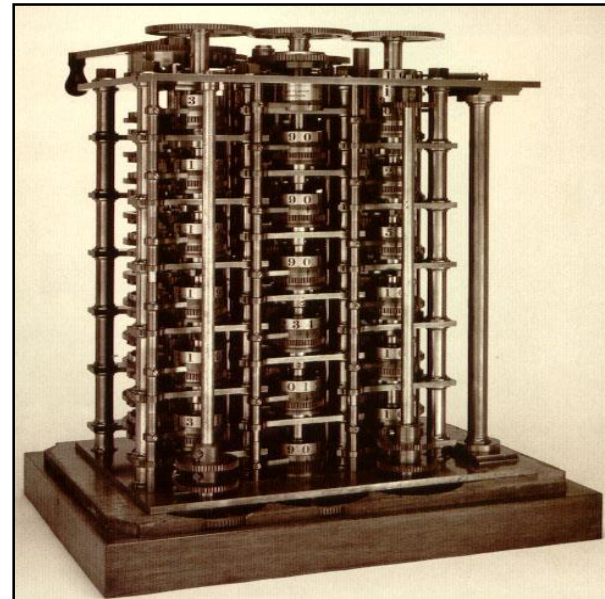
Joseph Jacquard (1810)



- **Punched Cards** were used by the French weaver Joseph Jacquard in 1810.
- The cards carried weaving instructions for the looms, later this idea offered a great use for *storing info*.

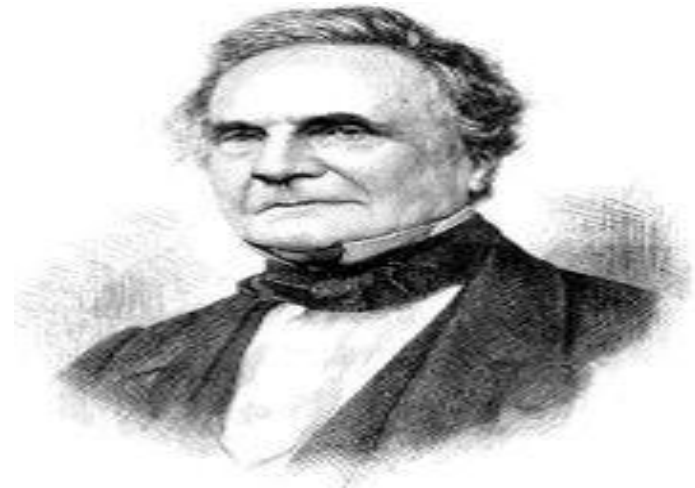
Charles Babbage (1832-1852)

- **Difference Engines:** were calculating machines made by Charles Babbage to produce tables of numbers that would be used by ship's navigators.
- Charles Babbage is known as 'the Father of the Computer'

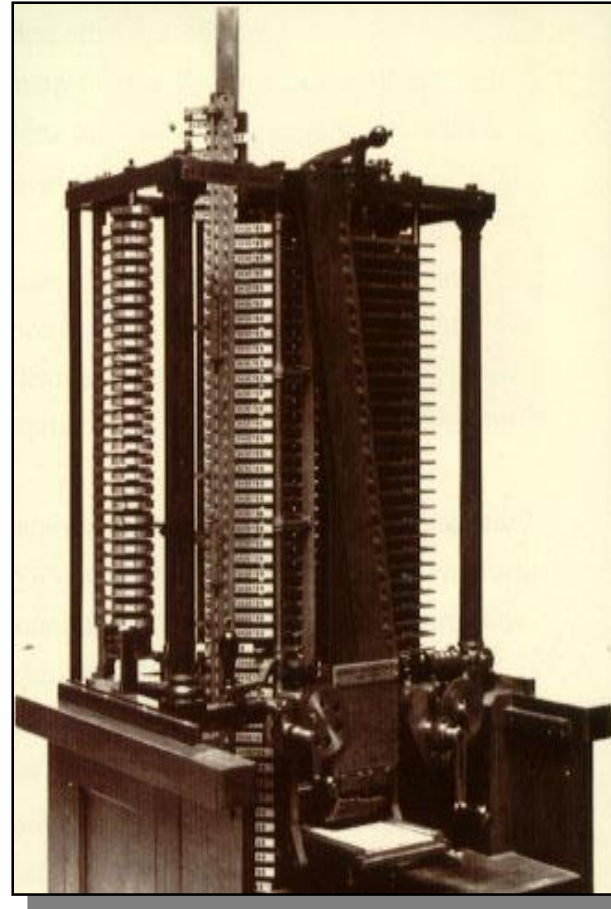


1832

1852



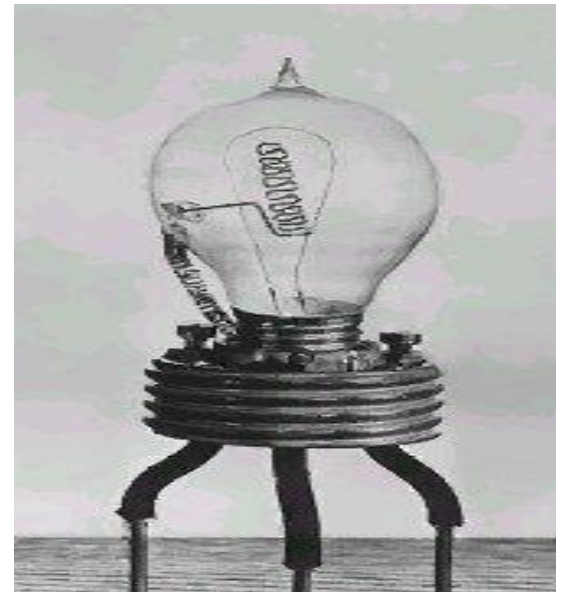
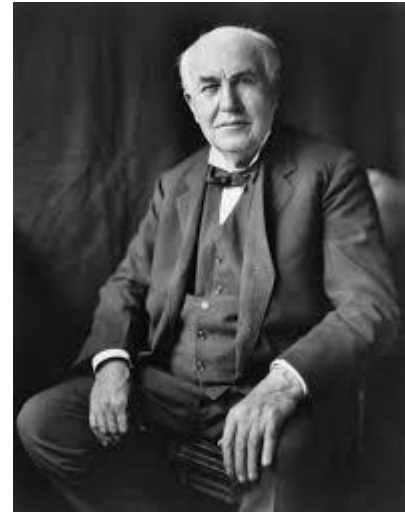
- A partial working model of Babbage's Analytical Engine was completed in 1910 by his son
- used punched cards to store numbers.
- The design was no more successful than its predecessors.



1910

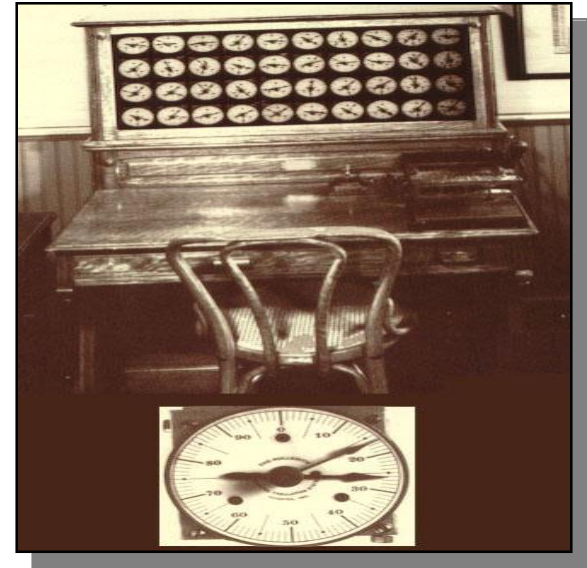
Thomas Edison (1883)

- **Vacuum Tube** was Initially discovered by Thomas Edison.
- the **vacuum tube** formed the building block for the entire electronics industry.
- Vacuum tubes were later used as **electron valves** in the 20th century to build the first electronic computers.



Herman Hollerith (1888)

- Invented a **tabulating machine** using punched cards (same size as ours today).
- Founded forerunner of IBM
- Along with punched cards instead of mechanical gears.



- Hollerith's machine was immensely successful. The general count of the population of the United States, then 63 million, took only 6 weeks to calculate!
- Based on the success of his invention, Herman Hollerith and some friends formed a company that sold his invention all over the world. The company eventually became known as: *IBM (International Business Machines)*

MARK I (1943)

MARK I was built by a team from IBM and Harvard University.

Mark I used **mechanical** telephone switches to store information.

It accepted data on punched cards, processed it and then output the new data.



ENIAC (1946)



The ENIAC (Electronic Numerical Integrator And Computer) was the first US-built all-electronic computer built to perform ballistics calculations.

Computer Generations

GENERATIONS OF COMPUTERS

- *A computer is an electronic device that accepts, processes, stores and outputs data under the control of sets of instructions.*
- Computers have come across a long way to acquire the current forms and capabilities.

GENERATIONS OF COMPUTERS

- Computers can be classified in to five different generation based on the following criterion
 - Basic electric components
 - Basic secondary storage device
 - Operating system
 - Machine language
 - Access time

First Computer Generation (1940-1956)

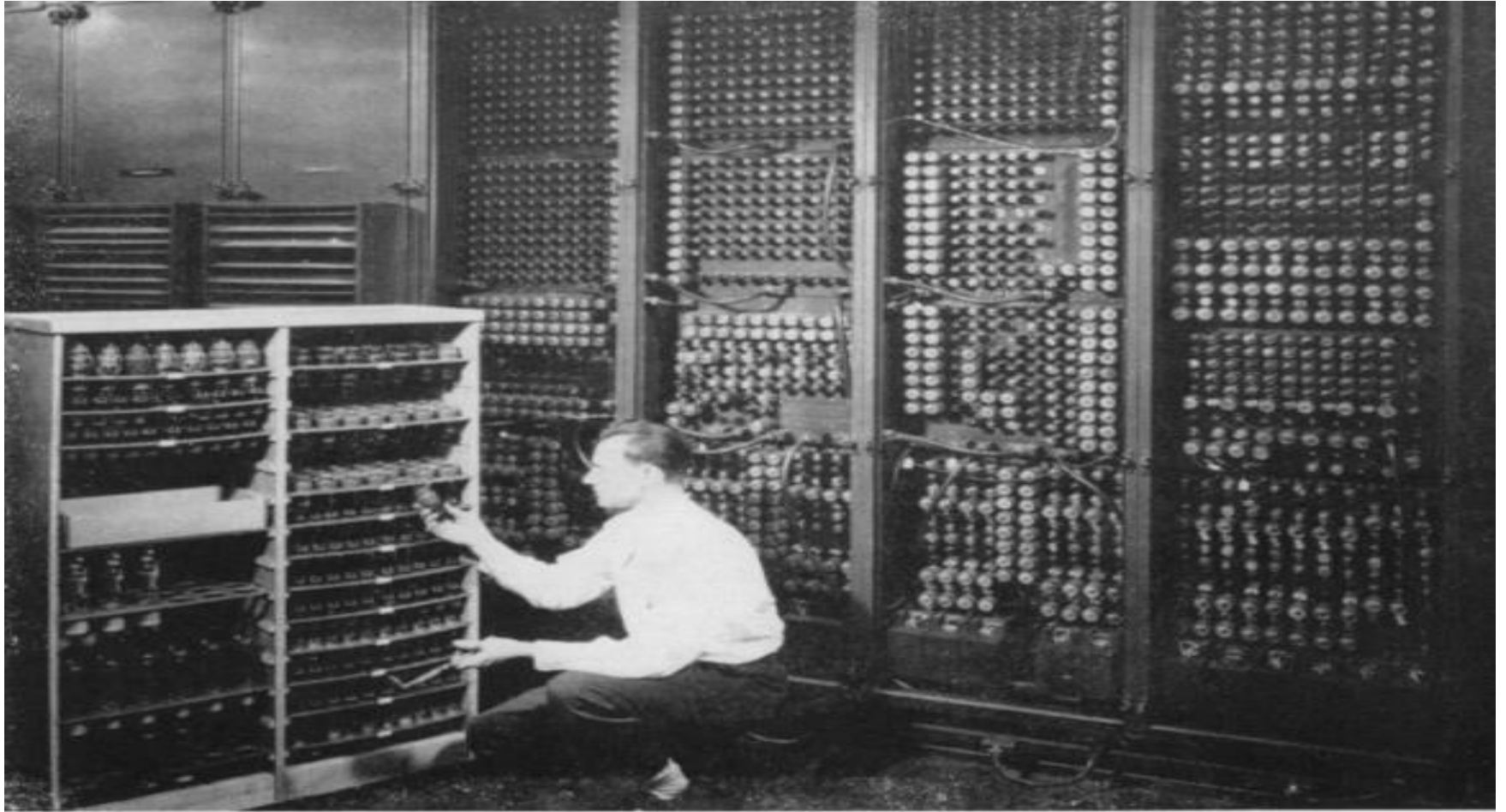
- **vacuum tube** was used as circuitry component
- Magnetic drums was used for memory / storage
- Punched cards for input and output
- They were often enormous and taking up entire room.
- First generation computers relied on machine language.
- They were very expensive to operate
- Consume a great deal of electricity
- generated a lot of heat, which was often the cause of malfunctions.

First Computer Generation



- Limited memory
- Heat and maintenance problems
- Slow input, processing and output
- Examples of first-generation computing devices are:
 - UNIVAC (Universal Automatic Computer)
 - ENIAC (Electronic Numerical Integrator and Computer)

First Computer Generation



Replacing a bad tube meant checking among ENIAC's 19,000 possibilities.

Second Computer Generation (1956-1963)

- **Transistors** replaced vacuum tubes and used in the second generation of computers.
- Second-generation computers moved from binary **machine language** to **symbolic language**.
- High-level programming languages were also being developed at this time, such as early versions of COBOL, FORTRAN and BASIC.
- These were also the first computers that stored their instructions in their memory.

Second Computer Generation

The main features of the second generation computers were as follows:

- They used **Transistors** instead of vacuum tubes.
- Magnetic tapes for storage
- Increased memory capacity
- They were more reliable and faster than the first generation computers.
- Reductions in size and heat generation
- Increase in processing speed and reliability



Second Computer Generation



Third Computer Generation (1964-1971)

- The development of the **Integrated Circuit(IC)** was the symbol of the third generation of computers.
- Integrated circuits on silicon chips for internal operations (IC's)
- Instead of punched cards and printouts, users interacted with third generation computers through **keyboards** and **monitors** and interfaced with an **operating system**.
- Allowed the device to run many different applications at one time.

Third Computer Generation

The main features of the third generation computers were as follows:

- ✓ They used **integrated circuits**
- ✓ Are small in size as compared to the second generation computers.
- ✓ They consumed less electricity.
- ✓ faster and reliable than the second generation computers.

Third Computer Generation

- Emergence of the software industry
- Reduction in size and cost
- Increase in speed and reliability
- Introduction of families of computers



Fourth Computer Generation (1971-present)

- Development of the Personal Computers (PC)
- The **microprocessor** (VLSI) brought the fourth generation of computers, as thousands of integrated circuits were built onto a single **silicon chip**.
- From the central processing unit and memory to input/output controls on a single chip.
- Fourth generation computers also saw the development of **GUIs**, the mouse and handheld devices.

Fourth Generation Computers (1971–Present)

Features of the fourth generation computers are:

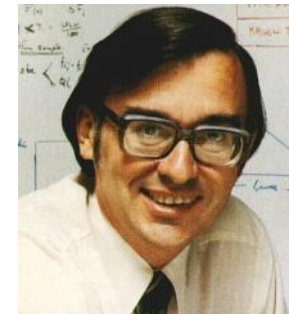
- They contain high-speed **microprocessors**.
- They contain huge storage volumes in the form of **magnetic disk** and **optical disk**.
- They contain main memories up to TBs (Terabytes).
- They are accompanied by great developments in the fields of Networks

Fourth generation computers



Microprocessor

Ted Hoff, Intel Designer of first microprocessor



Fifth Computer Generation (present-future)

- Recent research has focused on developing of “**thinking computers**”.
- These computers are called the Fifth Generation Computers.
- Fifth generation computers will have the power to *learn* and *apply knowledge* to solve a problem.
- They would be able to work like humans do.
- You can watch a movie named “**AI**” by Steven Spielberg to have an idea of such computers.

Fifth Computer Generation

- Fifth generation computing devices, based on **Artificial Intelligence (AI)**.
- Are still in development, though there are some applications, such as voice recognition.
- The use of parallel processing and superconductors is helping to make Artificial Intelligence a reality.
- The goal of fifth-generation computing is to develop devices that respond to **Natural Language Input** and are capable of learning and self-organization.

Fifth Computer Generation



TYPES OF COMPUTERS

- A computer is an electronic device used to gather, process, store and retrieve data/information.

INPUT→PROCESS→OUTPUT

- Computers are Instructed machines
- There are different types of Computers. Their difference is depending on different categories of characteristics.
 1. Based on Size, Cost and Performance
 2. Based on their Purpose
 3. Based on their Operation or Data Processing

Types of computers

- **Based on their size, speed and cost**
 - Super computer
 - Mainframe computer
 - Minicomputer
 - Microcomputer
- **Based on their purpose**
 - General purpose computer.
 - Specific Purpose computers
- **Based on their method of operation**
 - Analogue computer
 - Digital computer
 - Hybrid computer

Based on Size, Cost and Performance, Computers can be classified into:

- Super computers
- Mainframe computers
- Minicomputers
- Microcomputers

Supercomputer

- They are the fastest and most expensive computers.
- They have high processing speed compared to other computers.
- They have also multiprocessing technique. One of the ways in which supercomputers are built is by interconnecting hundreds of microprocessors.
- Supercomputers are mainly being used for weather forecasting, biomedical research, remote sensing, aircraft design and other areas of science and technology. Examples of supercomputers are CRAY YMP, CRAY2



Mainframes

- They operate at very high speed, have very large storage capacity and can handle the work load of many users.
- are used primarily by large organizations for critical applications and bulk data processing such as centralized databases, Census, Costumer statistics, etc.
- They are also used as controlling nodes in **Wide Area Networks (WAN)**.
- Example of mainframes are DEC, ICL and IBM 3000 series.



Minicomputer

- a computer of medium power, more than a microcomputer but less than a mainframe.
- Minicomputers are designed to support more than one user at a time.
- It possesses large storage capacity and operates at a higher speed.
- Minicomputer is used in multi-user system in which various users can work at the same time.

Minicomputer

- This type of computer is generally used for processing large volume of data in an organization.
- They are also used as *servers in Local Area Networks*
- A **minicomputer** may also be called a mid-range computer



Microcomputer

- Microcomputer is at the lowest end of the computer range in terms of speed and storage capacity.
- Its CPU is a microprocessor. The first microcomputers were built of 8-bit microprocessor chips.
- The most common application of personal computers (PC) is in this category.
- The PC supports a number of input and output devices. An improvement of 8-bit chip is 16-bit and 32-bit chips and 64-bit.
- Examples of microcomputer are IBM PC, PC-AT .

Microcomputer

- A personal computer designed to meet the computer needs of an individual.
- Provides access to a wide variety of computing applications, such as word processing, photo editing, e-mail, and internet.
- There are different types of Micro computers
 - Desktop computers
 - Video game consoles
 - Laptops
 - Tablet pcs
 - Mobile phones
 - Pocket calculators, and industrial embedded systems

Desktop Microcomputer



- A microcomputer that fits on a desk and runs on power from an electrical wall outlet.
- The CPU can be housed in either a vertical or a horizontal case.
- Has separate components (keyboard, mouse, etc.) that are each plugged into the computer.



Laptop Computer



- A portable, compact computer that can run on an electrical wall outlet or a battery unit.
- All components (keyboard, mouse, etc.) are in one compact unit.
- Usually more expensive than a comparable desktop.
- Sometimes called a Notebook.



Handheld



- Also called a PDA (Personal Digital Assistant).
- A computer that fits into a pocket, runs on batteries, and is used while holding the unit in your hand.
- Typically used as an appointment book, address book, calculator, and notepad.
- Can be synchronized with a personal microcomputer as a backup.



Types of Computers Based on their Purpose/Function

- **General-Purpose Computers**
- **Special-Purpose Computers**

General Purpose Computers

- They are designed to solve variety of problems through the use of “store program concept”.
- A program or set of instructions designed to solve a problem is read and stored into the memory and then executed by the computer one by one.
- The same computer can be applied to solve another set of problem using different program.
- General purpose computers are more flexible and versatile.

General Purpose Computers

- Computers that follow instructions for general requirements such as sales analysis, financial accounting, invoicing, inventory, management information etc. are called General Purpose Computers.
- Almost all computers used in offices for commercial, educational and other applications are general purpose computers.
- Personal **computers**, including desktops, notebooks, smartphones and tablets, are all examples of **general-purpose computers**.

General Purpose Computers

These Computers can be used for almost any purpose

- Typewriter
- video editor
- Accounts tracker
- Database / address book
- DVD / CD Player
- and many others...

Special Purpose Computers

- Computers designed from scratch to perform **special tasks** like scientific applications and research, weather forecasting, space applications, medical diagnostics etc. are called Special Purpose Computers.
- They are designed to solve a **single type of problem**, that is their components and function are uniquely adapted to a specific situation involving specific application

Special Purpose Computers

- Example:
 - ✓ The public telephone box
 - ✓ Traffic control system
 - ✓ Ticket machines (used in grocery, super market etc.)
 - ✓ Pocket calculators etc.
 - ✓ Counters
- Most analog computers are special purpose computers.

Based on their method of Operation or Data processing

- **Analog Computers**
- **Digital Computers**
- **Hybrid Computers**

Analog Computers

- Analog computers are **special purpose computers** that represent and store data in continuously varying physical quantities such as current, voltage or frequency.
- These computers are programmed for measuring physical quantities like pressure, temperature (Thermometer), speed (Speedometer) etc. and to perform computations on these measurements.
- Analog computers are mainly used for scientific and engineering applications.

Analog Computers

Examples

Thermometer

Voltmeter

Speedometer



Gasoline pump – Contains an analog Computer that converts the flow of pumped fuel into two measurements the price of the delivered gas and the quantity of pumped fuel.

- They are special purpose computers.

Digital Computers

- Digital computers are mainly **general purpose computers** that represent and store data in discrete quantities or numbers.
- In these computers, all processing is done in terms of numeric representation (Binary Digits) of data and information.
- Although the user enter data in decimal or character form, it is converted into binary digits (0's and 1's).

Digital Computers

- **digital computer** is the most commonly used type of **computer** and is used to process information with quantities using digits, usually using the binary number system



Hybrid Computers

- Hybrid computers incorporate the technology of both analog and digital computers.
- These computers store and process analog signals which have been converted into discrete numbers using analog-to-digital converters.
- They can also convert the digital numbers into analog signals or physical properties using digital-to-analog converters.
- Hybrid computers are mainly used in artificial intelligence (robotics) and computer aided manufacturing (CAM).

Hybrid Computers

- Hybrid computers are computers that exhibit features of **analog** computers and **Digital** computers.
- The **digital** component normally serves as the controller and provides logical and numerical operations, while the analog component often serves as a solver of differential equations and other mathematically complex equations