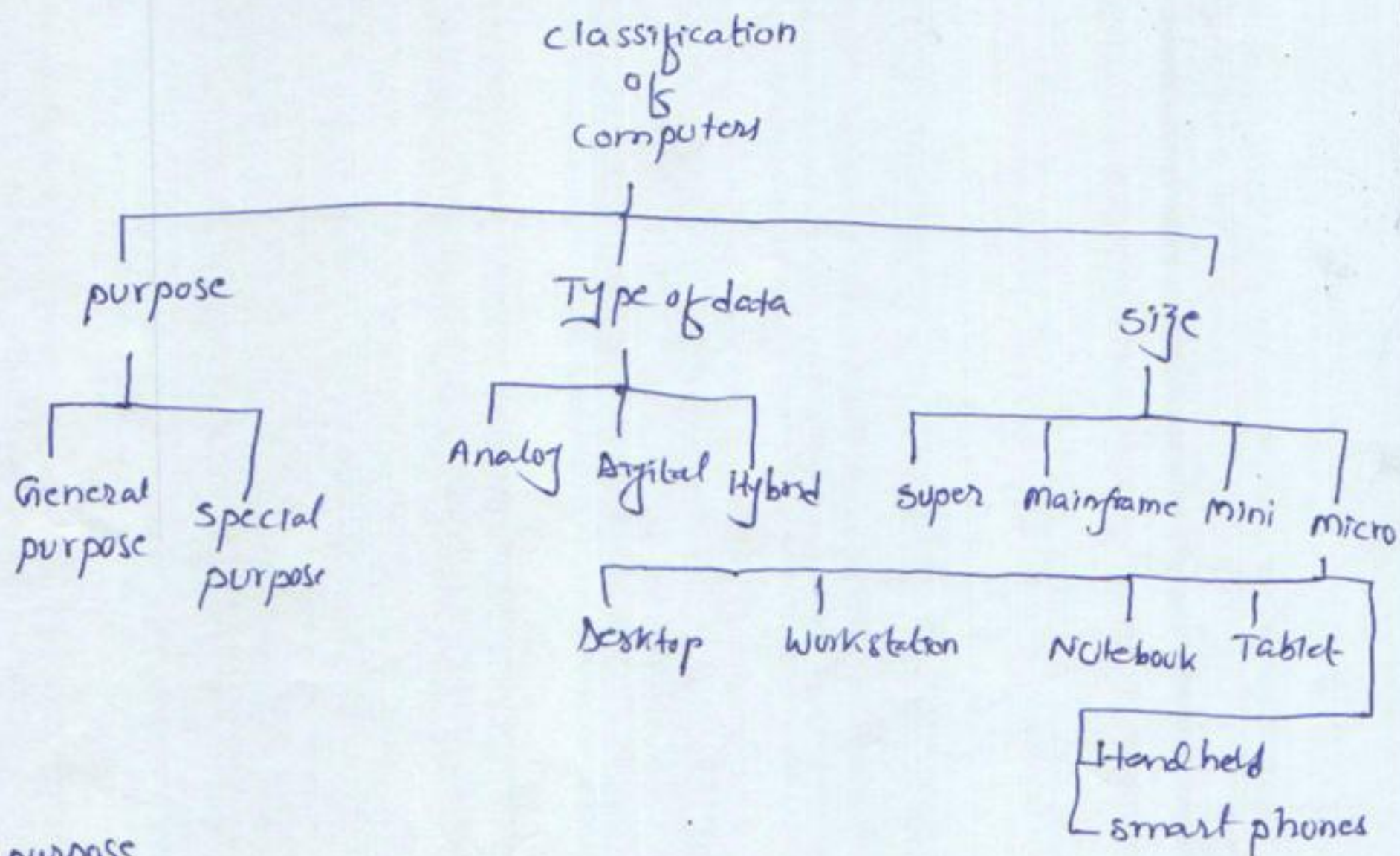


Classification of computers:-

①

computers are classified on the basis of:

- 1) purpose
- 2) type of data
- 3) size



purpose

1) General purpose computers:-

- They are designed to perform a wide variety of tasks (They are not limited).
- The computers that you see at your home are general purpose, they are designed to do followings:

- create documents
- print documents
- play music, video, games
- send emails
- Browse internet.
- create models of building, vehicles or any other system.
- edit images, sound, video
- create animations
- And many more

2) special purpose computers:

- These computers are designed to perform some specific task or set of tasks (They are limited).
- For example:-
 - Video games
 - Digital watches
 - Washing machines
 - Robots
 - GPS system.
 - Microwave oven
 - car ^{control} system

Size

1) Super computers

- They are most powerful computers built by human.
- They are the largest computers of all.
- They can house thousands of processors & can handle the needs of thousands of users at a time.
- They are designed for solving very large & complex problems which require extreme calculation power.
- Uses of super computers:-
 - Weather forecasting
 - molecular modeling (structure & properties of chemical compounds)
 - physical simulations. (simulation of airplanes aeroplanes in wind tunnel, simulation of deterioration of nuclear weapon).
 - military
 - scientific research laboratories.

2) Main frame computers

- Main frames are often referred as Macro computers or Big Iron.
- They are very large but smaller ^{than super computers} ^{more powerful &}
- They are mainly used by large organisations for critical applications, such as financial transactions (stock exchange).
- Early mainframes were so large that they were housed in room-sized frames / metal box.
- But today's mainframes are smaller than that of early mainframes.

Classification of computers on the basis of size

1) Super Computers

Super computers are the most powerful computers built by people. These computers are the largest computers among the computers made since very starting ages. These computers can house thousands of processors and can handle the needs of thousands of users at a time. These computers can process huge amount of data. These computers are ideal for solving very large and complex problems which required extreme calculation power. Supercomputers are used for highly calculation-intensive tasks such as problems involving quantum mechanical physics, weather forecasting, climate research (including research into global warming), molecular modeling (computing the structures and properties of chemical compounds, biological macromolecules, polymers, and crystals), physical simulations (such as simulation of airplanes in wind tunnels, simulation of the detonation of nuclear weapons, and research into nuclear fusion), cryptanalysis, major universities, military agencies and scientific research laboratories are heavy users.

Figure 1.2



Figure 1.2 – NASA's Supercomputer

The speed of super computers is measured in **FLOPS** (Floating Point Operations Per Second) or **TFLOPS** (10¹² FLOPS). IBM's **BLUE Gene/L** developed on March 25, 2005 is today's fastest super computer. At that time it ran at 135.5 TFLOPS (10¹² FLOPS) but on October 28, 2005 the machine reached 280.6 TFLOPS.

Some of the powerful super computers made are:

IBM NORC in 1954 at U.S. Naval Proving Ground, Dahlgren, Virginia, USA.

UNIVAC LARC in 1960 at Lawrence Livermore National Laboratory, California, USA.

CDC 6600 in 1964 at Lawrence Livermore National Laboratory, California, USA.

Burroughs ILLIAC IV in 1975 at NASA Ames Research Center, California, USA.

Intel Paragon XP/S 140 in 1993 at Sandia National Laboratories, New Mexico, USA.

Hitachi SR2201/1024 in 1996 at University of Tokyo, Japan.

NEC Earth Simulator in 2002 at Earth Simulator Center, Yokohama-shi, Japan.

IBM Blue Gene/L in 2005 at U.S. Department of Energy/IBM, USA.

Cray Inc., Fujitsu, Groupe Bull, CDAC, IBM, Infiscale, Microsoft, nCUBE, NEC Corporation, Quadrics, Sun Microsystems and SGI are some of the companies who manufacture super computers.

2) Mainframe Computers

Mainframes (often referred as *Macro computers* or *Big Iron*) are computers used mainly by large organizations for critical applications, typically bulk data processing such as census, industry and consumer statistics and financial transaction processing. These are large and power computers but have less power than super computers. The early mainframes were so large that they were housed in enormous, room-sized metal boxes or frames. But today's mainframes are smaller than that of early mainframes.

In the 1960s, most mainframes had no interactive interface. They accepted sets of punch cards. By the early 1970s, many mainframes acquired interactive user interfaces and operated as timesharing computers, supporting hundreds or thousands of users simultaneously. Users gained access through specialized terminals or, later, from personal computers equipped with terminal emulation software. Many mainframes supported graphical terminals (and terminal emulation) by the 1980s. In 1990, an IBM mainframe became the first Web server located anywhere outside Switzerland's CERN organization.

Mainframe computers are very large and powerful computers and can handle the processing needs of thousands of users at a time. But these systems lack in flexibility i.e. they are only used for specific tasks like, the mainframe in an Air-lines can only store the information about the schedules of flights, the data about the visas and passports of passengers, the record of the passengers etc means mainframe computers are not so much flexible.

The speed of the mainframe computers is measured in **MIPS (Millions Of Instructions Per Second)**. IBM System z9, Burroughs large systems and the UNIVAC 1100/2200 series are some examples of mainframe computers. Some of the companies that manufacture the mainframe systems are IBM, Hewlett-Packard, Sperry, Burroughs, Fujitsu, Hitachi and Groupe Bull.

Figure 1.3



Figure 1.3 – Mainframe Computer

3) Minicomputers

Minicomputers were evolved in 1960's. These are smaller and less powerful than mainframe computers but still they can offer huge processing capabilities. They usually took up one or a few cabinets the size of a large refrigerator. The first successful minicomputer was Digital Equipment Corporation's 12-bit PDP-8, which cost from US\$16,000 upwards when launched on March 22, 1965. It was designed by W.A. Clark and C.E. Molnar. The earliest PDP-8 model is also called Straight-8 because it used discrete transistor technology, packaged on flip chip cards, and was approximately the size of a compact refrigerator. This was followed by the PDP-8/S. By using a one-bit serial ALU implementation, the PDP-8/S was smaller, less expensive, but vastly slower than the original PDP-8. After this the family of PDP-8 computers continued and included PDP-8/I, PDP-8/L, PDP-8/E, PDP-8/F, PDP-8/M and PDP-8/A. Minicomputers are also known as midrange computers because their capabilities lie in between that of mainframes and microcomputers (Personal Computers).

Minicomputers can handle huge processing than microcomputers. The minicomputers can handle the processing needs of hundreds of users at a time. The user can access the central minicomputer through a terminal or standard PC.

Figure 1.4

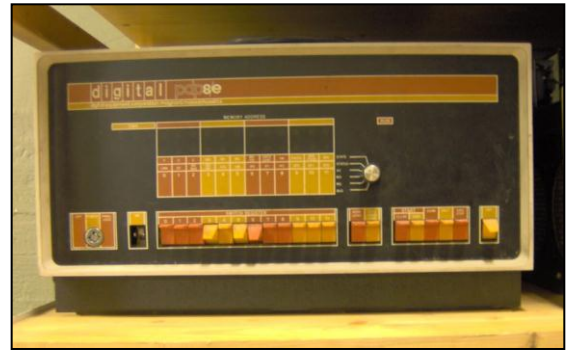


Figure 1.4 - Minicomputer

Figure 1.5



Some examples of minicomputers are:

Control Data's CDC 150A and CDC 1700, DEC, PDP and VAX series, Data General Nova, Hewlett-Packard's HP3000 series, Honeywell-Bull Level 6/DPS, 6/DPS 6000 series, IBM midrange computers, Norsk Data Nord-1, Nord-10, and Nord-100, Prime Computer Prime 50 series, SDS SDS-92 and Wang Laboratories 2200 and VS series.

IBM and Digital Equipment Corporation are the leading minicomputer manufacturers. Other companies who contribute are Data General, Prime, Computervision, Honeywell and Wang Computer.

Figure 1.5 - Minicomputer

4) Microcomputers

Microcomputers, as their name implies, are the smallest computers built for the users. These computers are so small that they can sit under or inside a desk or table some computer even can easily fit in to your hand or pocket. Microcomputers are so called because they contain a microprocessor (μP) as its CPU and another general characteristic of these computers is that they occupy physically small amounts of space. These are the computers which we see all around us in offices, homes, schools, colleges and universities. These computers are designed to be used by a single person at a time therefore these are also known as *personal computers (PCs)*.

The microcomputer came after the minicomputer, most notably replacing the many distinct components that made up the minicomputer's CPU with a single integrated microprocessor chip. The early microcomputers were primitive, the earliest models shipping with as little as 256 bytes of RAM, and no input / output other than lights and switches. However, as microprocessor design advanced rapidly and memory became less expensive from the early 1970s onwards, microcomputers in turn grew faster and cheaper. This resulted in an explosion in their popularity during the late 1970s and early 1980s.

Today's typical microcomputer usually comes with a system case which includes main critical circuitry as, the motherboard, microprocessor, RAM, video card, sound card, networking card/modem, hard disk drive, floppy disk drive, CD-Rom, power supply and many other components. It also contains a monitor and input/output devices like, keyboard and mouse. Today's microcomputers are very small then the microcomputers of early 1990's.

The early microcomputers include Apple II, Commodore 64, BBC Micro, and TRS 80.

There are six categories of microcomputers:

1. Desktop Computers
2. Workstations
3. Notebook computers
4. Tablet PCs
5. Handheld Computers
6. Smart Phones

Desktop Computers

Desktop computers are the most popular personal computers. These computers are designed to sit under or inside a desk or table. These are the computers which we see all around us in homes, office and colleges. These computers are very flexible and can perform a wide variety of tasks like they are widely used in homes for playing computer games, editing videos, creating office notes and documents, chatting through internet, sending e-mails, or playing music etc.

These computers contain a monitor for output, a keyboard or mouse for inputting usually both, a system unit which contains all the critical circuitry of the system, pair of speaker for sound output and many other devices. The main component of desktop computers is the system unit, which is the box containing all the critical circuitry like, mother board, microprocessor, RAM, hard drives, optical storage drives, floppy drives, power supply etc. The system unit comes in two basic models one is the horizontally oriented desktop model which sits flat on the surface horizontal and some users prefer placing monitor on the top of the system unit. Another is the vertically oriented tower ATX model, which sits vertically next to the monitor. It is the most popular model among the geeks of computers.

Figure 1.6



Figure 1.6 – Desktop Computer

Workstations

A workstation is a high-end desktop or desktide microcomputer designed for technical applications. Workstations are intended primarily to be used by one person at a time, although they can usually also be accessed remotely by other users when necessary. Workstations usually offer higher performance than is normally seen on a personal computer, especially with respect to graphics, processing power, memory capacity and multitasking ability. Workstations are often optimized for displaying and manipulating complex data such as 3D mechanical design, engineering simulation results, and mathematical plots. Workstations have a high resolution monitor, accelerated graphics-handling capabilities. These systems are ideal for advanced architecture, engineering design, animations. Workstations are popular for engineering and scientific field applications. Perhaps the

Figure 1.7



Figure 1.7 – High-end Workstation

first computer that might qualify as a "workstation" was the IBM 1620, a small scientific computer designed to be used interactively by a single person sitting at the console. It was introduced in 1959. Other types include Lisp machines developed at MIT around 1974, the famous Xerox Star (1981) and the less well known Three Rivers PERQ (1979).

Some of the companies who contributed in manufacturing workstations are: IBM, Digital Equipment Corporation, Hewlett Packard and Sun Microsystems.

Notebook Computers

Notebook computers are very small computers that can be fit easily on your lap. These computers are full-featured computers which offer same capabilities as found in traditional desktop PC. These computers are approximately same size and shape of a notebook therefore they are also called notebook computers. These computers look like a briefcase, which carries the important data. These computers are also called laptop computers because peoples can set these devices on their laps easily. These computers are very light and weight 2.2-18 pounds (1-6 kilograms), depending on size, materials, and other factors. These computers operate on a small battery which can be recharged. It is possible to run these full-features computers on a small battery because the circuitry of this computer is very small and the more important factor is that they use LCD (Liquid Crystal Display) monitor, which operates at very low electric power and run cooler than CRT (Cathode Ray Tube) monitor. These computers can also be operated with A.C current by using an AC/DC adapter. To use this computer you open the lid of this device and it reveals a small built-in keyboard and LCD monitor and when you want to close it you close the lid and the device folds itself for easy carrying. Today's typical notebook computers also contain a built-in trackpad as a pointing device, rather than mouse or trackball, located usually between G, H, and B keys on the keyboard. The main advantage of these computers is that they are very small and can be carried around easily and due to this portability these computers lie in the category of mobile computers. Beside this they also offer built-in keyboard and monitor, which makes them ideal for office workplaces. You can also connect the notebook computer to a full-sized keyboard, mouse and monitor.

Today's most popular notebook is Lenovo ThinkPad. The companies who manufacture laptop computers include: Toshiba, Sony, Lenovo, Dell, BenQ, Panasonic, Samsung, Gate Way, LG, Compaq and others.

Figure 1.8



Figure 1.8 – Notebook Computer

Tablet PCs

Tablet PCs also referred as shrunken notebook computers lie in the category of mobile computer. Tablet PCs are the computers, smaller and lighter than a notebook computer. These are portable computers and can be carried around easily from one place to another. These computers offer same functionality as offered by a traditional notebook computer. Tablet PCs have a touch screen which accepts the input with special pen called as digital pen or stylus; or with the finger touch instead of keyboard or mouse. You can directly tap or write on to the screen with the help of this pen. A software known as handwriting recognition is installed in the Tablet PC which matches the inputted text with its own stored assumptions and converts it into computer's own fonts. Few newer models of Tablet PCs also offer a built-in microphone which accepts the input from the user's voice and special software speech recognition software which converts it into the text or commands. Some models also offer a small miniature built-in fold-out keyboard, which you can use as you use in a traditional desktop PC. These small devices can also be connected to a full-sized keyboard and monitor. Tablet PCs use their own operating system like, Windows XP Tablet PC Edition.

Major Tablet PC manufacturers include Acer, Asus, Fujitsu, Gateway, Inc., Hewlett-Packard, IBM, Lenovo Group, LG Electronics, Motion Computing, TabletKiosk, NEC, Nokia (e.g. 770 and N800), Panasonic, Sony-Ericsson and Toshiba.

Popular models of Tablet PCs include:

Fujitsu Stylistic ST5000 , Electrovaya Scribbler SC2000, SC3000, SC3100 , MobileDemand xTablet , T8600 Rugged Tablet PC , Motion M1200, M1300, M1400, LE-Series, C5, LS800 , NEC Versa LitePad , Panasonic Toughbook 08 , TabletKiosk Sahara i215 (i412T, i440T and i440D announced Feb 2007) , Samsung Q1 , Nokia 770 and N800 , SonyEricsson P990 , Acer TravelMate C200/C300/C310 , Asus R1F, Averatec C3500 Series , Fujitsu LifeBook P1510(Slim, Ultra-portable, Small)/T4020, /T4210, /T4220 (Latest) , Gateway CX210/M285/S7200 , HP Compaq TC4200/TC4400 , HP TX1000/TX1020 , Lenovo ThinkPad X41 , Lenovo ThinkPad X60 Tablet (known popularly as "X60t") , Lenovo ThinkPad X61 Tablet , LG XNote C1 , LG LT-20-47CE , Panasonic Toughbook 19 , Toshiba Portégé 3500/M200/M400/M405/R400 , Toshiba Satellite R10/R15/R20/R25 , Toshiba Tecra M4/M7 , Compaq TC1000 , HP Compaq TC1100 and Fujitsu-siemens lifebook T and P series.

Figure 1.9



Figure 1.9 – Tablet PC

Handheld PCs

Handheld computers are very small devices enough to fit in your hand therefore these devices are also called palmtop computers. These devices are even smaller and lighter than Tablet PCs. There are many types of handheld computers but the most popular is Personal Digital Assistant (PDA). It is very small pocket-sized device and can be fitted in to your front or side pocket easily. It is widely used to take notes, display telephone and fax numbers and to display e-mail addresses. These devices are ideal for taking very small data and can not handle very huge amount of data as a traditional personal computer does. These devices like tablet PCs use a digital pen for inputting the data and some also come with a built-in microphone to allow the users to input the sound data.

These devices also offer many other features as, cellular phone, camera and music player. These devices can be connected to the Internet wirelessly and you can also connect them to a full-sized computer to share the data.

Smart Phones

Smart phones are full-featured mobile computers with personal computer like functionality. These are cellular phones which offer many other features which are not found in traditional cellular phone like, web and e-mail access, special software such as personal organizer, special hardware as digital camera and music player. These are the features that are not the part of a traditional cellular phone therefore these devices lie in the category of smart phones. Some models also offer a built-in miniature QWERTY keyboard.

These smart phones use different operating system as Symbian OS from Symbian Ltd, Windows Mobile from Microsoft, Palm OS and Rim BlackBerry OS.

Some models of smart phones are Apple iPhone, Motorola RIZR Z8, Nokia E61i, Nokia E70, Nokia N95, Palm Treo 700p, RIM BlackBerry 8700c, Samsung SGH-i607 BlackJack, Sony Ericsson P990, Sony Ericsson W950i and

Figure 1.10



Figure 1.10 – PDA (Personal Digital Assistant)

Figure 1.11

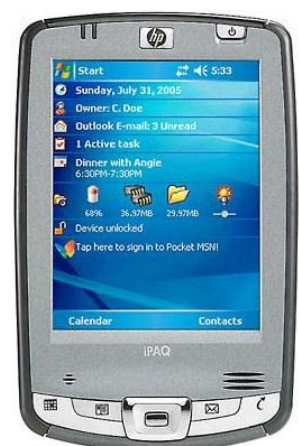


Figure 1.11 – Smart Phone

Samsung SCH-i730.

Some major manufacturers of smart phone are Gigabyte, Group Sense PDA, Hewlett-Packard, High Tech Computer (HTC), I-mate, Kyocera, Mio Technology, Motorola, Nokia, Palm Inc, Research in Motion Limited (RIM), Samsung Electronics and Sony Ericsson.

Classification of computers on the basis of type of data used OR on the basis of their working principles

Analog Computers

Analog computers (spelled analogue in British English) are the form of computers which use electrical, mechanical or hydraulic phenomena to solve the problems. More generally an analog computer uses one kind of physical quantity to represent the behavior of another physical system, or mathematical function. Analog computers are the computers, designed to perform arithmetical functions upon the numbers, where the numbers are responded by some physical quantity like, temperature and voltage (which vary continuously). Analog computers operate by only measuring rather than by counting. These computers are used for scientific and engineering problems.

Time line of analog computers

- 1) The slide rule is a hand-operated analog computer for doing multiplication and division, invented around 1620–1630, shortly after the publication of the concept of the logarithm.
- 2) The differential analyser, a mechanical analog computer designed to solve differential equations by integration, using wheel-and-disc mechanisms to perform the integration. Invented in 1876, they were first built in the 1920s and 1930s.
- 3) In World War II era gun directors and bomb sights used mechanical analog computers.
- 4) General Precision Systems electronic analog computer in 1950 was a very adaptable machine that could be configured to solve a range of problems.
- 5) The MONIAC Computer was a hydraulic model of a national economy built in the early 1950s
- 6) Heathkit EC-1 an educational analog computer made by the Heath Company, USA in 1960.

Some examples of analog computers constructed and practically used are:

Antikythera mechanism, Astrolabe, Differential analyzer, Kerrison Predictor, Mechanical integrator, MONIAC Computer (hydraulic model of UK economy), Nomogram, Norden bombsight, Operational amplifier, Planimeter, Rangekeeper, Slide rule, Torpedo Data Computer, Tide predictors, Torquetum and Water integrator.

Digital Computers

The digital computer is capable of performing operations on data represented in digital or number form i.e. data represented as a series of discrete elements arranged in a coded form. Digital computers are more accurate than analog computers. Digital computers handle values that are in discrete (binary 0's and 1's). As the digital computers do not support mechanical based operations therefore they are freed from huge and heavy mechanical components like motors and gears so the size of these computers is smaller and are lighter than analog computers. The computers that we see all around us in offices, schools, homes and colleges are the examples of digital computers.

Today's digital computers contain special hardware as microprocessor, memory, input/output (I/O) devices and storage devices; and special softwares like Operating System (OS) and other utility softwares which make them more powerful and flexible. These computers are quieter than the analog computers for this they are ideal for office use.

The old digital computers include Zuse Z3 (May, 1941), Atanasoff-Berry Computer (1941), Colossus (1943), Harvard Mark I - IBM ASCC (1944) and ENIAC (1944).

Today's most commonly used digital computers are Pentium III (uses Pentium III microprocessor) and Pentium IV (uses Pentium IV microprocessor). These are very powerful systems and can support very wide variety of tasks. The speed of the microprocessors that these systems contain is measured in ***Gega Hertz (GHZ)***.

Hybrid Computers

The term hybrid computer is frequently used to refer any computer system that comprises features of analog computers and digital computers. Hybrid computer has the properties of both analog and digital computers and can input and output analog and digital data. The digital unit controls the analog unit by the means of instructions stored in the digital memory. A hybrid computer uses digital-to-analog and analog-to-digital conversion. These computers are widely used in the fields of robotics. These computers can process both discrete and continuous data.

The examples of hybrid computer are HRS-100, a hybrid computer from Mihajlo Pupin Institute and WAT 1001 (a polish hybrid computer).

Figure 1.12

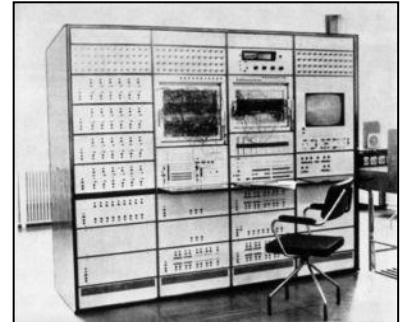


Figure 1.12 – Polish WAT 1001

Classification of computers according to the purpose

Special Purpose Computers

Special purpose computers are the computers used to perform specific applications. They do not offer wide variety of tasks. They are designed to perform a single or a limited set of tasks like the mainframe computers in the Airlines can only store the schedules of flights, information about the passengers etc. or a supercomputer used for predicting the weather or in a simulation of airplane. These computers are inflexible. These are commonly used in large industries and organizations but not in homes and offices. As they do not support wide variety of tasks they offer very high processing speed and power.

General Purpose Computers

General purpose computers can support wider variety of tasks like a home desktop computer can be used to print a document, play and edit music, play PC games, send an electronic mail (E-Mail), and much more which makes them very flexible. General purpose computers are ideal for home and office workplaces.