Chapter 2

COMPONENTS OF THE COMPUTER SYSTEM

COMPONENTS OF THE COMPUTER SYSTEM

- Concepts: HARDWARE & SOFTWARES

- Processor
- Motherboard
- Peripherals
- Memory
- Input/Output Devices
- E-Waste
- Software Classifications ….etc

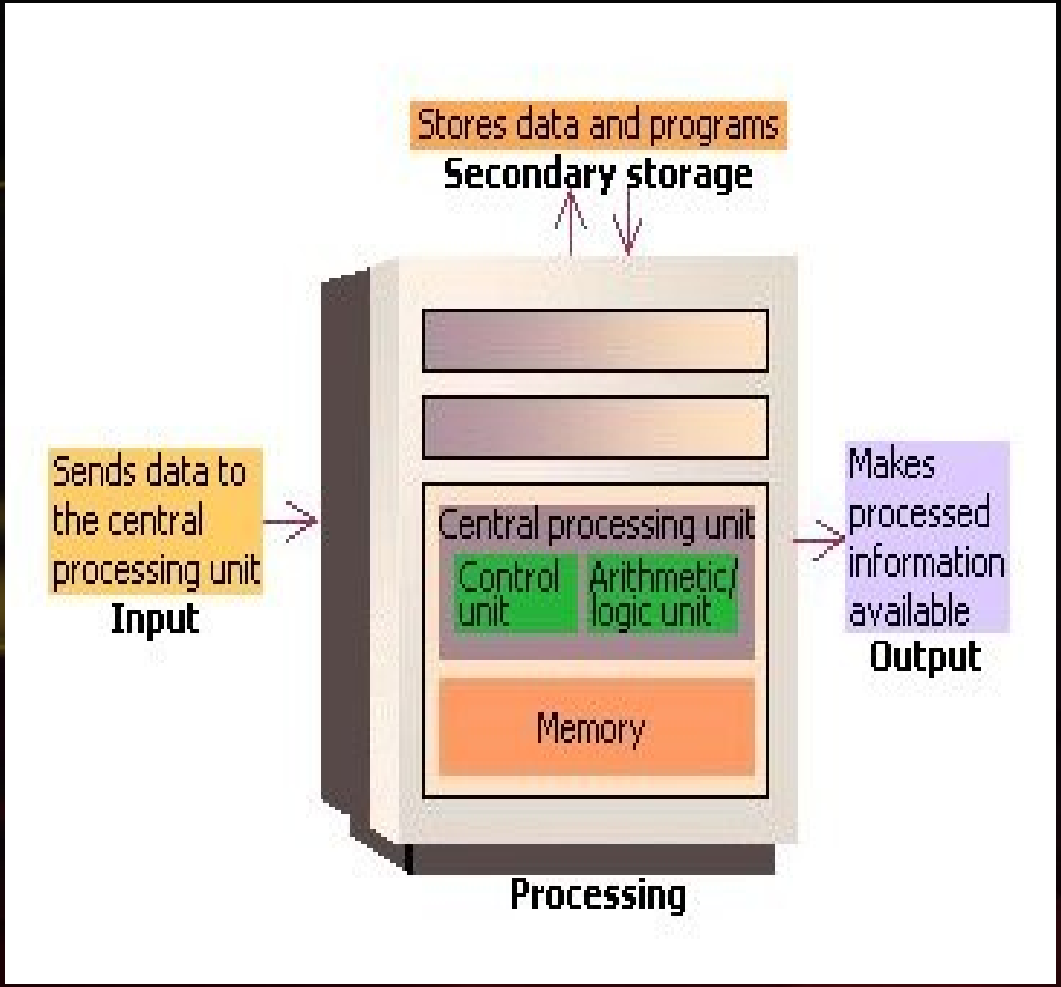
HARDWARE

The physical devices that constitute a computer are collectively called Hardware.

PROCESSOR (CPU)

- Processor is the computer's brain.
- It processes basic instructions stored in memory.
- It co-ordinates all computing and decision making operations.
- It determines the overall performance of the computer.
- It is a package that contain transistors and other components into a silicon chip referred as microprocessor.
- Registers are the storage locations inside the CPU

Block Diagram



Registers are the storage locations inside the CPU, They are

1. ACCUMULATOR

- It is used to store data to perform arithmetic and logical operations.
- The result of operations is stored in the accumulator.

2. MEMORY ADDRESS REGISTER(MAR)

It stores the address of memory location
to which data is either to be read or written by the processor.

3.MEMORY BUFFER REGISTER(MBR)

It holds the data either to be written to
or read from the memory by the processor.

4. INSTRUCTION REGISTER (IR)

The instructions to be executed by the processor are stored in the instruction register.

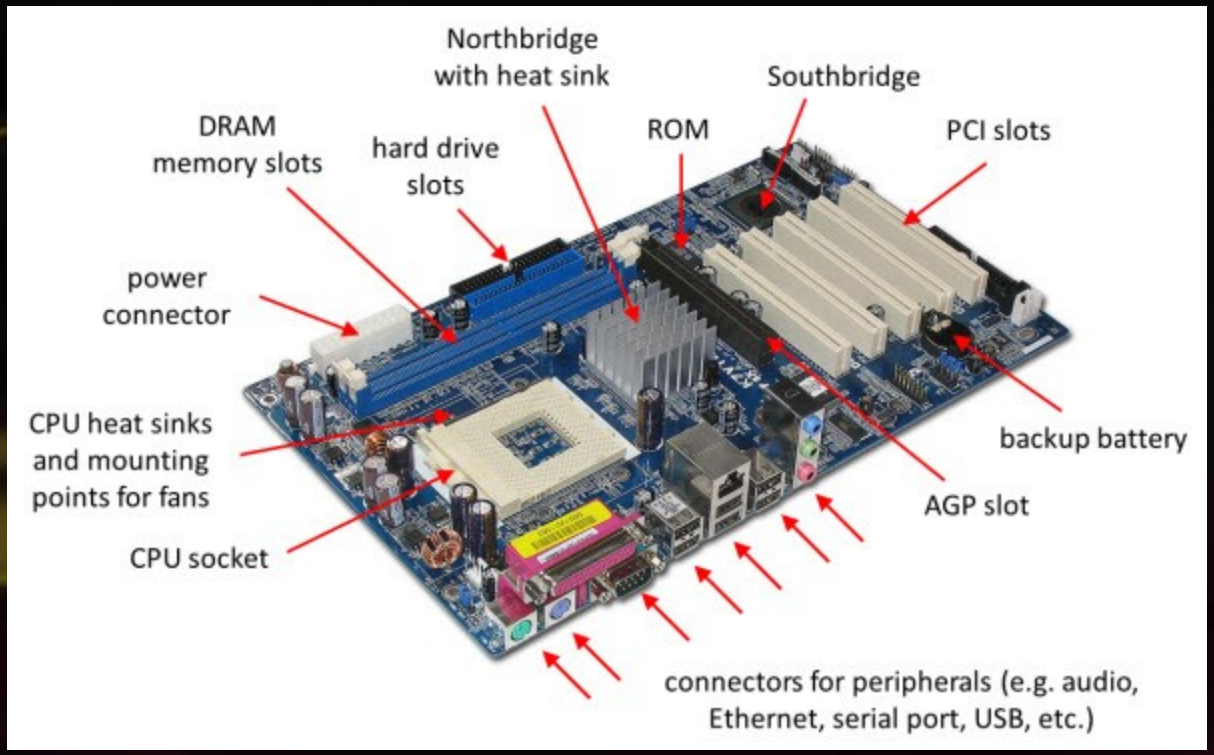
5.PROGRAM COUNTER (PC)

It holds the address of the next instruction to be executed by the processor.

MOTHER BOARD

It is the main circuit board of computer which contains the connectors for additional boards, CPU, memory.

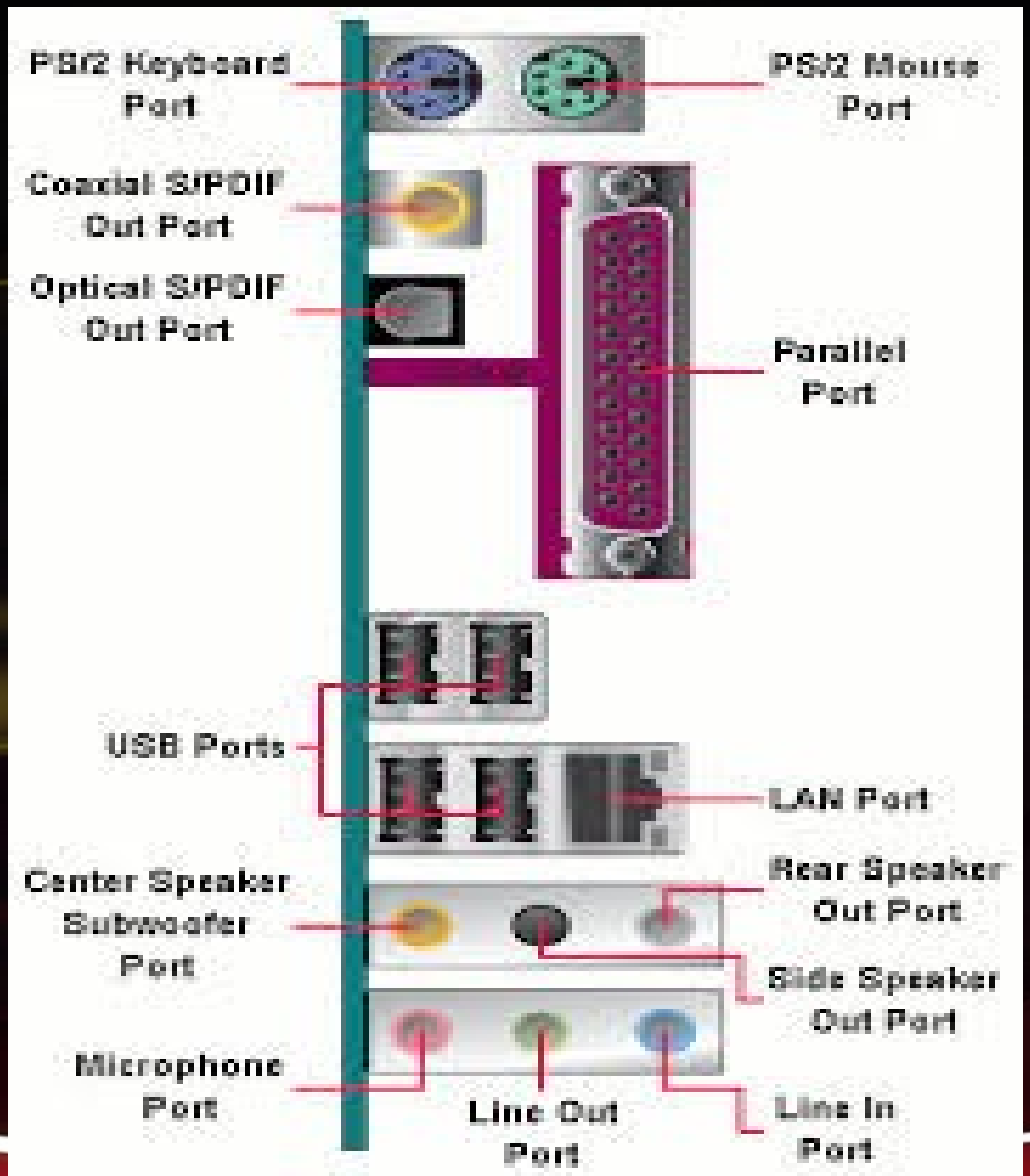
MOTHER BOARD



PERIPHERALS AND PORTS

- Peripherals are devices which are attached to a computer system to increase its capabilities. (Input/output devices, Storage devices, Communication devices).
- Peripherals are connected via some kind of port (I/O port).

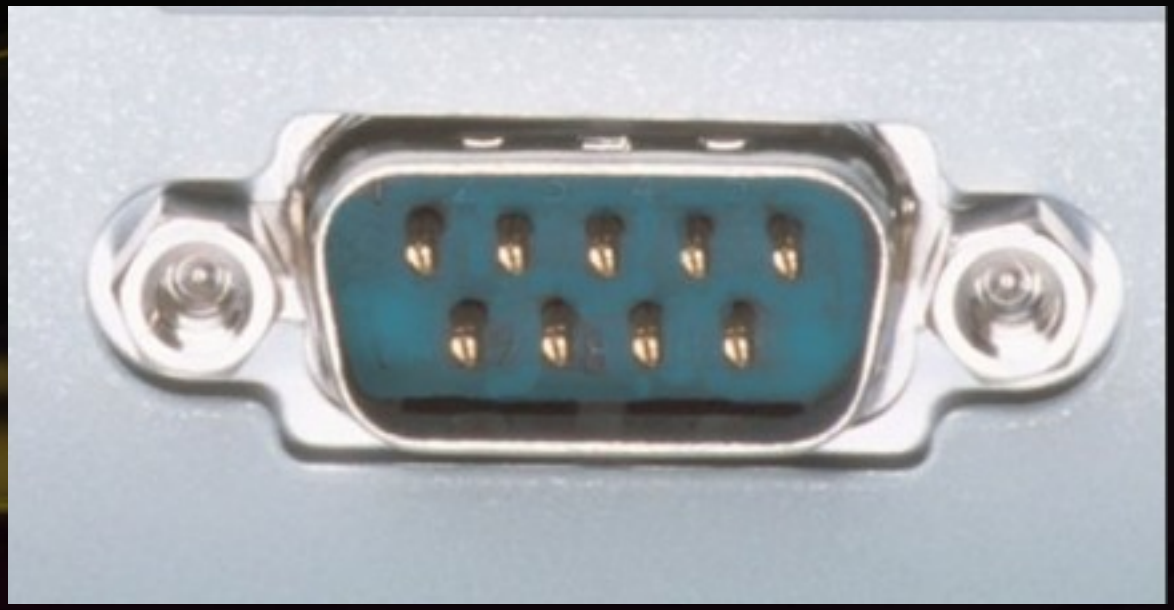
PERIPHERALS AND PORTS



SERIAL PORT

It transmits data one bit at a time typically on older PCs, a modem, mouse or keyboard.

SERIAL PORT



PARALLEL PORT

- It transmits 8 bits of data at a time.
- It is faster than serial port.
- It is used to connect printer or scanner.
- It uses 25-pin connectors.

Serial and Parallel Ports

USB(UNIVERSAL SERIAL BUS) PORT

- USB is a newer type of serial connection which is faster than old serial ports.
- It is used for short distance communication. (keyboard, mouse, printer, scanner)

It also provides voltages to devices connected in USB

USB(UNIVERSAL SERIAL BUS)

LAN PORT

LAN Port is a port connection that allows a computer to connect to a network using wired connection. they also called Etherne

PS/2 PORT
(Personal System / 2)

- These ports are used to connect keyboards and mouses.
- Speed is low.

AUDIO PORTS

These are small connectors for connecting sound input.
(microphone, external speakers, Line in)

VIDEO GRAPHICS ARRAY(VGA) PORT

- It is used to connect a monitor or a projector to a computer.
- VGA Connector has 15 pins.

VIDEO GRAPHICS ARRAY(VGA)

HIGH DEFINITION MULTIMEDIA INTERFACE (HDMI)

It is a digital connection capable of transmitting high definition **video and multichannel audio** over a single cable.

MEMORY

- a collection of storage locations
- Classified in to two
- Primary Memory (Working Memory used for storing data temporarily)
- Secondary Memory (used for permanent storage of data for future usage)

Primary Memory types : RAM and ROM.

Random access memory (RAM)

It is a volatile memory because the contents will be erased automatically when power is turned off.
Capacity of RAM 2GB,4GB etc

Read-only memory (ROM)

It is a non volatile memory because the contents will be stored for permanent use, but Read only. Types are

- **Programmable read-only memory (PROM).**
- **Erasable programmable read-only memory (EPROM).**
  (UV Light used for erasing data)
- Electrically erasable programmable read-only memory (EEPROM).
  (Electrical signals used for erasing data)

Cache memory

Cache memory is faster than main memory, but slower than the CPU and its registers. Cache memory, which is normally small in size, is placed between the CPU and main memory (Figure 5.5).

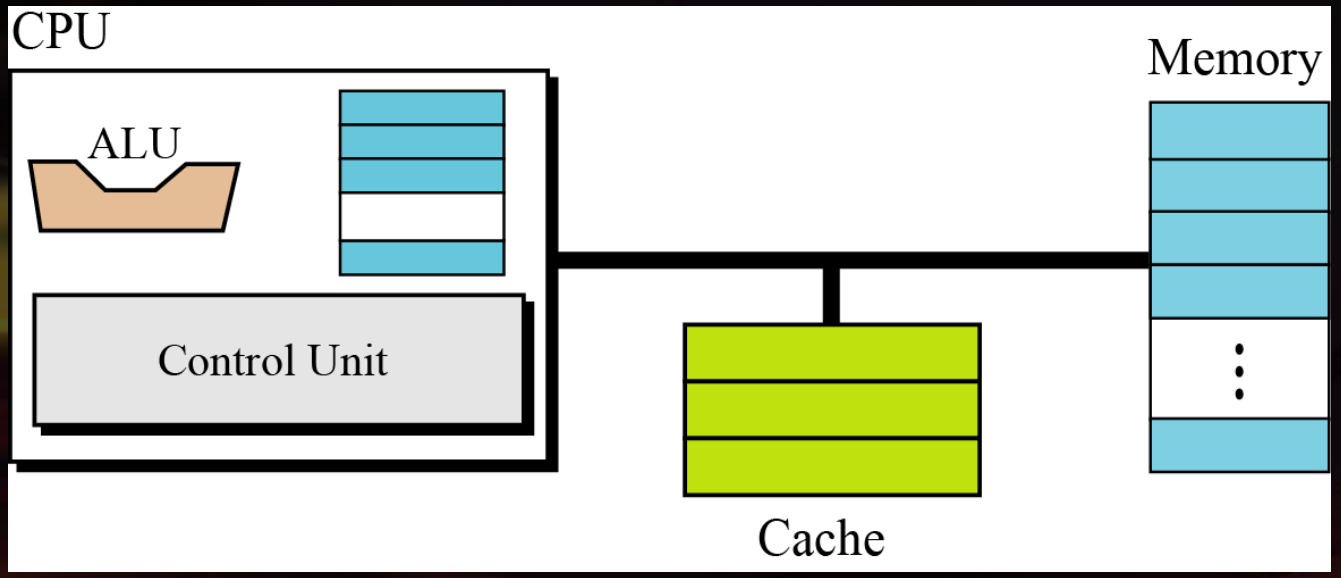


Figure 5.5 Cache memory

Secondary Memory (Auxiliary Memory)

They are classified in to Two

1. Sequential Access

   Here the data accessed in a sequential manner i.e. one after another

   Example: **Magnetic Tape**

2. Direct / Random Access

   Here the data accessed in any location randomly.

   It is classified in to two:

   Magnetic Disk and Optical Disk

Hard Disk

- It contain a group of metallic disks, coated with magnetic material in a dust proof case.
- Each plate have read write head.
- It has huge capacity from 80 GB to 1TB.
- The average delay required to access data from the disk is called access time.
- The recordable surface of a disk is divided into number or invisible concentric circles called Tracks.
- Each track again divided into pie shaped segments called sectors.

Hard Disk

Optical Disk

They are using laser light read/write data

Compact Disk (CD)

Made up of a layer of aluminum in between two plastic plates.

Its capacity is 700 MB. It may be CDROM & CD R/W

To read and write high beam of laser light is used.

Digital Versatile Disc (DVD)

Its capacity is 4.7 GB to 17 GB in dual layer.

DIGITAL VERSATILE DISC (DVD)

- It is designed to work with video player and television.
- They can store huge volume of data.
- Storage capacity: 4.37 GB- 15.9 GB.
- Recording and reading of data is done using DVD Drive.

(DVD)

TYPES OF DVD

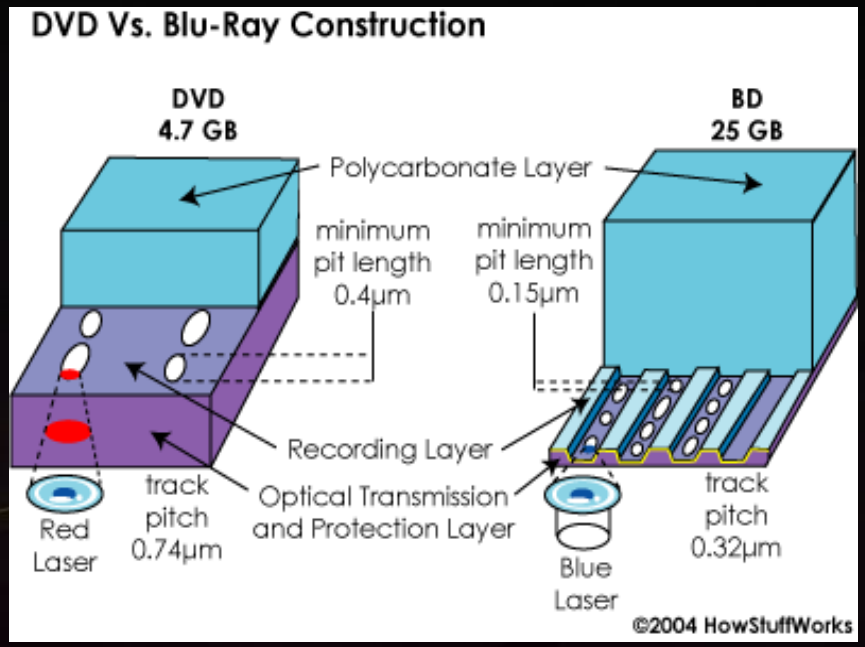
- DVD-ROM: DVD Read Only Memory

Blu-ray Technology

- Name is derived from the blue-violet laser used to read and write data.it can store 25 GB to 50 GB of data in one disc
- It also require special blue ray drive to read discs
  - Developed by the Blu-ray Disc Association with more than 180 members.
    - Dell
    - Sony
    - LG

Blu-ray Technology

- Data capacity
  - Because Blu-ray uses a blue laser(405 nanometers) instead of a red laser(650 nanometers) this allows the data tracks on the disc to be very compact.
  - This allows for more than twice as small pits as on a DVD.



SEMICONDUCTOR STORAGE (FLASH MEMORY)

- It uses electrically erasable ROM chips for data storage.
- It is faster and durable compared to the other types.

USB FLASH DRIVE

- Small external storage device.
- Portable and rewritable.
- Storage capacity: 2 GB-64GB.

USB FLASH DRIVE

(Pen Drive,Flash Drive,Thump Drive)

FLASH MEMORY CARDS

- Flat type memory cards.
- Storage capacity: 1 GB- 32 GB.
- Used in cell phones, laps, tablets.

FLASH MEMORY CARDS

INPUT DEVICES

- KEYBOARD,MOUSE,LIGHT PEN,TOUCH SCREEN,GRAPHIC TABLET,TOUCH PAD,JOYSTICK,MICROPHONE ,MICR, SCANNER,OMR,BARODE/QR READER, BIO METRIC SENSOR,SMART CARD READER,DIGITAL CAMERA etc

OUTPUT DEVICES

- VISUAL DIPLAY UNIT, PRINTERS, PLOTTERS

Keyboard

Working of keyboard

- When a key is pressed, the processor inside the keyboard detects pressed key
- Then An ASCII number corresponding to the key is passed to the motherboard then to the microprocessor.
- It converts the number to the corresponding character
- (ASCII of A is 1000001)

Mouse

Mouse

- It is a pointing device to point and select objects from the screen and also draw pictures.
- It contains a scroll wheel to scroll pages on screen

They Comes with port Serial or USB

Eg: Optical mouse

Working of Mouse

- The two light resources with photo detectors in optical mouse emits light
- It reflect back to small plastic lenses.
- When mouse move a grid line detect the light
- The mouse returns it as electric pulse to the processor.

Light Pen

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Light Pen

- Light pen is an another pointing device.
- To draw pictures, design objects and also put digital signatures directly on the screen.
- Here the photocell inside the light pen responses the picture element on the screen.

TOUCH SCREEN

- Operated by touching on the display screen.
- It has touching sensitive display screens.

- eg; Smart phones,
- Laps, ATMs.

GRAPHIC TABLET

- It consists of an electronic writing area.
- Special pen works on it.
- It allows artists to create graphical images with motions and actions.

GRAPHIC TABLET

TOUCH PAD

- It allows to move the mouse pointer without the need of an external mouse.
- It is operated by using finger and dragging across the flat surface.

Joystick

Joystick

- It is a pointing device used to select and move objects on the screen.
- Mainly used to play simulation games, and controls robots
- It place in a base, it cal move any direction.
- It has two control buttons.

Microphone

Microphone

- They help us to input sound to the computer.
- It translate the vibration in the air in to electric pulse.
- The sound can store and reuse for voice recognition applications.

Scanner

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Scanner

- The are used to scan and digitalize images, documents etc.
- Here a light source moves to and fro to red the document
- The detectors convert the document to electric pulse.

- OCR(optical Character Recognition) is also a scanner/Software which scan printed document and converts it into text format, that can be edited using word Processors)

Optical Mark Sheet

Optical Mark Reader (OMR)

- They detects marks made by a dark pencil or pen on special pre printed form.
- The OMR scan the document and transform it in to electric pulses.
- Uses:

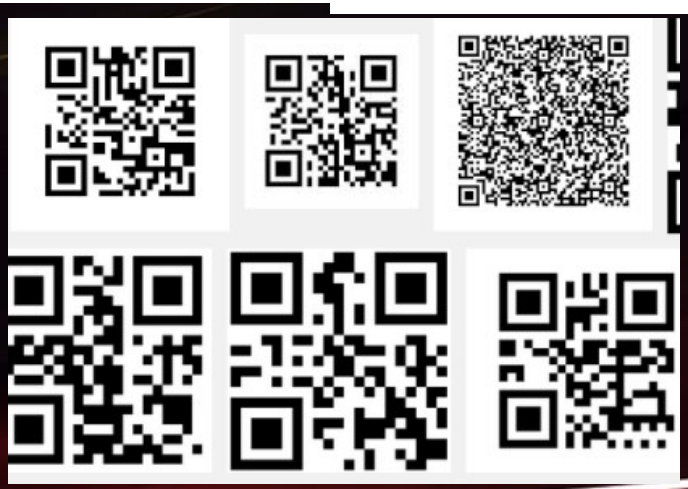
- Objective type exam
- Surveys.
- Order forms

Advantages:
Speed
Accuracy of result
Reliable

BAR CODE/ QUICK RESPONSE(QR) CODE READER

- Used to input data from a set of barcodes.
- Scanned by scanners.
- Bar codes are single dimensional.
- QR Codes are two dimensional.
- QR Codes can store more data than bar codes.

BAR CODE/QR Code



BIOMETRIC SENSOR

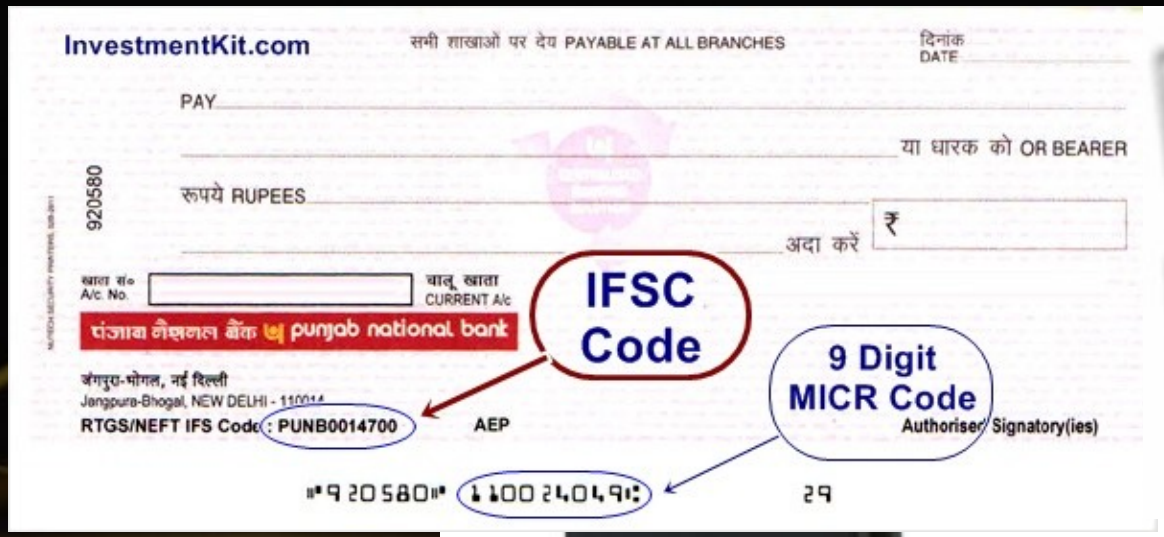
- Identifies human physical features.
- Uses finger prints, retina.
- Used to verify and authenticate the identity of the user.
- Types: 1. Semiconductor sensor.
  2. Optical sensor.
  3. Ultrasound sensor.

BIOMETRIC SENSOR

MAGNETIC INK CHARACTER RECOGNITION (MICR)

- This device is used to read special number printed below on bank cheques, drafts etc
- The special number printed with a ink contains iron oxide
- MICR code contains cheque number, branch code, bank codes etc
- MICR reduces error in data entry and speed up money transfer

MICR



SMART CARD READER

- It is a plastic card that stores and transacts data.
- The data card may contain memory or microprocessor.
- The smart card is used in banking, telephone calling etc.
- It is contact type of reader, with physical contact with cards.
- It is inserted to the reader.
- Contactless type reader works with radio frequency.

SMART CARD READER

Digital Camera

Digital Camera

- A digital camera allows to take digitized photographs or videos without using films.
- Without using any other studio equipments we can directly transfer the image to the computer.
- To store images memory card is used.

Output Devices

- It communicate the result of processing to the external world.
- They translate machine representation in to human readable form.
- So It is an electro mechanical device.

1.Visual Display Unit (Soft Copy)

2.Printers (Hard Copy)

3.Plotters (Hard Copy)

Visual Display Unit (VDU)

- It is a standard and soft copy output device of the computer.

They are:

- 1. Monochrome Monitors and Color Monitors with CRT(Cathode Ray Tube)
- 2. LCD (Liquid Crystal Display
- 3.LED
- 4.LCD Projector

CATHODE RAY TUBE

Monochrome Monitors and Color Monitors with CRT(Cathode Ray Tube)

- CRT is a vacuum tube.
- The rectangular part is coated with phosphor.
- An electron gun (In color Monitor 3 electron guns for red , green and blue) emits electrons towards the screen.
- It creates and glow tiny dots called pixels on the screen.
- The number of times a monitor scans the entire screen in each second is called refresh rate.

Disadvantages of CRT Monitors

- They are heavy
- Bulky size
- High power consuming
- Not portable
- Make eyestrain

FLAT PANEL MONITOR

- Thinner and lighter.
- Consumes less power.
- Emits less heat

- Eg: LCD Monitors, LED Monitors, Plasma Monitors, OLED Monitors.

LCD (Liquid Crystal Display)

LCD (Liquid Crystal Display)

- Made up of special kind of liquid crystal placed between two plates.
- When electricity passed through it, crystal liquid become solid and block the light.

LCD MONITOR

- It consists of liquid crystal made by two plastic plates.
- These crystals rearrange to form an image when electric current is passed.
- A light source at the back of the plate makes the picture visible.

Advantages of LCD Monitors

- They are weightless
- Slim size
- Low power consuming
- portable
- Not make eyestrain

FLAT PANEL MONITOR

LED MONITOR

- It uses LED directly behind the LCD in order to light up the screen.
- This technique gives the screen its own light.
- It can be ON or OFF stage.
- It is expensive.
- The advantages are colour quality, clarity and wider viewing angle.

PLASMA MONITOR

- It consists of Neon/Xenon gas between two sealed glass plates.
- Electrodes are parallely deposited on their surfaces.
- When a voltage pulse passes between the electrodes, the gas lights up different colours.
- It creates images on the monitor.
- It is expensive.

ORGANIC LIGHT EMITTING DIODE (OLED) MONITOR

- Panel of OLED is made up of millions of tiny LEDs.
- OLED Screens are thinner and lighter than LCD and LED.
- It can produce better quality images and better viewing angle.
- Needs less power.
- Very expensive.

LCD PROJECTOR

- It is a video projector for displaying video images on a large screen.
- A beam of high intensity light travels using thousands of pixels in a LCD display.
- This beam of light projects and focuses the image on the surface.

Printers

- Printed output is the most useful and convenient form of information for users.
- It is a hard copy device.

They are different types like:

1. Dot matrix Printers
2. Inkjet Printers.
3. Laser printers
4. Thermal Printers

Dot Matrix Printers

- There is physical contact between with print head and paper.
- It produce noise.
- Slow printing speed
- Poor quality, but can produce carbon copy

DOT MATRIX PRINTER

Dot-matrix Printers

- They are slow and print a single character at a time.
- Characters are formed by the impact of pin sets.
- When print head moves pins are strike on the paper.
- They versatile (can print both text and graphics), Print cost is low but low speed, low quality and noisy.

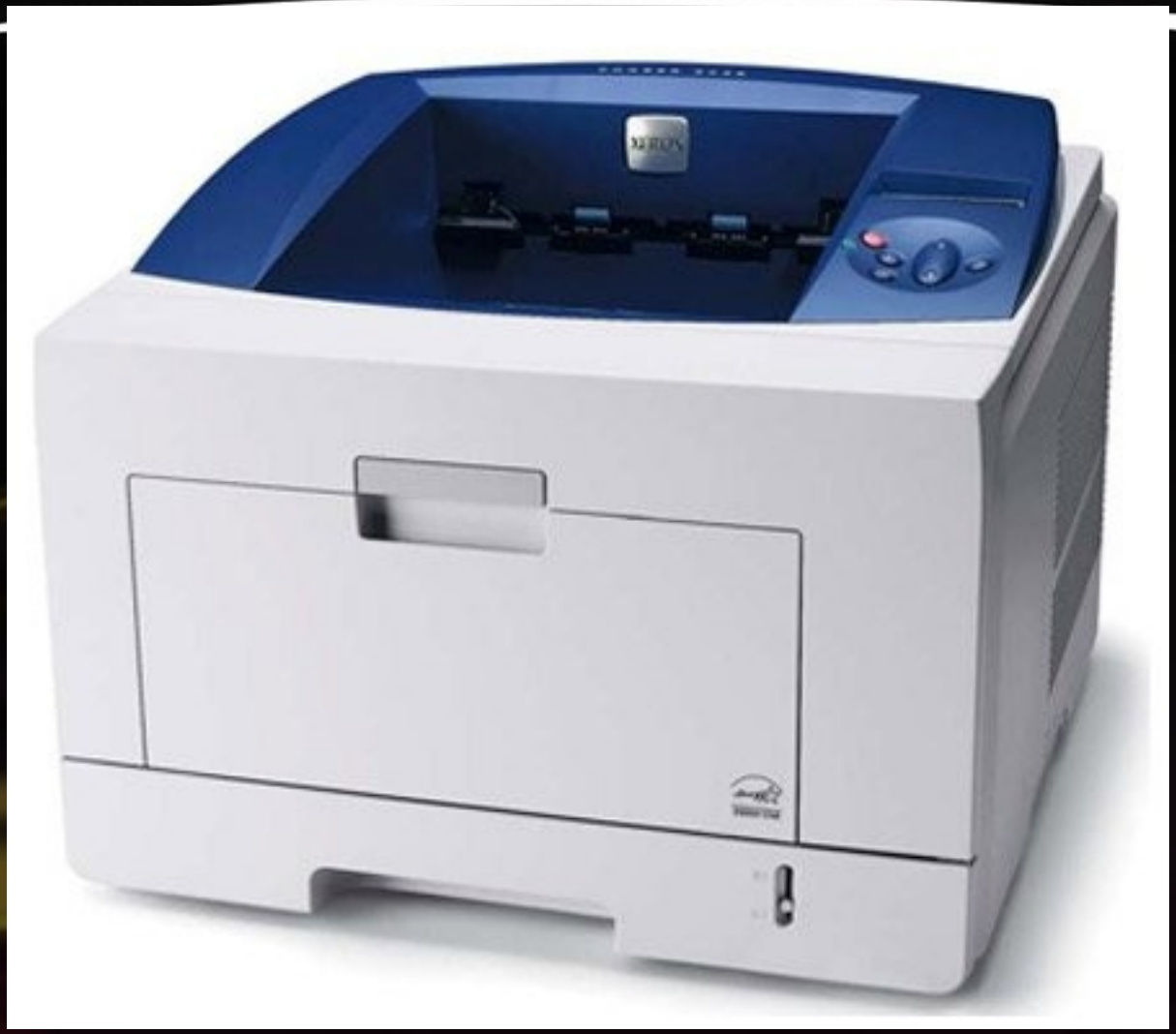
Inkjet Printers

- Here ink from ink bottle(catridge) is used
- Printing is done by spraying ink to the paper through a nozzle.
- There is no physical contact between print head and paper.
- Printing speed is high.
- High quality with color printing.
- Not produce noise.
- Highly used for home usage ,because it is cheap

Inkjet Printers

Laser Printers

- Here carbon powder (toner) used for printing
- Printing is done by electrostatic process
- Printing speed is high.
- High quality with color printing.
- Not produce noise.
- It has 180-300 cps speed.
- Working: Image to be printed transferred to a drum using laser beam(+ve charged),Toner powder(-ve charged) sprayed to drum .it is transferred to paper by rolling and heating)



Laser Printers

Plotters

- They are used to produce large drawings or images
- Used to print building plans, machine designing, blue prints etc.
- It has arms with colored pens
- Useful in CAD (Computer Aided Design)
- They are two types:1) Drum plotter
  2) Flat bed plotter

DRUM PLOTTER

FLATBED PLOTTER

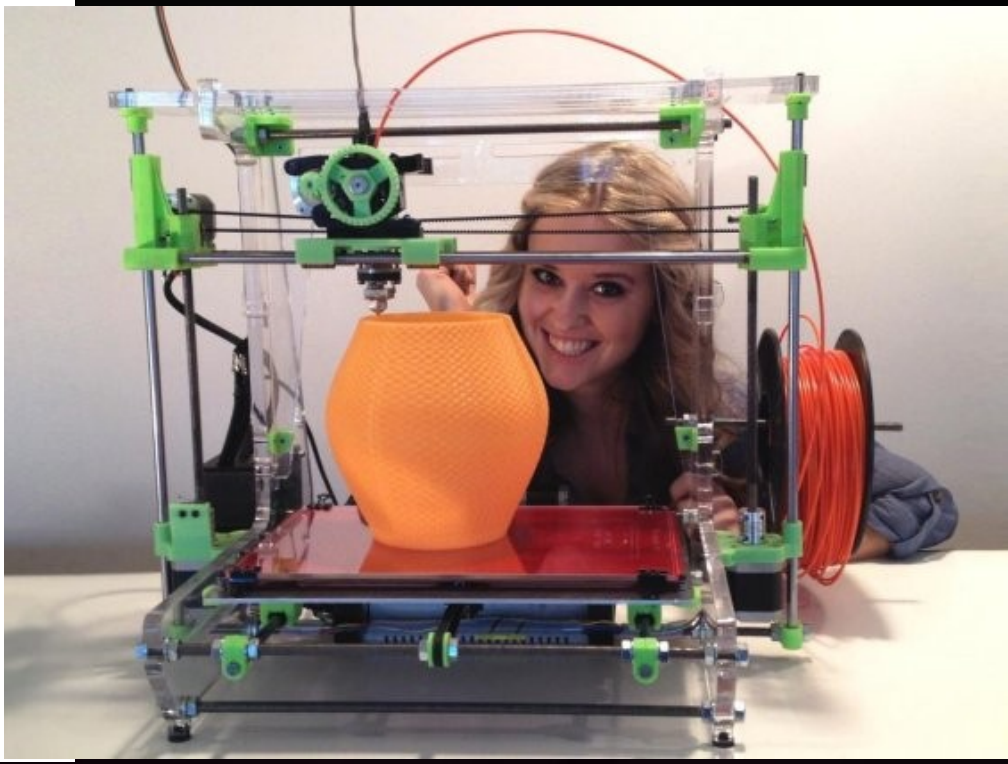
- Also known as Table Plotter.
- Paper fixed over flatbed table.
- Has two drawing arms.
- Holds coloured ink pens.
- Drawing arms move over the paper and draw graphs.
- Very slow in process.

FLAT BED PLOTTER

3D PRINTER

- **3D printing** refers to any of the various processes for printing a three-dimensional object.Primarily *additive processes* are used, in which successive layers of material are laid down under computer control. These objects can be of almost any shape or geometry,
- Can be created toys,ceramic cups,metal parts etc

3D PRINTER



AUDIO OUTPUT DEVICE

- Audio Output is the ability of the computer to produce sound.
- Speakers are the output device.
- These are connected to Audio port.

AUDIO OUTPUT DEVICE

E-Waste

What is E-waste?

- Any waste that has a circuit board or CRT.
- Electronic products nearing the end of their ‘useful life’.
- The definition includes:
  - Televisions
  - Computers: central processing units (CPUs), monitors, laptops
  - Computer keyboards, speakers, printers, and peripherals
  - VCRs and DVD players
  - Fax machines …from **HOUSEHOLDS**

The used electronics which are destined for reuse, resale, salvage, recycling or disposal are also considered as e-Waste.

E-Waste

- Nowadays electronics is part of modern life.
- Every year we buy new and updated equipments to satisfy our needs.
- More than 300 million computers and one billion cell phones are produced every year.
- These goods become obsolete or unwanted, often, within two or three years of purchase.

E-Waste

- Technological advances speed up obsolescence & lead to more e-waste
- It is estimated that 50 million tons of e-Waste are produced each year.
- Only 15-20% of e-Waste is recycled, the rest of these materials go directly into landfills and incinerators.

Why should we be concerned about e-Waste?

- ✓ Electronic waste is not just waste.
- ✓ It contains some very **toxic substances**, such as **mercury, lead, cadmium, brominated flame retardants**, etc.
- ✓ The toxic materials can cause **cancer, reproductive disorders** and many other health problems, if not properly managed.

- ✓ It has been estimated that e-Waste may be responsible for up to 40% of the lead found in landfills.

Important hazardous chemicals, their sources and consequences.

CHEMICAL	SOURCE	CONSEQUENCE
LEAD	**Found as solder on printed circuit boards and in computer monitor glass**	**It can cause damage to the central and peripheral nervous systems, blood systems and kidneys in humans**
MERCURY	**Found in PCBs, LCD screen backlights**	**Affect baby's growing brain & nervous system. Adults can suffer organ damage, mental impairment & other symptoms.**
CADMIUM	**Found in chip resistors and semiconductors.** 9847995577	**Cause various types of cancer. It can also accumulate in the kidney and harm it.**

Important hazardous chemicals, their sources and consequences.

CHEMICAL	SOURCE	CONSEQUENCE
BFRs – BROMINATED FLAME RETARDANTS	**Found in PCBs and some plastics**	**These toxins may increase the risk of cancer.**

What happens to the e-Waste?

- ✓ An incredibly small percentage of e-Waste is recycled.
- ✓ The majority of e-Waste is most often dumped or burned – either in formal landfills and incinerators or informally dumped or burned.
- ✓ In effect, our soil, water and air are easily contaminated.

- ✓ The United States Environment Protection Agency includes discarded CRT monitors in its category of ‘hazardous household waste’

E-Waste Disposal Methods

- Re use
- Incineration
- Recycling of E-waste
- Land filling

What are the e-Waste disposal methods?

1. **REUSE :**
   - ✓ **Second-hand use or usage after it has been upgraded or modified.**
   - ✓ **Old computers are passed on to relatives/friends or returned to retailers for exchange or for money.**
   - ✓ **Or passed on to charitable institution or educational institutions**
   - ✓ **Inkjet cartrideges, laser toners are also used after refilling.**
- ✓ **This method reduces the volume of e-Waste generation.**

What are the e-Waste disposal methods?

2. INCINERATION :

- ✓ **It is a controlled and complete burning process.**
- ✓ **The waste is burned in specifically designed incinerators at a high temperature in the range of 900 to 1000 degree celsius.**

What are the e-Waste disposal methods?

3. RECYCLING OF E-WASTE :

- ✓ **It is the process of making or manufacturing new products from a product that has originally served its purpose.**
- ✓ **Monitors, Keyboards, Laptops, Modems, Telephone boards, Hard drives, Compact disc, Mobiles, Fax machines, Printers, CPU, Memory Chips, Connective wires and cables can be recycled.**

What are the e-Waste disposal methods?

4. **LAND FILLING :**
   - ✓ **It is one of the widely used but not recommended method for the disposal of e-Waste,**

Role of students in e-Waste disposal

1. Stop buying unnecessary electronic equipments.
2. When electronic equipments get faulty try to repair it instead of buying a new one.
3. Try to recycle electronic equipments by selling them or donating them to others.

Role of students in e-Waste disposal

4. If you really need to buy new electronics, choose items with less hazardous substances, greater recycled content, higher energy efficiency, longer life span etc.
5. Buy rechargeable batteries instead of disposable batteries.
6. Buy products with good warranty and take back policies.

GREEN COMPUTING or GREEN IT

It is the study and practice of environmentally sustainable computing or IT.

It is the designing , manufacturing, using and disposing of computers and associated components such as monitors, printers, storage devices, etc., efficiently and effectively with minimal or no impact on the environment.

Some steps that can be taken for Green IT

- Turn off computer when not in use.
- Power-on the peripherals such as laser printers only when needed.
- Use power saver mode.
- Use laptop computers rather than desktop computers whenever possible.
- Take printouts only if necessary.
- Use LCD monitors rather than CRT monitors.
- Use H/W & S/W with Energy Star label.
- Dispose e-Waste according to central, state & local regulations.
- Employ alternative energy sources like solar energy.

Definition of Green Computing

The environmentally responsible and eco-friendly use of computers and their resources is known as **Green Computing.**

How to make computers Green ?

To promote green computing the following four complementary approaches are employed.

1. **Green Design**
2. **Green Manufacturing**
3. **Green Use**
4. **Green disposal**

Softwares

- It is a set of instructions to perform a useful work done by the help of computers.
- They are classified in to two.
- 1) System Software
- 2) Application Software.

System Software

- It is a collection of programs that directly control the operations of a computer.
- It supports the running of other softwares and communication with peripherals.
- It is also known as system package.

They are again classified in to three.

They are

- 1) Operating System
- 2) Language Processors.
- 3) Utility Software

1. Operating System

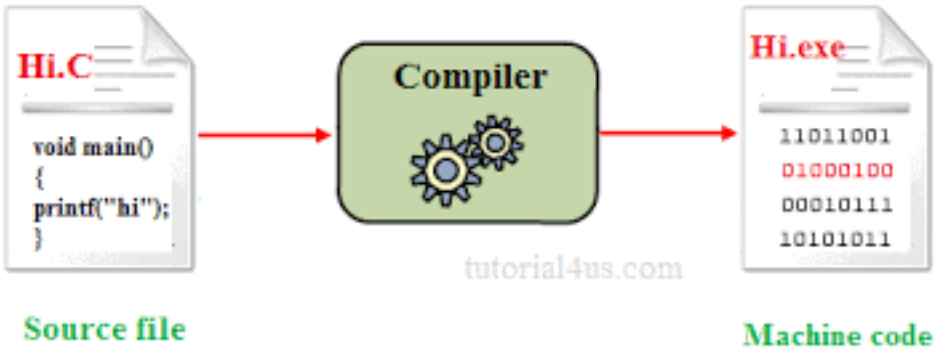
- It acts as an interface between the user and the hardware.
- It is a set of programs that control and co-ordinate the operations of a computer and help to make efficient use of resources.

It has the following functions.

- **Process management, Memory management, File management, Device Management**
- Example: MS Windows XP, Vista, Linux

Language processors

- They are used to translate the assembly or high level language instructions in to equivalent machine language instruction.
- They are classified in to three.
- They are
- 1) Assembler
- 2) Compiler
- 3) Interpreter.



Computer Language

- **Low Level Language(LLL)**
- 1.Machine Language: Language Understood by Machines,like binry 1,0
- 2.Assembly Langauge uses mnemonics codes like ADD,SUB,INC,etc
- **High Level Language(HLL)** Which uses english language to write programs

Assembler

- It converts assembly language codes to machine language.
- Which is uses numbers and memory locations for representing instructions.

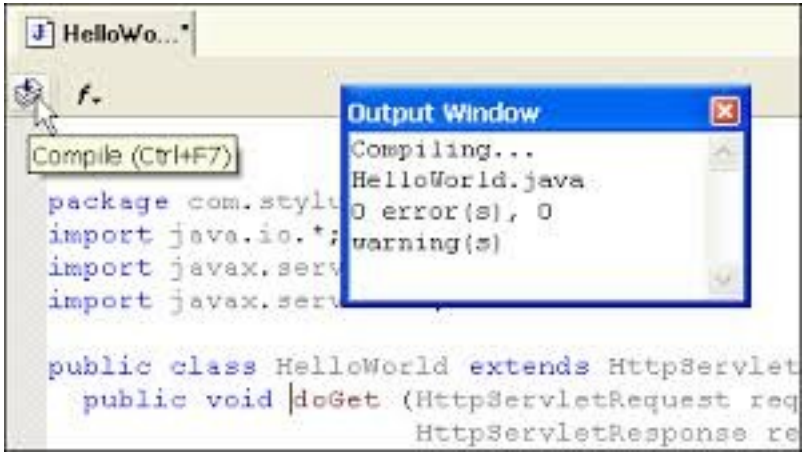
```
00000000        push    ebp
00000001        mov     ebp, esp
00000003        movzx   ecx, [ebp+arg_0]
00000007        pop     ebp
00000008        movzx   dx, cl
0000000C        lea     eax, [edx+edx]
0000000F        add     eax, edx
00000011        shl     eax, 2
00000014        add     eax, edx
00000016        shr     eax, 8
00000019        sub     cl, al
0000001B        shr     cl, 1
0000001D        add     al, cl
0000001F        shr     al, 5
00000022        movzx   eax, al
00000025        retn
```

Interpreter

- It translates high level language program in line by line in to its equivalent machine code.
- The language like BASIC used interpreter.

Compiler

- It translates all lines of high level language program at a time in to its equivalent machine code.
- The language like C++ and Java are used compiler.



Compiler V/S Interpreter

Compiler	Interpreter
It translates **whole code** at a time.	Only **one statement** is translated at a time.
Errors listed only after the compilation.	Errors listed in each line.
Execution of program requires source program or compiler.	Execution of program requires both source program and interpreter.

Utilitysoftwares

- **Softwares used for system maintenance tasks for the smooth functioning of computer**
- They are used to assist the computer for back upping files, scanning viruses etc.
- They are Backup Utility, Compression Utility(Zipping), Disk Defragmenter, Antivirus software etc.

Application Software

Application software is a set of one or more programs, designed to solve a specified problem, or do a specific task for an individual or an organization.

- They are classified in to.

- 1) Software packages (General Purpose)
- 2) Customized software (Specific Purpose)

(General Purpose packages)

It needs too many users. They are.

- Word processors :creates documents with formatted text

(MS Word, Open Office Writer, Soft word, LEAP, ISM)

- Electronic Spread sheets: creates worksheet to perform calculations

(MS Excel, Open Office Calc, VisiCalc, Lotus and Quattro pro)

- Presentation: to create multimedia slides

(Adobe Flash, MS Power point,Open office impress)

- Multimedia Software:to play audio,video,graphics etc

(VLCPlayer,Real Player , Media Player)

- Database management systems: Create & manage database

(DBMS) (MS Access, My SQL, Oracle)

Specific Purpose Software

- They are developed to solve an individual or organization's need.
- Example: Pay roll, Air line reservation, sales and inventory control, Hospital management, Library management, Supermarket management, banking, insurance, accounting etc.

Free & Open Source software

- Free software provides freedom to

1. Use
2. Copy
3. Distribute
4. Examine
5. Change & Improve the software

Eg: GNU/Linux, Gimp,Firefox,Open Office Package

Freeware , Shareware, Proprietary Softwares

- **Freeware software** provides free usage of copyrighted programs
- Eg:Audio Players,Video Players,CD Wrtiting Tools etc

- **Shareware software** can be used freely, but on trial basis,or demo mode,if we like the program ,we must buy it for getting full facilities or features
- Eg:Audio Video Converter/Cutter

- **Proprietary Softwares: These are**

Humanware

- Humanware is term used to refer humans who use computer

- Eg: Computer System Administrators
- System Manager
- Database administrators
- Computer Engineers
- Computer Operators
- System Analyst