

Course Title: 103 Introductions to Computers

Unit – 4: Input & Output Devices

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4.1 Introduction of input devices

What is Input?

Input is any data or instructions entered to the computer. Input can be in the form of audio, video, graphics and animations and instructions

What Are Input Devices?

Any hardware component used to enter data, programs, commands, and user responses into a computer

Examples: Key Board, Mouse, Digital Camera, Webcam, Scanner, etc.

4.1.1 Pointing Devices

A pointing device is an input device which is used to control a pointer on a screen. Pointer is a small symbol on a screen.

A pointing device is an input interface (specifically a human interface device) that allows a user to input data to a computer. Graphical user interfaces (GUI) allow the user to control and provide data to the computer using physical gestures — point, click, and drag — for example, by moving a hand-held mouse across the surface of the physical desktop and activating switches on the mouse. Movements of the pointing device are echoed on the screen by movements of the pointer (or cursor) and other visual changes.

Mouse:

“Mouse is an input device that fits under palm of hand and Controls movement of pointer”.

The mouse is a palm-size device with a ball built into the bottom. The mouse is

usually connected to the computer by a cable (computer wires are frequently called cables) and may have from one to four buttons (but usually two). Mouse comes in many shapes and sizes.

When you move the mouse over a smooth surface, the ball rolls, and the pointer on the display screen moves in the same direction.

With the mouse, you can draw, select options from a menu, and modify or move text. You issue commands by pointing with the pointer and clicking a mouse button.

TYPES OF MOUSE

There are three types of mouse

1. Mechanical mouse
2. Optical mouse
3. Laser mouse
4. Wireless mouse

MECHANICAL MOUSE:

- It is also known as **ball mouse** because it uses a moving ball to work.
- A mechanical mouse is comprised of a metal or rubber ball in its underside.
- When you move the mouse across a surface, the ball also moves.
- Inside the mouse, there are two rollers that roll against two sides of the moving ball.
- One roller tracks the horizontal motion of the mouse and the other roller tracks the vertical motion.

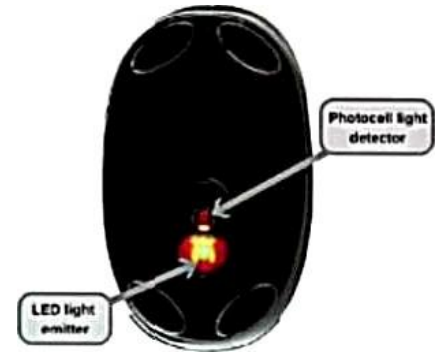
- The motion of the two rollers is converted into electrical signals which is then sent to the computer through a cord.
- The software on the computer then converts these electrical signals into meaningful X and Y movement of the mouse cursor that you see on screen.
- Moving the mouse causes the ball to foil, and sensors Inside the mouse detect the movement of the ball and consequently send signals to the cursor on the screen.
- The mechanical mouse has largely been replaced by the optical mouse.



2. Optical Mouse

- An Optical mouse works using optical technology. So, it doesn't require any moving parts.
- When you move the mouse over a surface, a small red LED (Light Emitting Diode) emits light onto a surface and reads the pattern or grid on that surface.
- The mouse converts this surface information into meaningful motion data which is sent to the computer.
- As you push the mouse around your desk, the pattern of

reflected light changes, and the chip inside the mouse uses this to figure out how you're moving your hand.



- **Optical mouse has advantages over mechanical mouse:**

1. Less wear and lower change of failure because there are no moving parts.
2. Dirt or dust cannot get into the mouse and interfere with the sensors.
3. Smoother response due to increased ticking resolution.
4. Mouse pad is not required, because it works on any flat surface like desk.

3. Laser Mouse

- It is the newest technology.
- It works same way as optical mouse but give better results.
- The laser inside the laser mouse can deliver up 20 times the performance of an optical mouse which gives more accurate tracking of motion and smoother movement.
- It also works flawlessly on any type of surface, where optical mouse may not work.

4. Wireless Mouse

- Wireless mice usually work via radio frequencies commonly referred to as RF.
- RF wireless mouse require two components to work properly a radio transmitter and a radio receiver.

Trackball-

- A trackball is like an upside-down mouse. Used similarly to the mouse, the trackball is frequently attached to or built into the keyboard.
- The main advantage of a trackball is that it requires less desk space than a mouse.
- The user spins the ball in different directions to move the cursor on the screen. The
- The associated electronic circuits detect the direction and speed of the spin. The information is sent to processor.
- It is used on a laptop computer where there is no space for a conventional mouse.
- Early alternatives, such as trackballs clipped to the side of the keyboard, have not proved satisfactory. The IBM ThinkPad replaces the trackball with a red plastic button, called a track point, located in the middle of the keyboard. You move the button with your thumbs.
- It serves the same purpose as a mouse, but is designed with a moveable ball on the top, which can be rolled in any direction. Instead of moving the whole device, you simply roll the moveable ball on top of the trackball unit with your hand to generate motion input.



Joystick –

- A joystick is an input device that allows the user to control a character or machine in a computer program, like in flight simulator.
- It has a lever that moves in all directions and controls the movement of a pointer or some other display symbol.
- It consists of a small, vertical lever i.e. stick, on a base.
- Most joysticks select screen position with actual stick movement, others respond to pressure on the stick.
- Some joysticks are put on the keyboard, others function as stand-alone unit.
- The distance that stick is moved in any direction from its center position corresponds to screen cursor movement in that direction.
- Springs returns the stick to center position when it is released.
- On most joystick buttons are provided to select the option, which is currently pointed to by cursor.
- Typical uses of joystick include video games, flight simulators, training simulators and controlling industrial robots.



How Joystick works?

- A joystick is connected to two potentiometers.
- Each potentiometer is used to record for left and right and forward and

backward movements.

- When a joystick is moved these two potentiometers send the details of the x and y coordinates to the **CPU** and the required movement is achieved.


Touch screen-

- A touch screen is a computer display screen that is also an input device. The screens are sensitive to pressure; a user interacts with the computer by touching pictures or words on the screen.
- Touch screen technology is the direct manipulation type of gesture-based technology. Direct manipulation is the ability to manipulate the digital world inside a screen. A Touch screen is an electronic visual display capable of detecting and locating a touch over its display area.
- This technology is most widely used in computers, user interactive machines, smartphones, tablets, etc. to replace most functions of the mouse and keyboard.

Components and working of touch screen:

- A basic touch screen is having a touch sensor, a controller, and a software driver as three main components. The touch screen is needed to be combined with display and a PC to make a touch screen system.

Touch sensor:

-  The sensor generally has an electrical current or signal going through it and touching causes a change in the signal. This change is used to determine the location of the touch on the screen.

Controller:

- A controller will be connected between the touch sensor and PC. It takes information from the sensor and translates it for the understanding of PC. The controller determines what type of connection is needed.

Software driver:

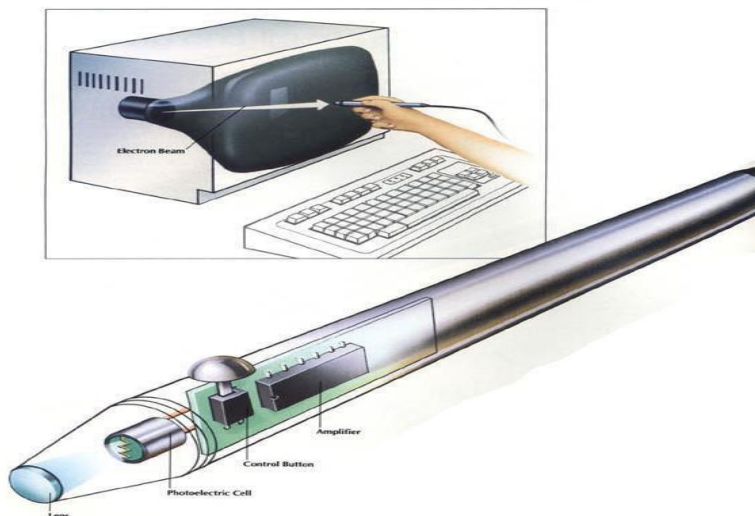
- It allows computers and touch screens to work together. It tells OS how to interact with the touch event information that is sent from the controller.

Light Pen –

- Light pen is an input device that utilizes a light sensitive detector to select objects on a display screen.
- In this pen, you hold the pen in your hand and directly point with it on the screen to select menu items or icons or directly draw graphics on screen or write with it on a special pad for direct input of the written information to the system.
- It is used with CRT base display, but not with LCD screens.

How light pen works?

- Light enters the lens of a light pen, where it encounters a photoelectric cell, which converts the energy to a signal that is sent to the computer.
- The light is obtained from the refresh of the CRT, and at the instant the light is generated, the computer knows what location on the screen is being refreshed.
- This information is coordinated with the signal from the light pen and is subsequently used by the graphics software.



Touch Pad / Track pads –

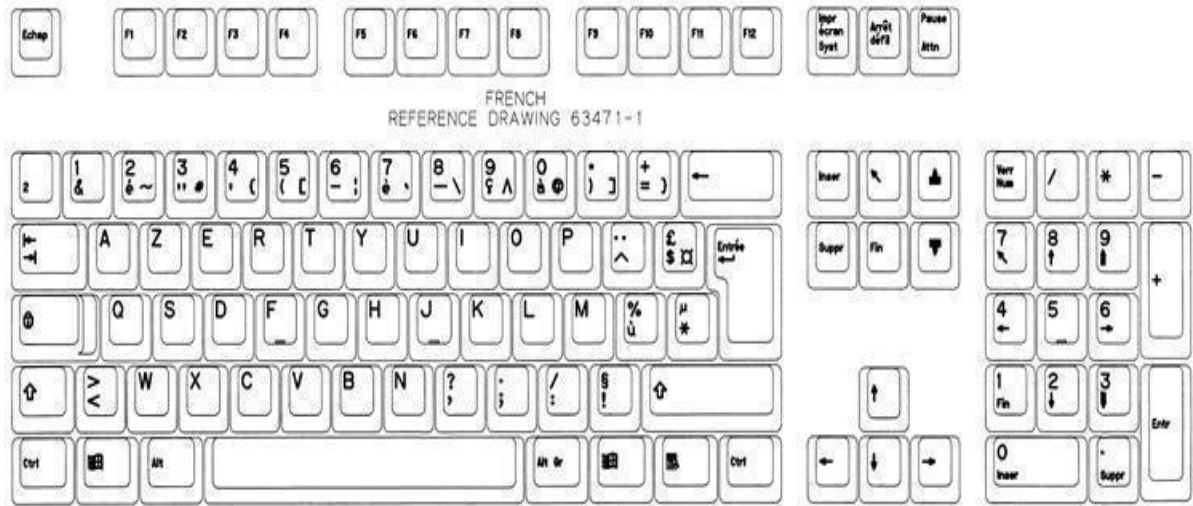
- A touch pad is a device for pointing on a computer display screen.
- It is an alternative for the mouse and designed mainly for laptop computers.
- It works by sensing the user's finger movement and downward pressure.
- **How touchpad works?**
 - A touch pad contains several layers of material.
 - The top layer is the pad that you touch.
 - After that, there are layers containing horizontal and vertical rows of electrodes that form a grid.
 - After this layer, there is a circuit board to which the electrode layers are connected.
 - The layers with electrodes are charged with a constant alternating current (AC).
 - As the finger approaches the electrode grid, the current is interrupted and the interruption is detected by the circuit board.
 - The initial location where the finger touches the pad is registered so that subsequent finger movement will be related to that initial point.
 - Touchpad also has two buttons below the touch panel that allows you to left click or right click.
 - Some touch pad sense single or double taps of the finger at any point on it.

4.1.2 Keyboard –

- Keyboard is the most common input device which helps in inputting data to the computer.
- Its layout is like traditional typewriter, but it performs additional functions.
- Using keyboard, a person can type a document, make key shortcuts, play games

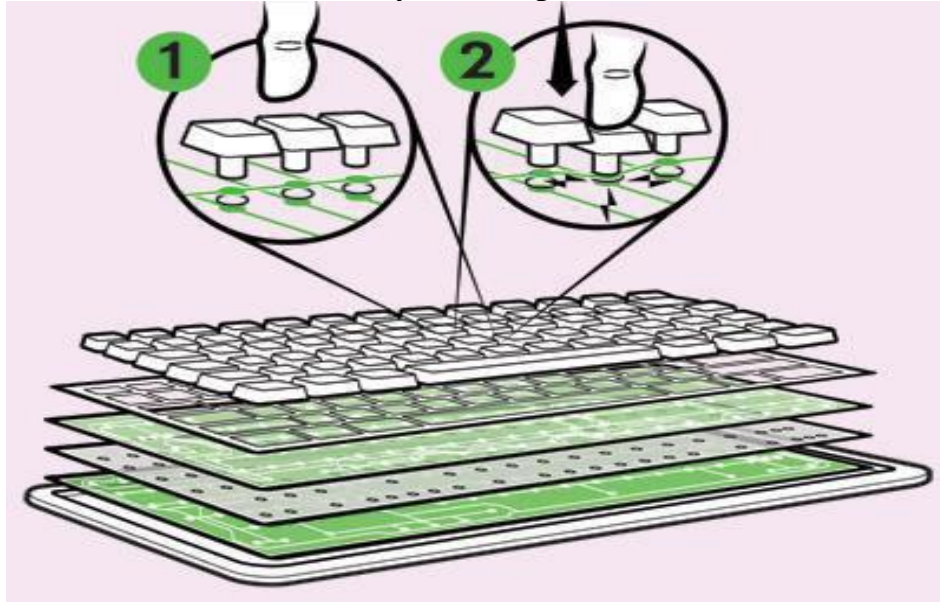
and perform other tasks.

- Keyboards are of two sizes 84 keys or 101/102 keys, but now keyboards with 104/108 keys are also available.



- The keys on the keyboard are as follows:
 1. Alphanumeric keys (A-Z, 0-9)
 2. A numeric keypad
 3. Function keys (F1 – F12)
 4. Control keys (Home, End, Insert, Delete, Page Up, Page Down, Ctrl, Alt, Esc, Arrow keys)
 5. Special Purpose keys (Enter, Shift, Caps Lock, Space bar, Tab, Print screen)
- **How keyboard works?**
 - In each key of keyboard, there is a little electrical switch under it.
 - When you press a key(1), its switch completes an electrical circuit(2).
 - A processor inside the keyboard records which circuits were completed and in what order.

- This keyboard processor records information into part of its memory, known as keyboard buffer.
- Then it sends that information to your computer.



- Your computer is programmed for “what to do” with the information sent by keyboard processor.
- For example, when the computer gets the signal that the backspace key was pressed, it knows to erase a keystroke.

4.1.3 RFID (Radio frequency identification) Concepts and Application in Fast Tag

RFID (Radio frequency identification) Concepts

FAST Tag – A smarter way of Toll Collection.

In India, the concept was decided to implement in the month of April 2013 and the Scheme of ‘One Nation One FAST Tag’ came into force on 15 December 2019. To prevent the overcrowding of traffic, air pollution and to ensure a smooth transportation on National highway’s Toll plazas, the NPCL (National Payments

Corporation of India) has introduced FAST Tag as a nationwide Electronic Toll Collection solution which has become compulsory on Fast tag-only lanes and presently it is operational at 240 plus toll plazas across national & state highways.

FAS Tag is a vehicle-specific and RFID Technology-based device which enables digital cash transaction for paying toll-fare while being a vehicle in motion. It is an RFID tag fixed on the windscreen of a vehicle which enables electronic toll collection immediately from the registered bank account of the car owners without stopping them for payment.



RFID:

- RFID is a technology behind Fast tag.
- RFID belongs to a group of technologies referred to as Automatic Identification and Data Capture (**AIDC**).
- AIDC methods automatically identify objects, collect data about them, and enter those data directly into computer systems with little or no human intervention. RFID methods utilize radio waves to accomplish this.
- **At a simple level, RAID systems consist of three components: an RFID tag or smart label, an RFID reader, and an antenna.**
- RFID tags contain an integrated circuit and an antenna, which are used to transmit data to the RFID reader (also called an interrogator).
- The reader then converts the radio waves to a more usable form of data. Information collected from the tags is then transferred through a communications interface to a host computer system, where the data can be stored in a database and analyzed at a later time.
- When the vehicle reaches the toll plaza, the RFID antenna at the top of the toll gates scans the tag identification number and the QR code and then lifts the barriers to allow a vehicle to pass through.

Types of RFID tags:

Passive RFID tags (used in FAST Tag): Passive RFID tags are those tags which operate **without a battery** and get power supply from the electromagnetic energy transmitted by the RFID reader.

Active RFID tags (battery-powered): Active RFID tags operate through a **small battery** that powers the relay of information. These have a short time span and need to be replaced when the battery dies.

RFID Applications:

- Inventory management
- Asset tracking
- Personnel tracking
- Controlling access to restricted areas
- Supply chain management

FAST Tag Benefits:

- It is a reloadable tag which is simple to use.
- Reduces the overcrowding and waiting time at toll plazas.
- Prevents air pollution which occurs due to congestion around toll plaza.
- Facilitate ease of transaction through digital payment of toll-fare.
- Saves the travel time and fuel consumption.
- Provide secure interoperable framework applicable across the country.
- Eco-friendly initiative as it reduces pollution and use of paper.
- Better highway management and reduced efforts in managing toll plaza.
- A web portal for all the customers to access their statements of transaction by logging on the FAST Tag customer portal.
- SMS alerts for the transactions on the registered mobile number of the customer.
- Online recharge facility by using any of the authorized method of payments and bank linked to the FAST Tag.

4.2 Explain about different scanner available.

- A scanner is an input device that converts paper document into a digital file format that can be stored in a computer.
- The input documents may be typed text, pictures, graphics or hand written material.
- This input device is very useful for preserving paper documents in electronic form.
- This stored image can also alter and manipulated using image processing software.
- These scanners are of various shapes and sizes. Commonly used types are:

4.2.1 Optical Scanner

- An optical scanner is an input device using light beams to scan and digitally convert images, codes, text or objects as two-dimensional (2D) digital files and sends them to computers and fax machines.
- Flatbed scanner are optical scanner which makes use of a flat surface for scanning documents. The scanner is capable of capturing all elements on the document and does not require movement of the document
- A flatbed scanner is like a copier machine consisting of a box having a glassplate on its top and lid that covers the glass plate.



- A document to be scanned is placed upside down on the glass plate, moves horizontally from one end to another when activated.
- After scanning one line, the light beam moves up a little and scans the next line. The process is repeated for all the lines.
- Its name derives from the fact that, the glass plate, where the document to be scanned is placed, is flat.
- Flatbed scanner comes in different sizes like A4, A3, etc.
- Flatbed scanner can scan single sheet of paper and page from book.
- Most scanners can scan documents of 8 ½ by 11 inches. Some can scan larger documents.

- These scanners are larger than hand held or sheet fed scanner. It produces good quality image.

Hand Held Scanner –

- A handheld scanner is a small manual scanning device which is moved over the object that needs to be scanned.
- It is generally cheap and for home user market.
- It has a set of light emitting diodes encased in small case, which can be conveniently held in hand during scanning operation.



- Most common example of hand-held scanner is **barcode scanner**, which is used in shopping store.

4.2.2 Bar Code Readers

- Bar Code Reader is a device used for reading bar coded data (data in the form of light and dark lines).
- Bar coded data is generally used in labeling goods, numbering the books, etc.
- It may be a handheld scanner or may be embedded in a stationary scanner.
- Bar Code Reader scans a bar code image, converts it into an alpha numeric value, which is then fed to the computer that the bar code reader is connected to.
- This method uses a number of bars (lines) of varying thickness and spacing between them to indicate the desired information.
- An optical-bar reader can read such bars and convert them into electrical pulses to be processed by a computer.
- The most commonly used bar-code is Universal Product Code (UPC).

- The UPC code uses a series of vertical bars of varying width. These bars are detected as ten digits. The first five digits identify the supplier or manufacturer of the item. The second five digits identify individual product.
- The code also contains a check digit to ensure that the information read is correct or not.

4.2.3 Web camera

- The webcam is a compact digital camera that works the same as a conventional digital camera but is designed to interact with the web pages and other Internet pages. It is also known as a web camera that can capture pictures or motion video.
- Webcam, the small bug-eyed camera mounted on the computer captures light through the front small lens using a grid of microscopic light-detector. These light detectors are built into the image-sensing microchip.
- This chip is the core of webcam that captures the images and videos and converts them to the digital format (such as the string of zero and one).
- Also, the webcam does not include any memory chip as it does not store the captured images and videos rather immediately transfer them to the computer.
- Take a close look at the back of the webcam and you will notice a USB cable. This is the cable through which computer or laptop supplies power to the webcam and then the captured images are sent back to the computer again.

Features of Web camera

The webcams can differ in terms of size, shape, specification, and price. There are several features of webcam that help you choose the best webcam for your individual needs:

Megapixels

The megapixels are very small dots of colour that make a visual image when they are combined. Accordingly, a webcam produces a clearer bright image with more megapixels. Although a webcam with 320X240 or 640X480 pixels provides a better image. Also, the 1280X720 pixels are considered a better specification for your webcam to produce high definition (HD) quality.

Frame Rate

As the megapixels control the image and color brightness, the frame rate deals with the video quality, which decides how many images per second are displayed. At least the frame rate in a reasonable webcam will have 30 frames

per second. If the frame rate is less than 30fps, this is out of date, and images may shake and vibrate. A webcam that supports 60 fps recording can provide a higher quality moving image or smoothest video.

Lens Quality

In the video process, the lens is the first stage. Therefore, it is most important that your camera has the correct lens for full filling your requirements.

Autofocus

There can be a lot of activity happening during a webcam session in many scenarios; autofocus is a feature that works by automatically focusing the subject, while it moves around.

Low Light Quality

Sometimes, if you need to use your webcam in the evening or in low light conditions, the image quality can be very poor.

Resolution

A resolution is an important aspect in pictures or videos, although many webcams support 720p and 1080p high-definition quality. Also, some webcams come to have 4k capability, but they come with a premium price tag. A webcam with a resolution between 1.3MP and 2.0MP can provide you clear pictures.

Applications of Web camera:

Buildings, Banking sector, Video calling, home security system, Roads and parking areas

Explain optical scanner in detail. OR Write detail note on OCR and OMR.

Optical Character Reader / Optical Character Recognition (OCR) –



- OCR is the recognition of printed or written text characters by a computer.
- It scans the text character by character, analyzes scanned image and translates character image into character codes like ASCII.
- With normal image scanner scanned documents are stored as an image. So, word processing is not possible. Image data required more storage than text data. These limitations are overcome using OCR.
- It is used by libraries to digitize and preserve their documents. It is also used to process checks; credit card slips and sort mails.
- In this, the data is passed to the computer by either scanner or other hardware device like digital camera.
- OCR still has difficulty with handwritten text.

Optical Mark Reader / Optical Mark Recognition (OMR) –

- OMR are capable of recognizing a pre-specified type of mark made by pencil or pen.
- It is very useful for grading tests with objective type



- questions, or for any input data that is of a choice or selection nature.
- This technique involves focusing a light on the page being scanned and detecting the reflected light pattern from the marks.
- Reflection of light from marks made by pencil and plain paper are different, which enable the reader to determine



which response is marked.

- It allows the processing of hundreds or thousands of physical documents per hour.
- It allows the processing of hundreds or thousands of physical documents per hour.

4.3 Introductions and comparisons of Output devices

4.3.1 Monitors

A monitor is an electronic output device that is also known as a video display terminal (VDT) or a video display unit (VDU). It is used to display images, text, video, and graphics information generated by a connected computer via a computer's video card.

Types of monitors:

1. CRT monitors (Cathode Ray Tube)

It is a technology used in early monitors. It uses a beam of electrons to create an image on the screen. It comprises the guns that fire a beam of electrons inside the screen.

The electron beams repeatedly hit the surface of the screen. These guns are responsible for generating RGB (Red, Green, Blue) colours, and more other colours can be generated with the help of combining these three colors. Today's Flat Panel Monitors replace the CRT monitors.

When CRT monitors can still be found in some organization, many offices have stopped using them largely because they are bulky, heavy, costly and require more space.



2. LED monitors (light-emitting diode)

LED monitor is a flat screen computer monitor, which stands for light-emitting diode display. It is lightweight in terms of weight and has a short depth.

As the source of light, it uses a panel of LEDs. Nowadays, a wide number of electronic devices, both large and small devices such as laptop screens, mobile phones, TVs, computer monitors, tablets, and more, use LED displays.

A LED display is a flat panel display that uses an array of light-emitting diodes as pixels for a videodisplay.

An LED is an electronic device that emits light when an electrical current is passed through it.

Light Emitting Diode (LED) monitors also feature a liquid crystal display, but the backlighting is produced by LEDs, not fluorescent lamps.



3. LCD monitors (liquid-crystal display)

The LCD monitors bring lots of advantages when compared to the CRT ones. The first advantage which is also the most obvious one is the fact that the LCD monitors are smaller and have a smaller weight than the CRT monitors.

The LCD monitors can be placed on the table and they use far less space than the CRT monitors. This is a great advantage. The picture quality of the LCD monitors will be increased as well which means that the movies will be displayed in a better quality and the games will have better colours, and so on.



LCD displays utilize two sheets of polarizing material with a liquid crystal solution between them.

The LCD **monitor does not produce its own light**. Instead, additional lighting behind the screen shines through the glass and illuminates the crystals. LCD monitors are usually backlit **fluorescent lamps**.

4. TFT monitors (thin-film transistor)

It is a type of LCD flat panel display, which stands for a thin-film transistor. In TFT monitors, all pixels are controlled with the help of one to four transistors.

The high-quality flat-panel LCDs use these transistors. Although the TFT-based monitors provide better resolution of all the flat-panel techniques, these are highly expensive.

The LCDs, which use thin-film transistor (TFT) technology, are known as active-matrix displays. The active-matrix displays offer higher quality as compared to older passive-matrix displays.



5. OLED monitors (organic light-emitting diode)

It is a new flat light-emitting display technology, which is more efficient, brighter, thinner, and better refresh rates feature and contrast as compared to the LCD display.

These displays do not need a backlight as they are emissive displays. Furthermore, it provides better image quality ever and used in tablets and high-end smartphones.

Nowadays, it is widely used in laptops, TVs, mobile phones, digital cameras, tablets, VR headsets.



6. Touch Screen Monitor

These monitors are also known as an input device. It enables users to interact with the computer by using a finger instead of using a mouse or keyboard.

When users touch the screen by their finger, it occurs an event and forward it to the controller for processing.

These types of screens include pictures or words that help users to interact with the computer. It takes input from the users by touching menus or icons presented on the screen.



A touch screen is a computer display screen that serves as an input device. When a touch screen is touched by a finger or stylus, it registers the event and sends it to a controller for processing.

A touch screen may contain pictures or words that the user can touch to interact with the device.

How a touch screen event is registered depends on the touch screen's inherent technology? The three main touch screen technologies are:

Resistive: This screen has a thin metallic layer that is conductive and resistive, so that touching results in a change in the electrical current sent to the controller.

Surface Acoustic Wave (SAW): Ultrasonic waves pass over this screen. Touching it results in absorption of part of the wave, registering the position of the touch, which is sent to the controller.

Capacitive: This screen is coated with an electrically-charged material. Touching it causes a change in capacitance, which allows the location to be determined and sent to the controller.

4.3.2 Printers

A printer Is a hardware output device that is used to generate hard copy and print any document.

A document can be of any type such as a text file, image, or the combination of both.

It accepts input command by users on a computer or on other devices to print the documents. For example, if you have to submit a project report at your college, you need to create a soft copy of your report and print it with the help of the printer

Printer can be classified into two types according to technology used in their manufacturing:

Impact Printers

Impact printers print the characters by striking them on the ribbon, which is then pressed on the paper. These printers are of two types – Character printers, Line printers. **(Dot Matrix printer)**

Non-impact printers

Non-impact printers print the characters without using the ribbon. These printers print a complete page at a time, thus they are also called as Page Printers. **(Laserprinter, Inkjet printer)**

BASIS FOR COMPARISON	IMPACT PRINTERS	NON-IMPACT PRINTERS
Contain	Electromechanical print head	No electromechanical device
Mechanism	Printing Is done by hammering a set of metal pin or character set	Printing is done using laser beam or ink
Multiple copies	Can be created	Hard to produce multiple copies.
Noise	Operation produces noise	Works silently
Speed	Slow	Faster
Quality	Low	High
Cost	Low	High
Example	Dot matrix, chain printer, drum printer	Inkjet and laser printers.

According to hinting style, printers are divided in three types!

- 1) Character printer
 - o Prints one character at a time
 - o Examples: dot matrix printer, Inject printer
- 2) Line printer
 - o Prints one line at a time
 - o Examples: drum printer, chain printer
- 3) Page printer
 - o Prints one page at a time
 - o Examples: laser printer

1. Dot Matrix Printer

In the market, one of the most popular printers is Dot Matrix Printer. These printers are popular because of their ease of printing and economical price.

Dot matrix printers are character printer, which print one character at a time.

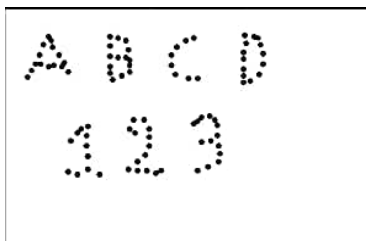
They form characters and all kind of Images as a pattern of dots.

it has a print head which can move horizontally left to right / right to left across the paper.

A print head contains an array of pins, which can be activated independent of each other to extend and strike against an inked ribbon to form a pattern of dots on the paper.

The printer activates the appropriate set of pins as the print head moves horizontally,

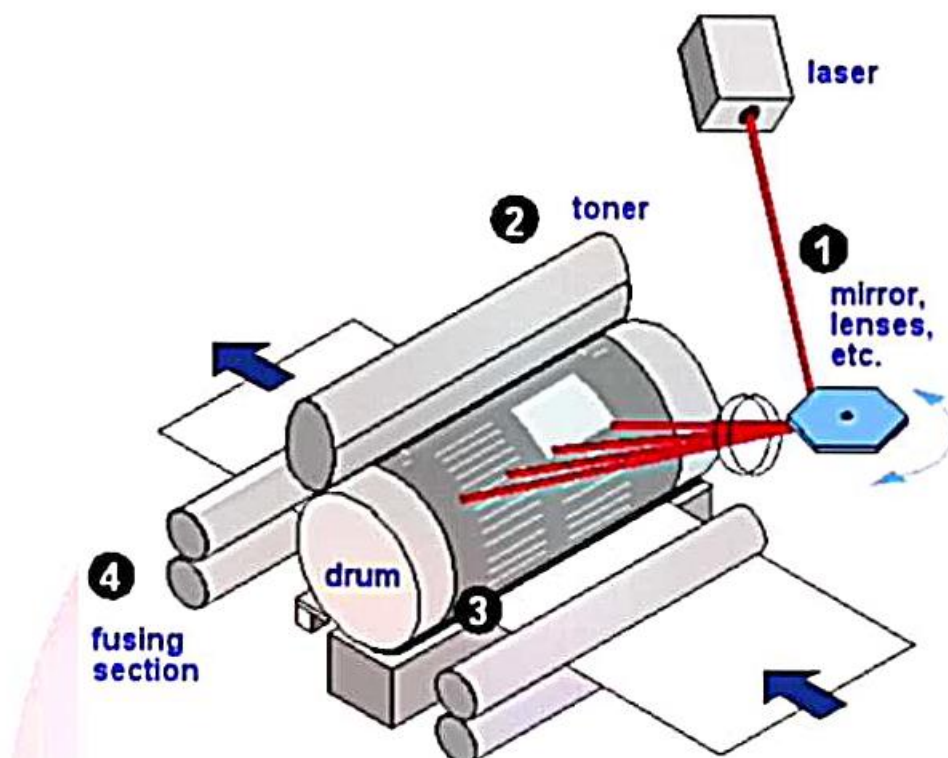
For faster printing, Dot-matrix printers are designed to print both while move from left to right and while it moves return from right to left.



Advantages	Disadvantages
Inexpensive Widely Used Other language characters can be printed	Slow Speed, Poor Quality

2. Laser printers

These are non-impact page printers. They use laser lights to produce the dots needed to form the characters to be printed on a page.



Structure: The main component of a laser printer are

1. Laser beam source
2. A multi sided mirror
3. Photoconductive drum
4. Toner

Working

Laser beam Is focused on electro statically charged drum which spinning by multisided mirror.

The mirror focuses laser beam on the surface of the drum in a manner to create the pattern of character to be print on page.

Drum is photoconductive

Different electric charge is created on those part of drum surface which exposed to laserbeam.

Toner which is opposed to charged ink particles, stick to the drum in the places where laser

beam has charged the drum surface.

Toner is finally fused on paper with heat and pressure to generate the printed output.

After print one-page drum is rotated and cleaned with rubber blade to remove toner sticking to its surface.

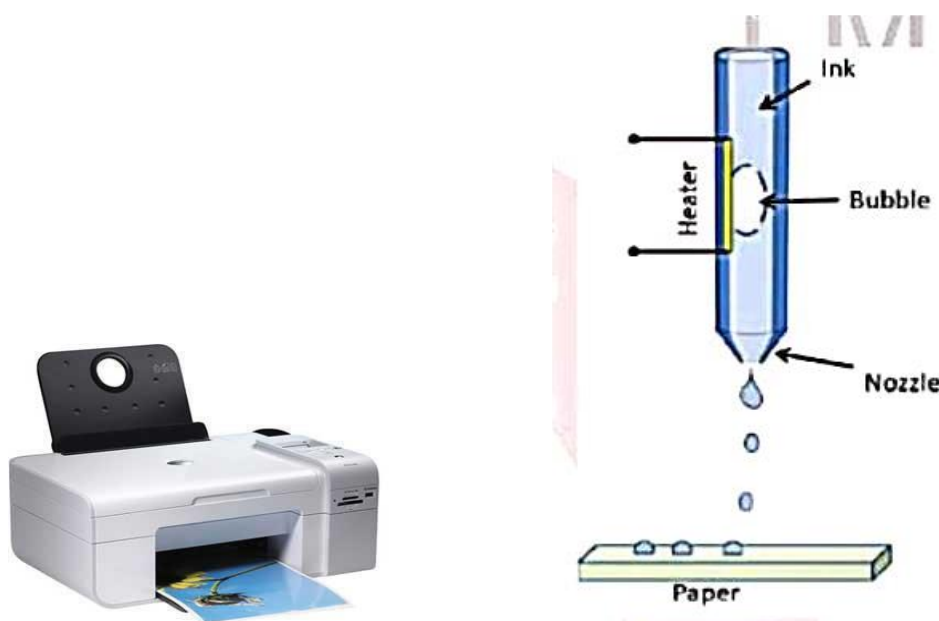
Advantages	Disadvantages
Very high speed Very high quality output Good graphics quality Supports many fonts and different character size	Expensive Cannot be used to produce multiple copies of a document in a single printing.

3. Inkjet Printers

Inkjet printers are non-impact character printers based on a relatively new technology. They print characters by spraying small drops of ink onto paper. Inkjet printers produce high quality output with presentable features.

They make less noise because no hammering is done and these have many styles of printing modes available.

Color printing is also possible. Some models of Inkjet printers can produce multiple copies of printing also.



An ink jet printer uses dot-matrix approach to print text and graphics. Most ink jet printers use multiple jets vertically aligned on a cartridge, which move horizontally across a page.

The ink cartridges contain a column of tiny heaters. When a heater is activated a drop of ink is exploded onto the paper.

The print head contains an ink cartridge which is made up of a number of Ink-filled firing chambers each attached to a nozzle thinner than a human hair.

When an electric current is passed through a resistor, the resistor heats a thin layer of ink at the bottom of the chamber.

This causes the ink to boil and form a vapour bubble. The vapour bubble expands and pushes Ink through the nozzle to form a droplet at the tip of the nozzle.

The pressure of vapour bubble forces the droplet to move to the paper.

When the resistor cools down, the bubble collapses. This results in a pressure which pulls fresh ink from the cartridge into the firing chamber.

Advantages	Disadvantages
High quality printing More reliable	Expensive as the cost per page is high Slow as compared to laser printer

COMPARISION OF PRINTERS

Technology Type	LASER PRINTER Non-Impact printer	INK JET PRINTER Non-Impact printer	Dot Matrix Printers Impact printer
How it works	Laser printers use fine ink powder and heat the powder on the paper.	Inkjet printers spray liquid ink on paper through microscopic nozzles.	Dot Matrix works having pins pushed against an ink-soaked ribbon to paper.
Printing style	One page at a time	One Character at a time	One Character at a time
Printing speed	20 pages a minute	6 pages a minute	30-550 characters per second.
Quality	Printing quality is adequate. Best for black and white.	Printing quality is good, especially for small fonts.	Printing quality is bad if printing images. In terms of text, printing is fine
Maintenance	Expensive	Cheaper	Expensive, difficult to get parts.
Noisy	No	No	Yes

Print multiple copies at a time.	No	NO	Yes
Main Component	Photo conductive drum, toner, laser beam	ink, tiny nozzle	Pin array
Advantages	Prints faster High quality High speed No noise	Low printer cost Compact size No noise No warm up time compare to laser printer	Cheap Produce multiple Copy
Disadvantages	Expensive	Expensive ink Short life time of printed page Easily get "blur" If get water drop	Low resolution Low speed Noisy