

to
compute

Printer

- A **printer** is a peripheral device which makes a representation of an electronic document on physical media.
- It is an external hardware device which is responsible for taking computer data and generating a hard copy of that data.
- Printers are one of the most used peripherals on computers and are commonly used to print text, images, and photos. Some printers can print documents stored on memory cards or from digital cameras and scanners.
- The world's first computer printer was a 19th-century mechanically driven apparatus invented by Charles Babbage for his difference engine

Printer



Video tutorial on How to Print?

Classification of Printers

Printer

Impact Printer

Daisy
Wheel

Dot-
Matrix

Non-Impact Printer

Ink-jet

Therm
al

Laser



Classification of Printers

- In terms of the technology utilized, printers fall into the following categories:
- **Impact printers and non impact printers**
- Impact printers are further classified as:
 1. Daisy Wheel Printer
 2. Dot Matrix Printer
- Non Impact printers are further classified as:
 1. Ink-jet Printer
 2. Thermal Printer
 3. Laser Printer

Impact Printers

- Printers that work by applying force in other words by striking upon an ink ribbon are called impact printer.
- An impact printer operates by striking a metal or plastic head (called print head) against an ink ribbon. The inked ribbon placed between the print head and the paper.
- Then it is pressed against the paper to deposit the ink on the page in the desired shape, marking the page with the appropriate character, dot, line, or symbol.
- Daisy-wheel, dot-matrix, and line printers are impact printers.
- Impact printers produces heavy noise.

Non-Impact Printers

- The printers that prints on paper without striking the paper are known as non-impact printers
- They does not work by applying force
- Non-impact printers include laser printers and ink-jet printers.
- Non Impact printers are less quieter
- Non-Impact can print up to 24 pages per minute
- While impact printers still have some uses (such as printing carbon copies), most printers are now non-impact printers.

Impact VS Non-Impact

1. Impact printers functions by applying force, where non impact printers does not do so.
2. Non-Impact printers prints without touching the paper, where impact printers does not do so.
3. Non-Impact printers are faster and produce high quality output than impact printers.
4. Non-Impact produce almost no noise during printing where impact printers produce loud noise while printing.
5. Non-Impact printers print more pages per minutes

Dot Matrix Printer

- Dot Matrix were 1st introduced by Centronics in 1970. The term dot matrix refers to the process of placing dots to form an image.
- However, unlike a typewriter or daisy wheel printer, letters are drawn out of a dot matrix, and thus, varied fonts and arbitrary graphics can be produced
- Its speed is usually 30 to 1000 characters per second (cps).
- This is the cheapest and the most noisy printer and has a low print quality.



How Dot-Matrix works?

- **Dot matrix printer** uses a print head that runs back and forth, or in an up and down motion, on the page and prints by striking an ink-soaked cloth ribbon against the paper, like a typewriter.
- The dot matrix prints one character at a time as the print head moves across the paper. Each dot is produced by a tiny metal rod, also called a "pin", which is driven forward by the power of a tiny electromagnet or solenoid.
- This printer arranges dots to form characters and all kinds of images. The portion of the printer containing the pins is called the print head.
- The Dot Matrix printer, generally prints one line of text at a time. There are two approaches to achieve this: serial dot matrix and line dot matrix printer.

How Dot-Matrix works?

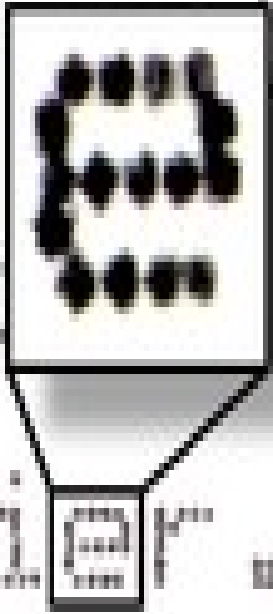
- The **serial dot matrix** printers use a horizontally moving print head. The print head can be thought of a single character box with pins arranged in it. The pins are arranged in four horizontally displaced columns, where each horizontal columns contains seven pins in vertical, which is the height of the character box. Thereby, up to 48 pins can be used to form the characters of a line while the print head moves horizontally.
- In a considerably different configuration, the **line dot matrix** printers use a fixed print head almost as wide as the paper utilizing a horizontal line of thousands of pins for printing. Sometimes two horizontally slightly displaced rows are used to improve the effective dot density through interleaving. These printers print a whole line at once while the paper moves forward below the print head.

Serial VS Line Dot Matrix

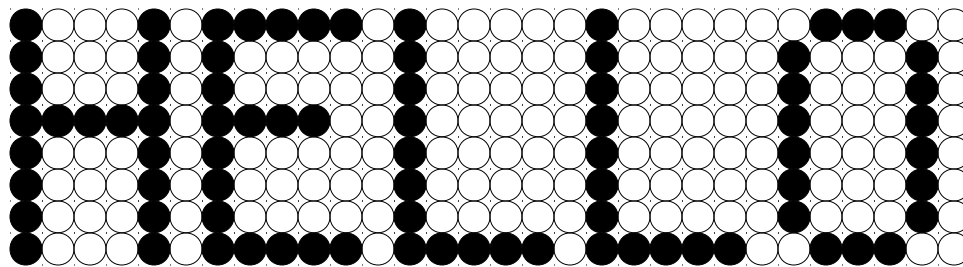
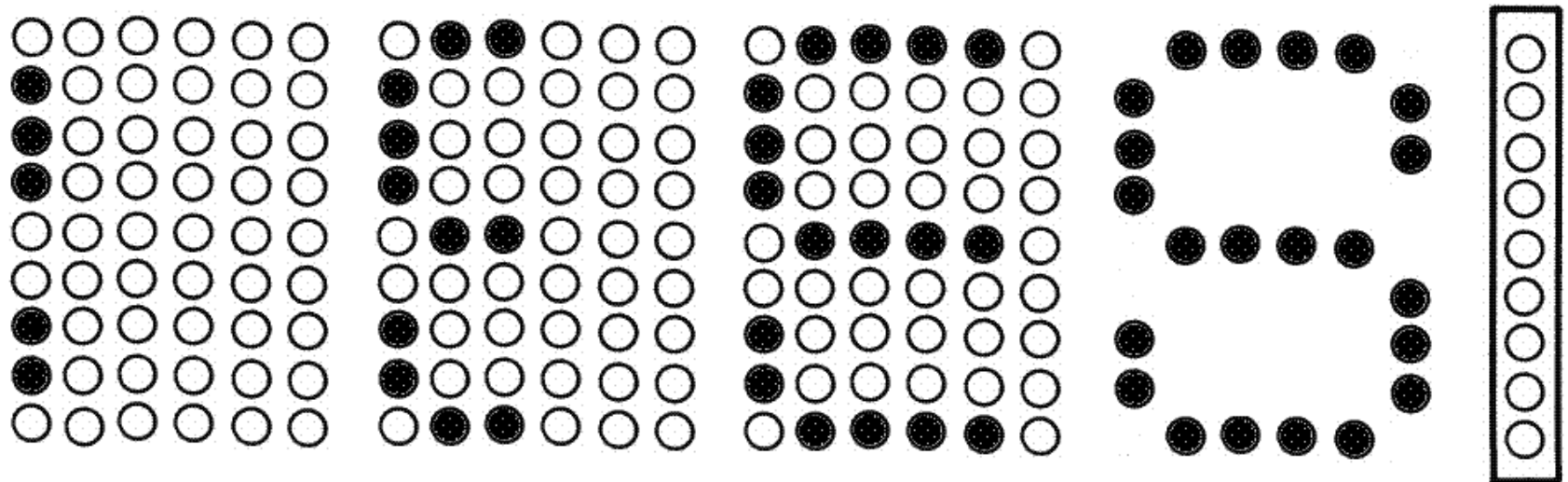
- The printing speed of serial dot matrix printers with moving heads varies from 50 to 550 cps. In contrast to this, line matrix printers are capable of printing much more than 1000 cps, resulting in a throughput of up to 800 pages/hour.
- Because the printing involves mechanical pressure, both of these types of printers can create carbon copies and carbonless copies.
- Line dot matrix printers are used for the professional heavy-duty market printing. Every aspect of the line matrix printer is designed to deliver higher reliability, faster throughput, and greater resistance to rough handling and hazardous environmental conditions

A typical dot matrix output

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A dot matrix printer is shown from a side-on perspective, with its paper carriage and print head visible. The printer is outputting a drawing of a lightbulb. The drawing is composed of black dots on a white background, forming the outline and internal details of the bulb. The printer itself is a simple, boxy design with a small handle on top.

A typical dot matrix output

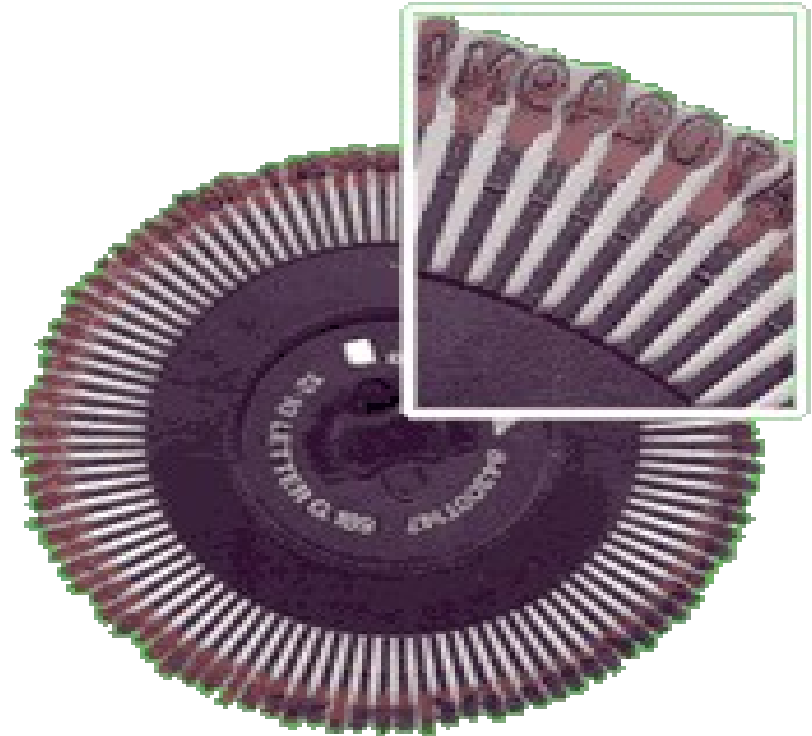


Issues Related to Dot Matrix

- Problems generally found on the following issues:
- **Print head:** The ink from the ribbon can clog the tiny pins. Pins can be bent. Electromagnet can be damaged. Print heads are expensive.
- **Ribbon:** Poor print quality can simply mean that the ribbon needs to be replaced. Cartridges vary from printer to printer thus they are not interchangeable.
- **Overheating :** Dot matrix printers are noisy. They are often kept under a padded, sound proofed cover. Less ventilation lead to overheating.
- **Paper jams :** Big problem. Perforated sides can be ripped off easily, jamming the printer.

Daisy Wheel Printer

- A daisy wheel printer is basically an impact printer consisting of a wheel and attached extensions on which molded metal characters are mounted. A daisy wheel printer produces letter quality print and it can't produce graphics output.



How Daisy Wheel works?

- In a daisy wheel printer, a hammer presses the wheel against a ribbon which in turn makes an ink stain on the paper in the form of a character mounted on the wheel extensions.
- These printers are very noisy as there occur great movement during the printing. Its printing speed is also very slow , less than 90cps.

Ink-Jet Printer

- Inkjet technology was developed in the 1960s, but first commercialized by IBM in 1976.
- Ink-jet printer is type of non-impact printer. It creates output on paper by spraying tiny drops of liquid ink.
- Inkjet printer has print-head that can spray very fine drops of ink. It consists of print cartridge filled with liquid ink and has small nozzles in form of m



How Inkjet Printer works?

1. Print head having four ink cartridges moves .
2. Software instructs where to apply dots of ink, which color and what quantity to use.
3. Electrical pulses are sent to the resistors behind each nozzle.
4. Vapor bubbles of ink are formed by resistors and the ink is forced to the paper through nozzles.
5. A matrix of dots called print head forms characters and pictures.



Color cartridge showing inkjet nozzles

How Ink-Jet Printer works?

- Characters and graphics are sprayed line by line as a print head scans horizontally across the paper. An ink-filled print cartridge is attached to the inkjet's print head. The print head contains 50 or more ink-filled chambers, each attached to a nozzle. An electrical pulse flows through thin resistors at the bottom of each chamber. When current flows through a resistor, the resistor heats a thin layer of ink at the bottom of the chamber to more than 900 degrees Fahrenheit. The ink boils and forms a bubble.
- As the bubble expands, it pushes ink through the nozzle to form a droplet at the tip of the nozzle, and the droplet sprays onto the paper. The volume of the ejected ink is about one millionth that of a drop of water from an eye-dropper. A typical character is formed by an array of these drops 20 across and 20 high. As the resistor cools, the bubble collapses.

Evaluation of Ink-jet Printer

- These printers have resolution ranging from 300 to 720 dpi.
- The ink-jet printers have low price than laser printers. They are also slower and have low print quality than laser printer. However, They are faster and have high print quality than dot matrix printers.
- The printing speed of ink-jet printer is from 1 to 6 pages per minute

Issues Related to Ink-Jet

- Problems generally found on the following issues:
- **Cartridges:** Ink can dry out over time. If large amounts of printing is done, the cost can be more than a laser. They are also subject to mold growing in the ink, which forces ink out the nozzle.
- **Refills:** Cartridges can be refilled, but the quality of refill ink is often less than OEM standards, and after a few uses, the nozzles are worn out, and ink drips.
- **Cost:** While the printer is usually cheap, the cartridges can be expensive, and often hard to find.
- **Paper jams:** Moisture in paper often causes paper to misfeed.

Print Quality

- The output produced by printers is said to be either
 1. **Near typeset quality:** A Lower quality print similar to the output of a type-writer.
 2. **Letter quality:** Print made up by fully formed (solid line) characters.
 3. **Near letter quality:** A print of high quality formed by multiple passes of print head over the same letter.
 4. **Standard quality:** A high quality print formed by a single pass of the print head.
 5. **Draft quality:** A print formed with minimum number of dots or lines and are smaller than the standard quality characters.

Factors affecting print quality

1. **DPI:** It is a measurement of printer's resolution indicating how many ink dots can be placed by the printer in one square inch. The higher the DPI, the sharper is image.
2. **Type of printer:** Each type of printer has its own capabilities of printing. Some types of printers produce high quality print while other produce low quality print.
3. **Print Mode:** The printing mode may also affect the quality. For example the draft mode increases the print rate but quality is reduced.
4. **Toner:** The quality and amount of toner also affects print quality.

Printer Interfaces

- There are several different interfaces or ways a printer can connect to the computer. Today the most common way a printer connects to a printer is using USB.

1. Cat5
2. Firewire
3. MPP-1150
4. Parallel port
5. SCSI
6. Serial port
7. USB

Printer Interfaces

- Cat5: **Category 5** is a network cable that consists of four twisted pairs of copper wire terminated by a RJ-45 connector.
- Firewire: also called **IEEE-1394**. It was developed by Apple and is a bus that has a bandwidth of 400-800 Mbps. It is hot swappable. **Hot-swappable** is the capability of being able to disconnect and connect devices while the computer or other device is on and ability to detect devices without reboot the computer or device. eSATA, FireWire, and USB are examples of Interfaces that are hot-swappable.
- MPP-1150: it is a serial interface that connects to a printer 36-pin connector.
- Parallel port: Found on IBM compatible computers and is a 25-pin (developed by Epson) computer interface. Commonly used.
- SCSI: **Small Computer System Interface**, **SCSI** is pronounced as "*Scuzzy*".

What is Virtual Printer?

- A virtual printer is a piece of computer software whose user interface and API resembles that of a printer driver, but which is not connected with a physical computer printer.
- When a user requests a document to be printed by a virtual printer, then, instead of having the document printed on paper or other material, the underlying software processes its contents in some other way, that it results in writing the document in a file.
- **Example:** nitro pdf reader enable to print document in a pdf file or create a pdf file from a doc file using virtual printing functionality.
- **Typical uses of virtual printers include:** Saving a document to another format such as a PDF file and Saving multiple documents into a single document

Consideration While Buying a Printer

- To choose a printer from a printer's family following considerations are to be made.
 1. What's the budget?
 2. Is color needed or just black& white?
 3. What is the Volume of the output?
 4. How important is the quality of the output?
 5. What special features are needed?
 6. Is the printer is to be used by a single user or a whole network?

Printer for Different users

- 1. For home users:** the quality of the print and the price of the printer both matter. So a better choice in such case is a portable color Inkjet printer. If the budget of the user is good enough then the best choice is a personal laser printer which enhances both the speed and quality of the print.
- 2. For small and medium offices:** a better option is a multi-function printer which is an integrated device fulfilling various requirement of the office. For better output, a laser printer is the best choice.
- 3. For banks, large business organizations:** In banks, large size business environments and companies printers with networking capabilities should be preferred which can increase productivity and reduce the cost without compromising on the quality. Of course laser printer is quite suitable choice but multi-functional printer and inkjet printer can also play vital role.

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Md. Shakhawat Hossain
Student of Department of Computer Science &
Engineering
University of Rajshahi
E-mail: mshimul86@gmail.com