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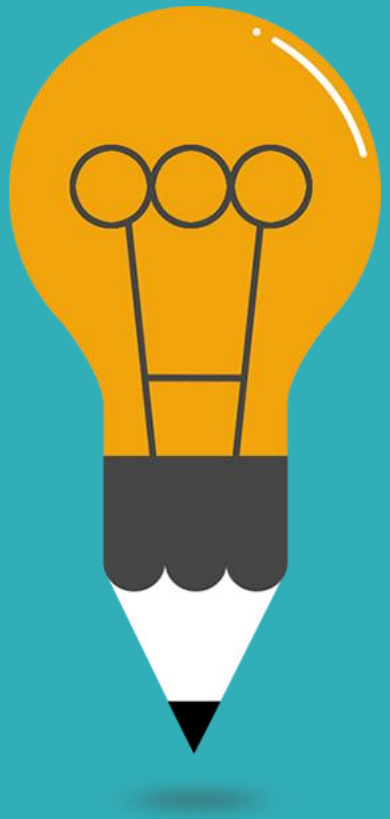

MULTIMEDIA SYSTEMS

INPUT AND OUTPUT DEVICES

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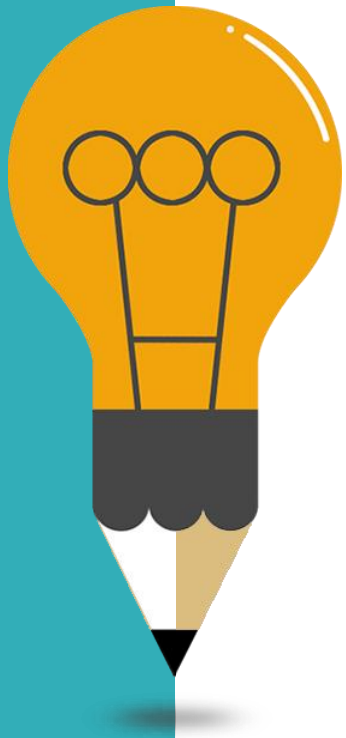
OBJECTIVE

“To study the salient features of various multimedia input /output devices.”



01 ELECTRONIC PEN

02 SCANNER

03 PRINTER AND PLOTTER

04 CAMERA

Is Pen Mightier than mouse & Keyboard

- Pen is a natural device used to write or draw on a document.
- It allows adding comments to forms and documents. Documents can be signed with electronic pen. Input via a pen retains an individuals handwriting for verification.
- It can be direct pointing device. Can be used in place of mouse to pick, drag and click on objects.

Advantage

- Easy to carry as compared to mouse.
- It is a natural drawing tool. For example a circle is drawn using pen, as soon as the pen is picked up, pen device renders a perfect circle. It can be then stretched or shrunk.
- It is very useful for data entry. As the user fills in a form with a pen, device replaces handwritten character with selected fonts.
- Requires no training. Highly suitable for unskilled or partly skilled keyboard operator.
- Creation of highly portable devices.
- Development of new markets.
- Used by delivery drivers for courier services. airline baggage handlers , professionals etc.

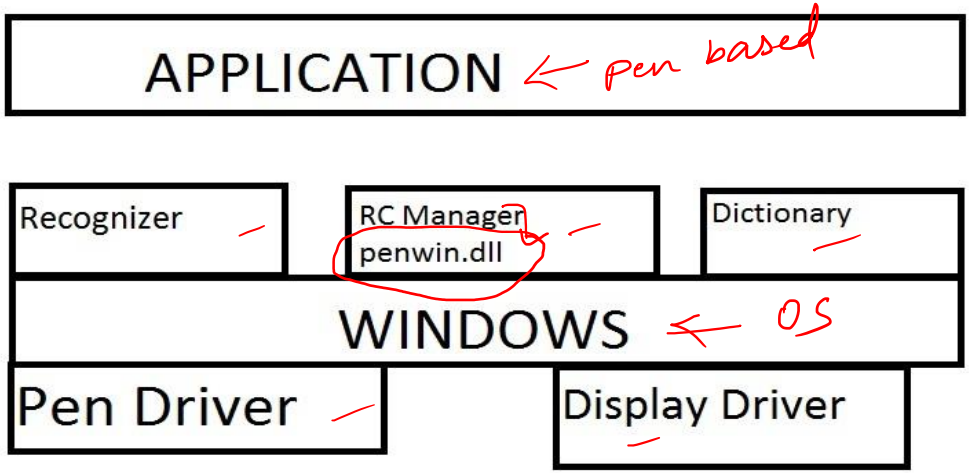
Microsoft

Windows For Pen Computing System

base

pen specific APIs → pen centric applications

Windows 3.1



Architecture

The design of Pen Services was driven by the following goals:

- to provide a compact yet powerful implementation covering all aspects of specialized pen hardware.
- to support the "pen and paper" metaphor fully.
- to provide support across different machine configurations.
- to provide an open system that encourages developers of third-party add-ons and enhancements.
- to enable existing Windows-based applications to benefit from pens.

The Microsoft Windows for pen computing system consists of the following components:

- (i) Electronic pen and digitizer
- (ii) Pen driver
- (iii)Recognition context manager
- (iv)Recognizer
- (v) Dictionary
- (vi) Display driver.

ELECTRONIC PEN

- When an electronic pen is used to write or draw, digitizer encodes the xy coordinate of the pen and the pen status.
- Pen status includes Pen location (x, y)
  - whether pen is touching the digitizer surface or not
  - pen pressure
  - pen rotation
- Most electronic pen contains a micro switch at the tip that behaves like button of a mouse.

DIGITIZER:

- A transparent digitizer is bounded to thin flat LCD screen of a computer or a separate tablet containing electronic digitizing circuitry.
- Tablet digitizer used in CAD for digitizing drawing, images and maps.
- Most digitizers are based on two types of technologies:

  (i) electromagnetic

  (ii) electrostatic.
- Electromagnetic digitizers contain x-y grid of wires.
- Electrostatic technology uses a resistive coated thin glass or plastic writing surface.

PEN DRIVER

- A pen driver is a pen device driver that interacts with digitizer to receive all digitized information about pen location. Drivers send 100 pen packets/sec to RC manager.
- 100 packets/sec sampling rate insure that there is sufficient data to generate complete object.
- If sampling rate is lower and pen movement faster, recognizer may not get some crucial coordinate and produce an incorrect recognition.

RECOGNITION CONTEXT MANAGER

- It is heart of windows for pen system. Pen driver sends pen packets to RC manager which then works in harmony with
  - recognizer
  - dictionary
  - display driver

to recognize and display pen drawn objects.

- It is responsible for routing the inking message directly to display driver.
- If pen behaves like a mouse RC Manager send messages to windows for processing.

RECOGNIZER

- Recognizer recognizes hand drawn characters, symbols or drawings and then with RC manager and display driver, renders the recognized objects on the computer screen(pen drawn character screen or standard drawn objects)

DICTIONARY

- It can be used to validate the recognition results.

DISPLAY DRIVER:

- It interacts with the graphics device interface' and display hardware.
- When a user starts writing or drawing, the display driver paints the ink trace on the screen.

IMAGE SCANNERS

- In a document imaging system, documents are scanned using a scanner.
- The document being scanned is placed on the scanner bed or fed into the sheet feeder of the scanner .The scanner acts as the camera eye and takes a photograph of the document, creating an image of the original.
- The pixel representation (image) is recreated by the display software to render the image of the original document on screen or to print a copy of it.

- TYPES OF SCANNERS

A and B size Scanners, large form factor scanners, flat bed scanners, Rotary drum scanners and hand held scanners are the examples of scanners.

CHARGE-COUPLED DEVICES

- All scanners use charge-coupled devices as their photo sensors.
- CCDs consists of cells arranged in a fixed array on a small square or rectangular solid state surface.
- Light source moves across a document. The intensity of the light reflected by the mirror charges those cells. The amount of charge is depending upon intensity of the reflected light, which depends on the pixel shade in the document.
- Charge in the cell generates a voltage which is fed to an A/D converter.
- All the cells in the CCD array are read out sequentially in a similar manner.

SCANNER FEATURES

- Scan resolution
- Scan area
- Scan contrast
- Scan threshold
- Image compression
- Autofeed.

The above said features are provided either at the scanner controls or through the scanning software

Fig: Drum Scanner

Fig: Sheetfed scanner

Fig : Flatbed Scanner

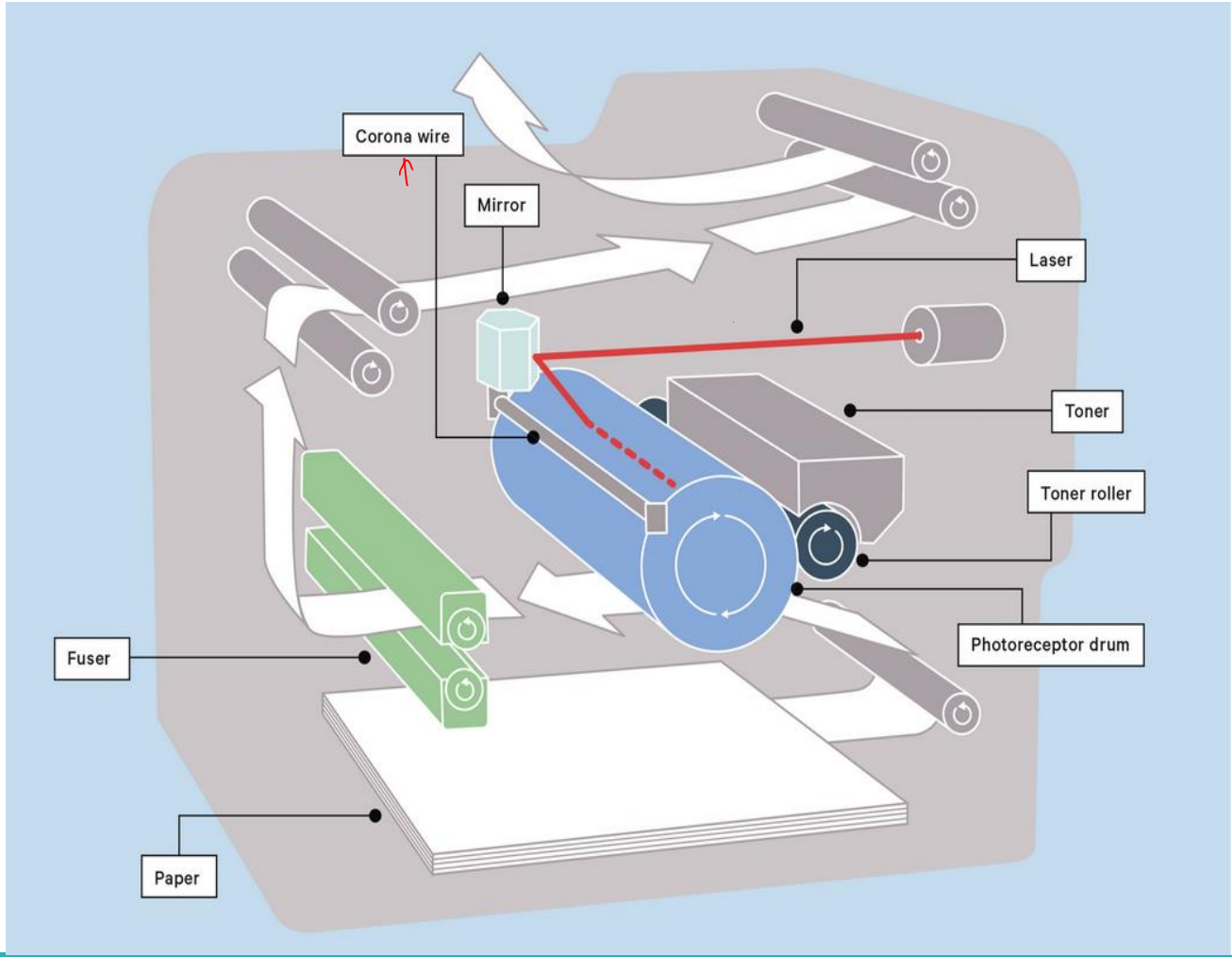
Fig: Hand-held Scanner

PRINTER

- There are various printing technologies available namely Dot matrix, inkjet, laser print server and ink jet color.
- But, laser printing technology is the most common for multimedia systems.
- To explain this technology, let us take Hewlett Packard Laser jet-III laser printer as an example.
- The basic components of the laser printer are
  - Paper feed mechanism
  - Paper guide
  - Laser assembly
  - Fuser
  - Toner cartridge.

Working:

- The paper feed mechanism moves the paper from a paper tray through the paper path in the printer. The paper passes over a set of corona wires that induce a charge in the paper .
- The charged paper passes over a drum coated with fine-grain carbon (toner), and the toner attaches itself to the paper as a thin film of carbon .
- The paper is then struck by a scanning laser beam that follows the pattern of the text on graphics to be printed .
- The carbon particles attach themselves to the pixels traced by the laser beam .
- The fuser assembly then binds the carbon particles to the paper.


Corona wire
Mirror
Laser
Toner
Toner roller
Photoreceptor drum
Fuser
Paper

Role of Software in the printing mechanism:

- The software package sends information to the printer to select and control printing features .Printer drivers (files) are controlling the actual operation of the printer and allow the application software to access the features of the printer.

Printer : Step-by-step

- The moment you press print on your computer, tablet or mobile device the information is sent to the printer memory, where the data is stored.

- The printer begins to warm up. This is the point where you usually need to wait and it's because the corona wire is heating up and getting ready to pass its positive static charge to the drum.

- As the drum (coated metal cylinder) begins to roll, it received a positive charge across it's whole surface. Some printers contain 4 drums, one for each colour – Cyan, Magenta, Yellow & Black.

The laser activates, and beams against a series of mirrors to reflect across the surface of the drum(s) imprinting the shape of your print using an opposite negative electrical charge.

The toner cartridge and hopper, sat next to the drum(s) slowly releases positively charged carbon toner particles on to the drum as it turns and the toner is attracted to any areas of negative charge leaving positively charged areas of the drum untouched.

The transfer belt rolls the paper through the printer giving it a positive charge, and as it passes the drum, the negatively charged toner is attracted to the page in the shape of your print.

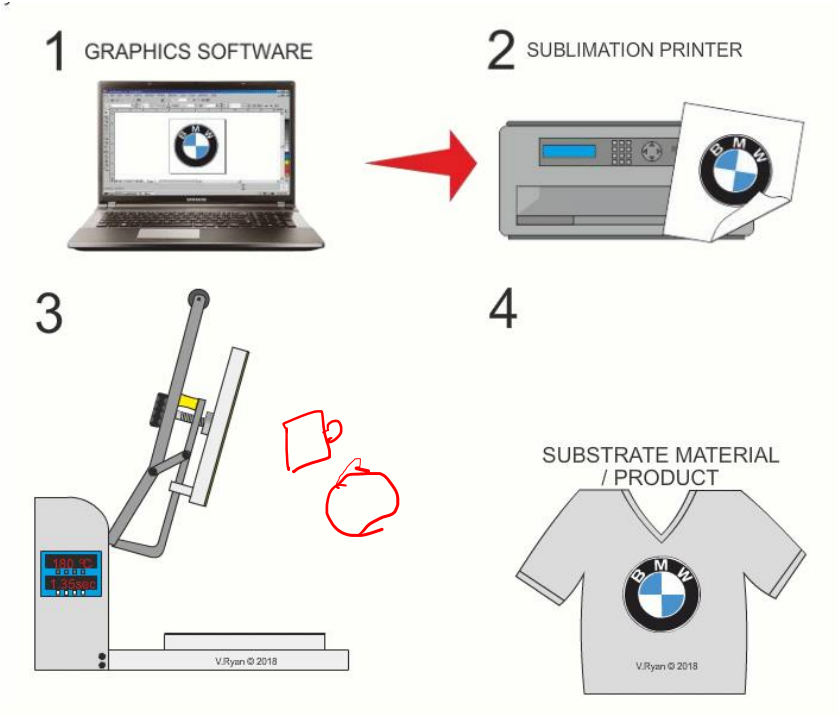
The toner is then melted to the paper by hot rollers called the fuser unit and voila, your page is printed!

Dye sublimation printer

- A dye sublimation printer is very applicable to multimedia applications because prints in colour and the print quality is very high.
- Whoever requires photographic prints with continous tone can use the printer

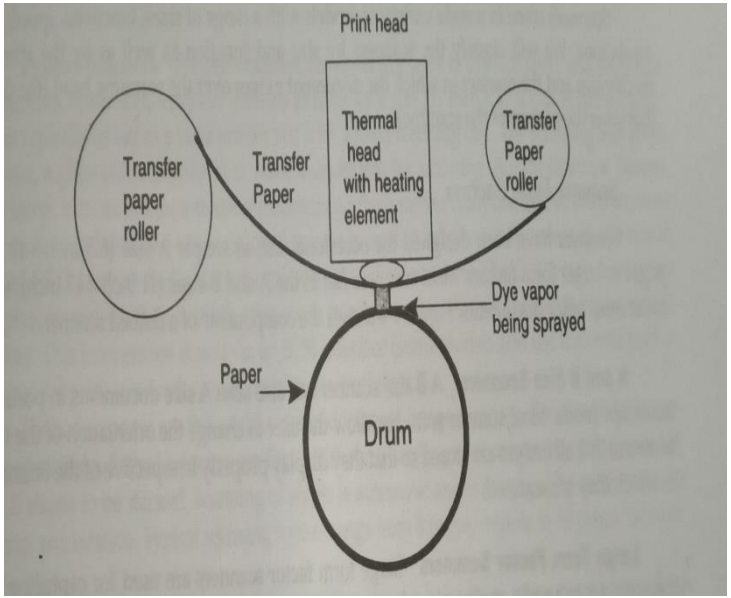
SAMPLE PRODUCTS WITH SUBLIMATION PRINTING

- A dye sublimation printer has a thermal printing head with thousands of tiny heating elements , a plastic film transfer roll mounted on two rollers, and a drum. The transfer roll film contains panels of cyan magnta, yellow and black dye.

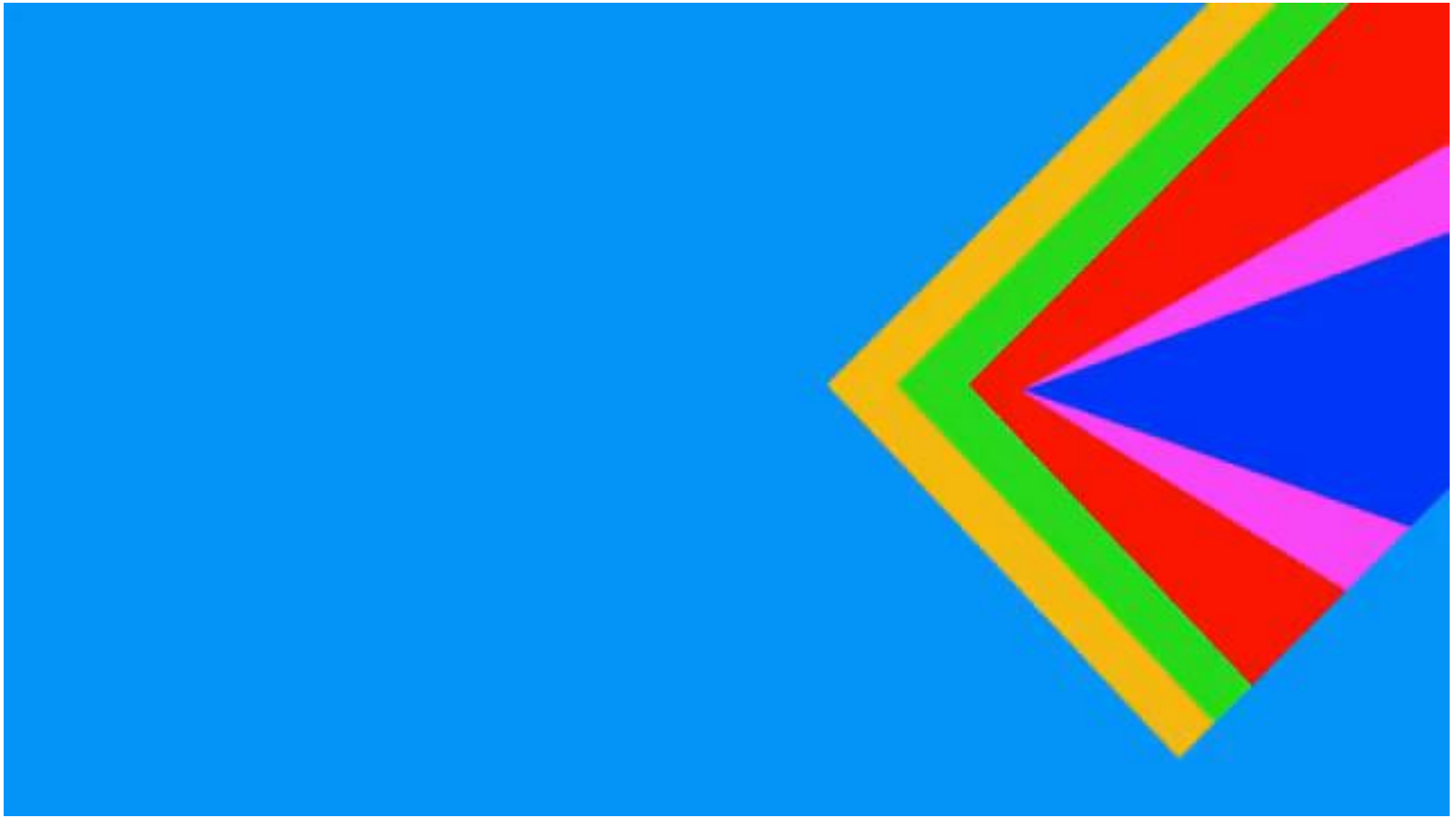


Working

- During printing, individual heating elements can be heated to one of 256 different temperature levels.
- The coils are heated to their individual temperature levels under program control. The cyan panel is rolled under the thermal printing head first. Tiny spots of cyan dye from the panel get very hot and turn into a vapor state (sublimation); the vapor is quickly absorbed by the printer paper, which clings to the drum.
- The printer paper is coated with polyester. If the temperature of the heating element is more, the dot becomes larger.
- This change in dot size results in a continuous tone effect.
- The process is repeated with multiple passes to create a photo quality print.



- In some countries, dye sublimation is also known as "dye diffusion" printing.
- Inside a dye-sublimation printer is a roll of transparent film with a repeating series of yellow (Y), magenta (M), cyan (C), black (K), and clear (O) panels.
- The YMC panels contain thermally sensitive dyes corresponding to the three basic colours used in **subtractive** printing. By combining varying amounts of these dyes, any colour in the spectrum can be created, from white (no dye transferred on a white card) to black (full transfer of each of the three dyes).



Advantages of Dye Sublimation Printer

- The print quality is very high.
- It can be used to print photos, bit maps, scanned color images and video
- camera captured images.
- It is an attractive alternative to photographs or film.
- It saves time.
- It is' more economical than photographic development.

PLOTTERS

- A plotter is a computer hardware device much like a printer that is used for printing vector graphics.
- Instead of toner, plotters use a pen, pencil, marker, or another writing tool to draw multiple, continuous lines onto paper rather than a series of dots like a traditional printer.
- Though once widely used for computer-aided design, these devices have more or less been phased out by wide-format printers. Plotters are used to produce a hard copy of schematics and other similar applications.
- Architects and product designers use plotters for technical drawings and computer-aided design purposes since plotters have the ability to create large images on oversized sheets of paper. Additionally, many garment and sign manufacturers use cutting plotters in which the plotter's pen is replaced with a sharp razorblade.

Types of plotters

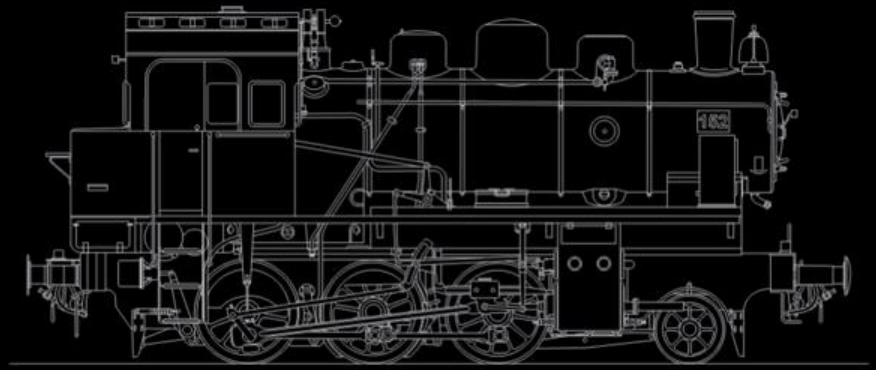
Two important types of plotters are as follows:

- Flatbed plotter
- Drum plotter

Flatbed plotter

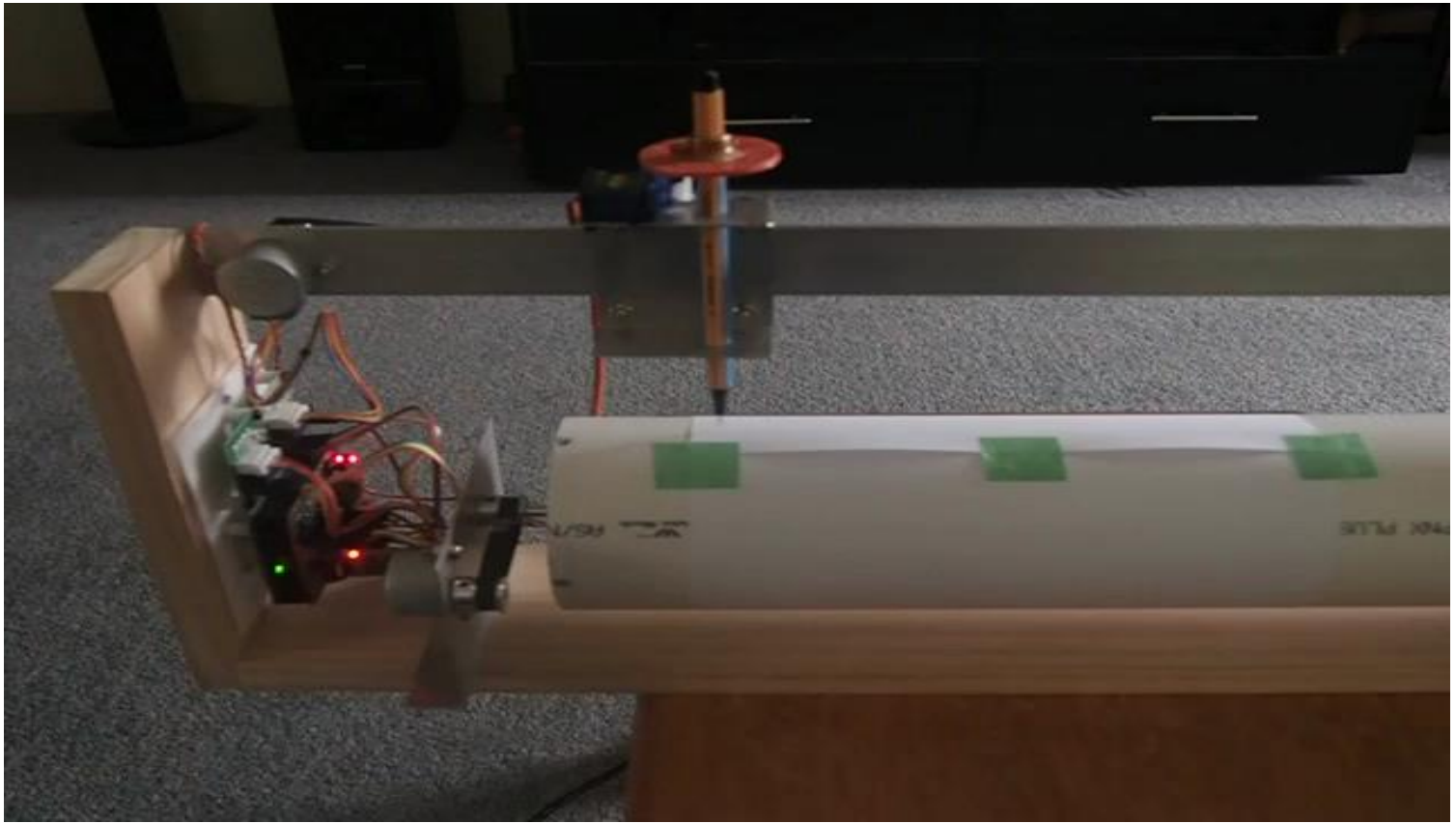
Drum plotter

Roland DXY-1350 pen plotter
(1997)
drawing



ELNA 5 locomotive 152 (1927)

MBS Loc 5 'Elna'
Museum Buurtspoorweg
Haaksbergen, The Netherlands



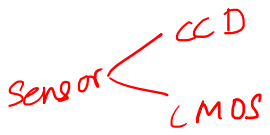
Advantages of plotters

- Plotters can work on very large sheets of paper while maintaining high resolution.
- They can print on a wide variety of flat materials including plywood, aluminum, sheet steel, cardboard, and plastic.
- Plotters allow the same pattern to be drawn thousands of times without any image degradation.

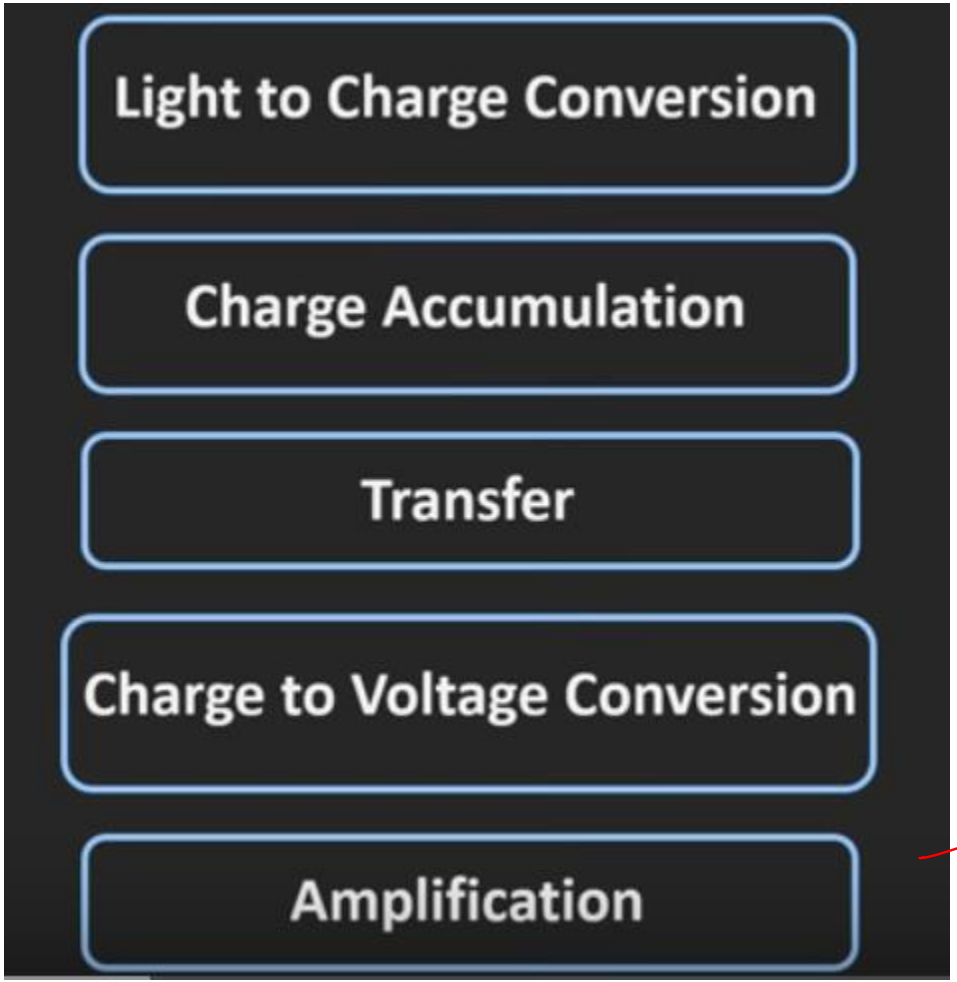
Disadvantages of plotters

- are quite large when compared to a traditional printer.
- Plotters are also much more expensive than a traditional printer Plotters .

DIGITAL CAMERA



- Digital cameras use charge coupled devices(CCDs) as photosensors.
- The image sensors used in an digital can be either a Charge Coupled Device (CCD) or a Complimentary Metal Oxide Semi-conductor (CMOS). Though both CMOS and CCD are very common, CMOS chips are known to be more cheaper. But for higher pixel range and costly cameras mostly CCD technology is used.
- The ccd array is located right behind the lenses
- The cells get charged by the intensity of light.
- The charge in the cells generate a voltage which is then fed into a A/D converter.
- This device converts the charge voltage into a digital value which is then stored in the cameras memory.
- This data can be moved from camera memory to computer memory under program control.

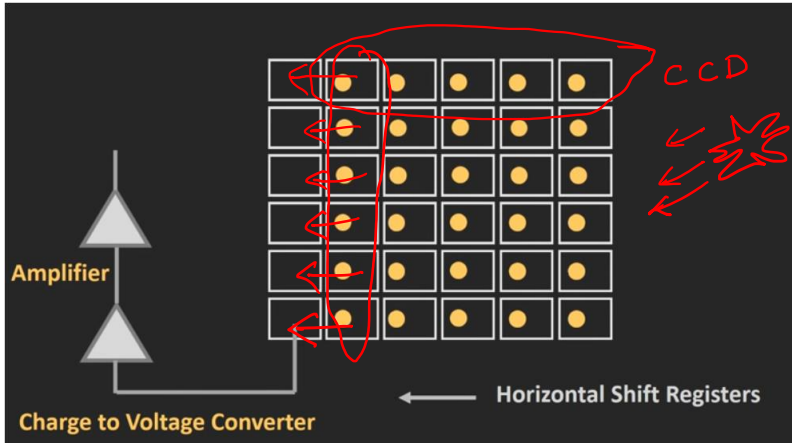


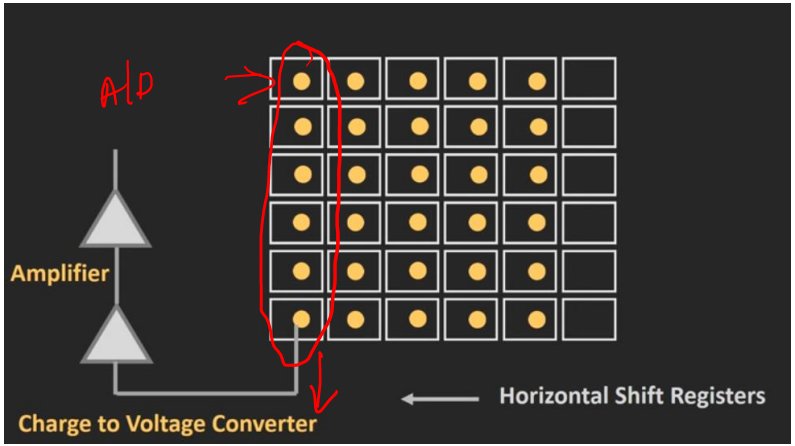
CCD
CMOS

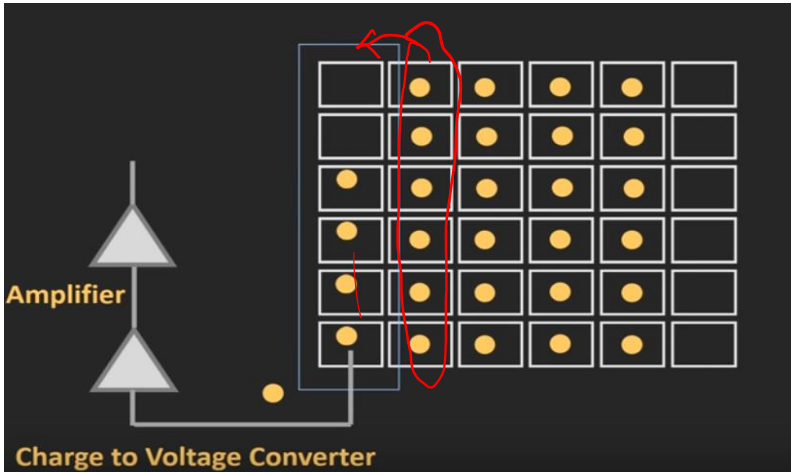
pixels/
photosites

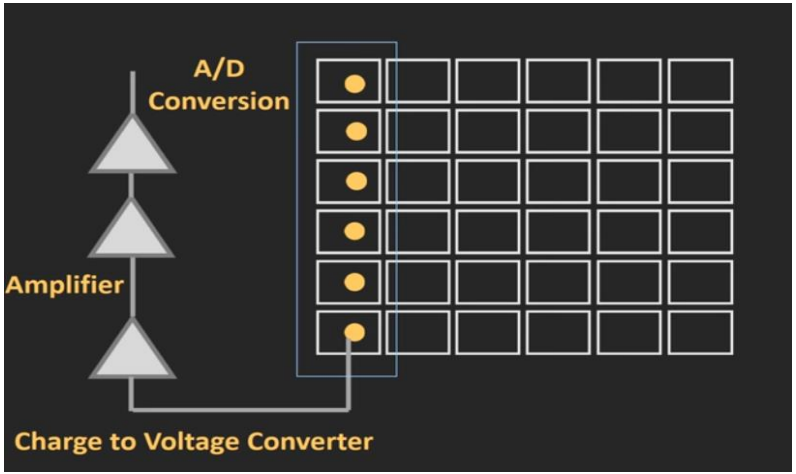
→ A/D

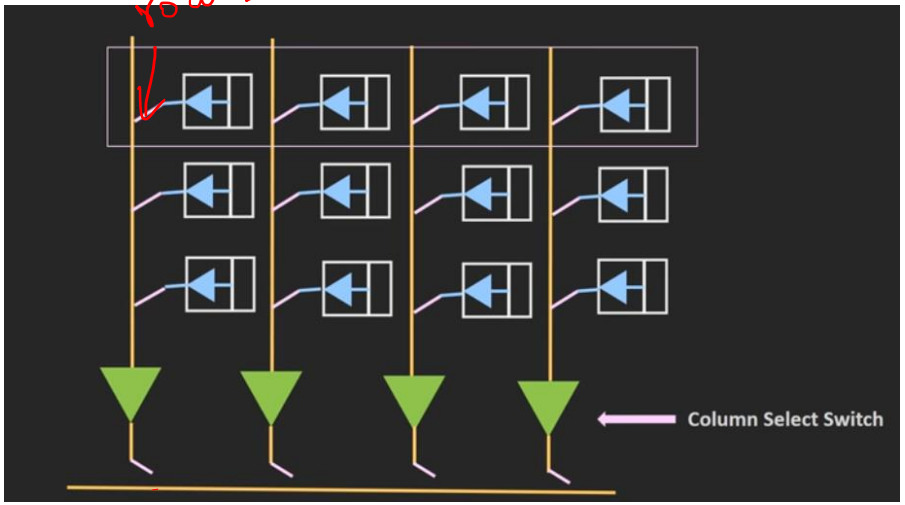
CCD


CCD
Amplifier
Horizontal Shift Registers
Charge to Voltage Converter


A/D
Amplifier
Horizontal Shift Registers
Charge to Voltage Converter


Amplifier
Charge to Voltage Converter


A/D
Conversion
Amplifier
Charge to Voltage Converter


Column Select Switch

System integration

CCD: Timers

Analog to Digital Converters

CMOS: Camera on Chip
Or
System on Chip

Power consumption

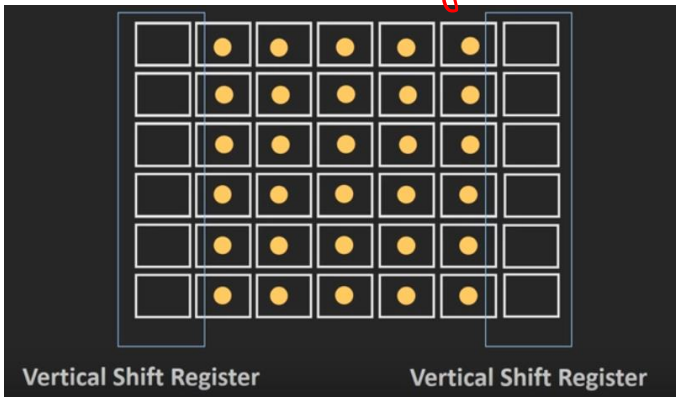
CCD: Requires Different Power Supplies

Typical Voltage : 7V to 10 V (More Power)

CMOS: Requires Single Power Supply

Typical Voltage : 3.3 V to 5V (Less Power)

Processing Speed



Noise & Sensitivity

high dynamic range

fill factor

Image Distortion

CCD: Blooming

CMOS: Rolling Shutter

Global shutter

Rolling shutter

CCD

- Digital images can be viewed immediately for proofing.
- Digital images can be printed immediately and any number of times.
- Digital images can be integrated with word processor documents.
- Digital images can be altered or enhanced to make a more effective presentation.
- Digital images can be archived.
- Digital images can be faxed or embedded in mail messages.
- Digital cameras are portable and can be used in environments where film cameras cannot be used due to heat or radiation.

Probable University Questions

Explain the following input/output devices briefly:
(i)Printer
(ii)Plotter
(iii)Scanner
(iv)Camera
(v)Electronic Pen