

# **Module no 1**

## **Introduction to Multimedia**

# Introduction to Multimedia Systems

**Multimedia :-** A computer based interactive communications process that incorporates text, graphics, sound, animations and video.

## Properties of Multimedia System

**1. Independency –** Different independent media such as sound, graphics, text, video. Computer controlled video recorder stores audio and video information, but there is tight connection between audio and video. Both the media are coupled through the common storage medium of the tape.

**2. Computer Support Integration –** Need for interchange between different multimedia applications running on different platforms has lead to the evolution of common interchange file formats. Many of these formats build on underlying individual media formats (MPEG, JPEG etc.)

**3. Communication Systems –** Various multimedia applications running on different platforms will need to communicate with each other particularly if they are running on distributed networks. A common interchange format needs to be widely adopted.

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# **Properties of Multimedia System- Contd..**

## **4. Interactivity –**

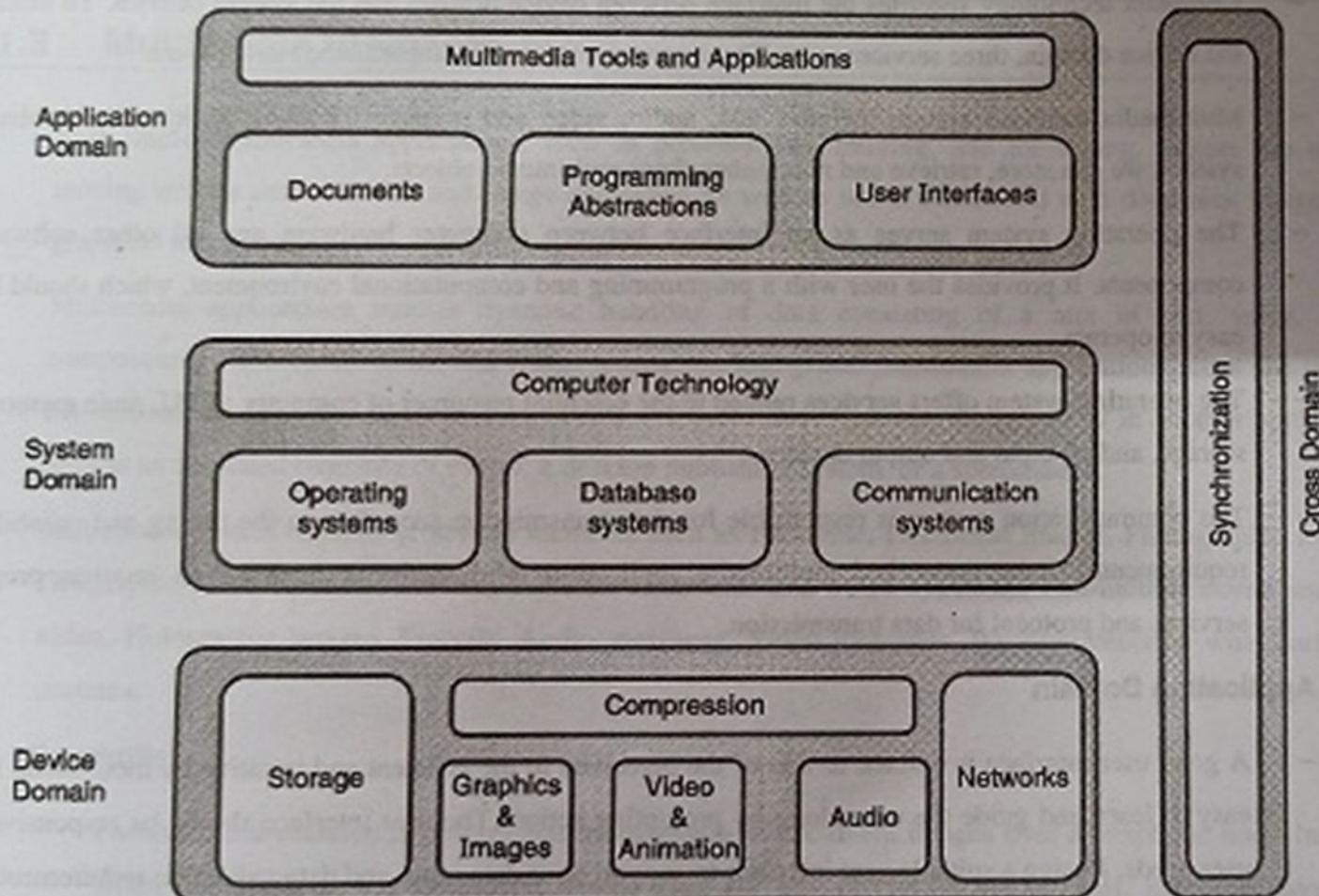
In a Multimedia system, if the user has the ability to control what elements are delivered and when, the system is called as interactive system.

To communicate with the system, the user can use a variety of device such as keyboard, mouse, touch screen and stylus based mouse. Thus while designing a multimedia applications we have to decide the level of interactivity we wish to provide the user of the system.

e.g. In a direct-sales applications, we can give different choices for a single product with different schemes. The buyers can select the products they wish to buy.

# Global Structure of Multimedia

## 1.2 Global Structure of Multimedia



# **Global Structure of Multimedia**

## **1. Device Domain –**

It contains all multimedia elements including text, audio, video, image, animation, graphics etc. It also consists of the composition and storage of these elements. It also specifies how these elements are digitized and processed.

An audio technique includes MIDI, speech generation, speech analysis and speech transmission. A video technique includes Chroma sub sampling, CCIR and HDTV.

A multimedia networking allows for the data exchange of discrete and continuous media among computers. This communication requires proper services and protocol for the data transmission.

For Compression of the multimedia data various compression schemes are used such as Packbit encoding(RLE), CCITT group 3 & 4 compression, JPEG,JPEG2000, MPEG1,2,4,7 are used.

Optical storage media offer a higher storage density at lower cost. Compact Disk – Digital Audio (CD-DA) allows the digital storage of stereo audio information at a high level of quality.

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# **Global Structure of Multimedia**

## **2. System Domain –**

Computer technology specifies the interface between device domain and system domain. To utilize the device domain three services exist. These are implemented in the software.

Multimedia database system includes text, audio, video and images. By using Multimedia database system we can store, retrieve and manipulate these multimedia objects.

The Operating System serves as an interface between computer hardware and all the other software components. It provides the user with a programming and computational environment, which should be easy to operate.

The Operating System offers services related to the essential resources of computer : CPU, main memory, storage, and all input and output devices.

The Communication System is responsible for data transmission according to the timing and reliability requirements of the networked multimedia application. Multimedia communication requires proper services and protocol for data transmission.

**Contd....**

# **Global Structure of Multimedia**

## **3. Application Domain –**

A good user interface is defined as one of the perceived to be efficient and intuitive by most users. It is easy to learn and guide the user along by prompting action. The user interface should be responsive to user needs. Design a suitable user interface to support user data input and data validation requirements.

A document consists of a set of structured information that can be in different forms of media, and during presentation can be generated or recorded.

A document is aimed at the human perception of a human, and is accessible for computer representation.

Many functions of document handling and other applications are accessible and presented to the user through a user interface.

Abstraction is the process of hiding the details and exposing only the essential features of a particular concept. Abstraction reduces the complexity of program generation and maintenance.

Abstraction of multimedia data services as the fundamental building block for the programming of different multimedia applications, especially editors and other document processing tools. The services of the system domain are offered to application domain through proper programming abstraction.

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# **Global Structure of Multimedia**

## **4 Cross Domain –**

Synchronisation in multimedia systems refers to the temporal relations between media objects in the multimedia system. Synchronisation is addressed and supported by many system components including the operating system, communication system, database, documents and even often by application.

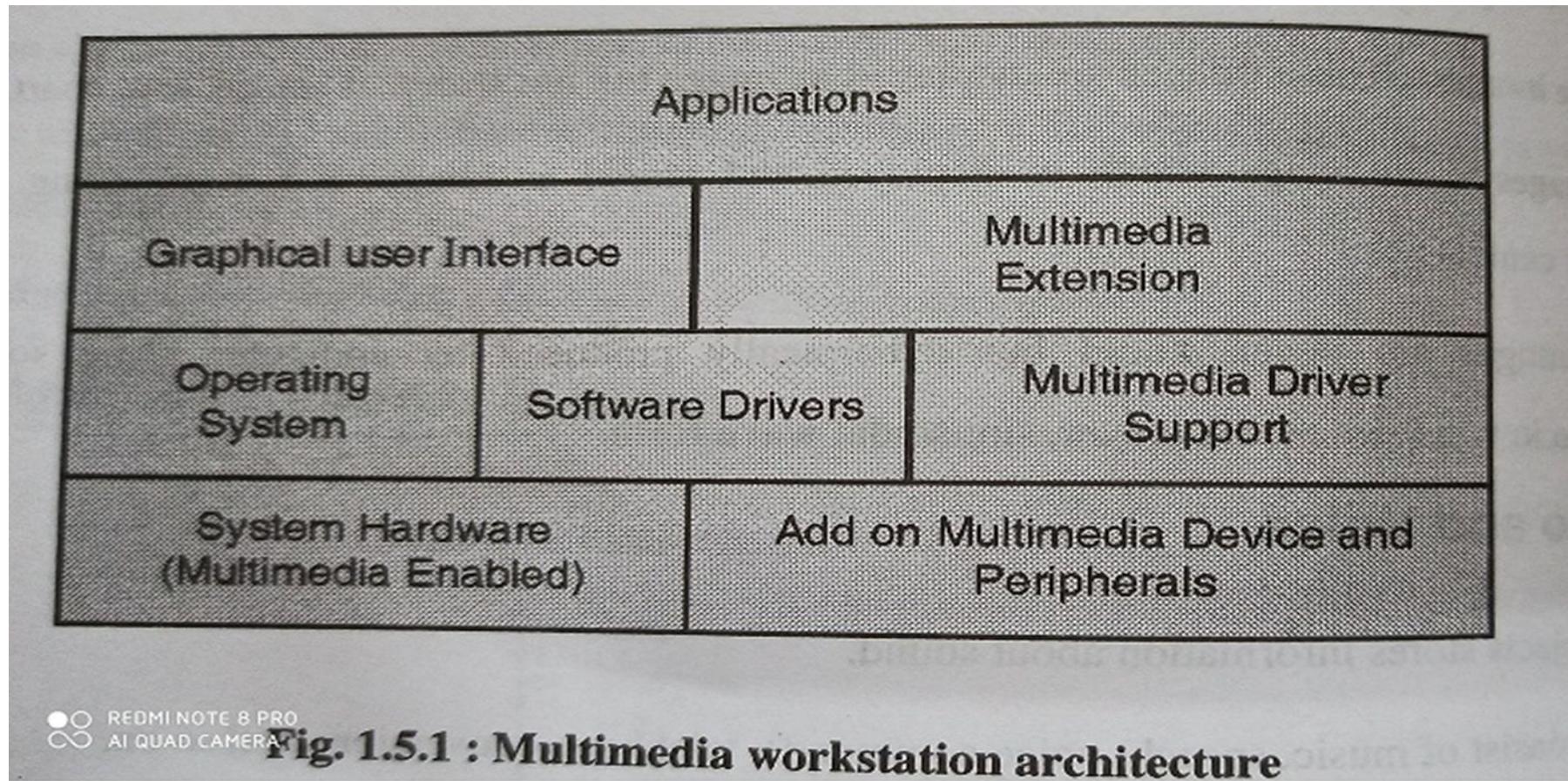
Hence synchronisation must be considered at several levels in multimedia system.

### **Multimedia Elements :-**

1. Facsimile
2. Document Images
3. Photographic Images
4. Geographic Information System(GIS) maps
5. Voice commands and Voice synthesis
6. Full-motion Stored and live Video
7. Holographic Images
8. Fractals
9. Audio messages
10. Video messages

# Multimedia System Architecture

Multimedia system architecture gives the idea about how to run multimedia application on user desktop. What type of interface is required and for hardware connecting what specifications are required?



# Multimedia System Architecture

## 1. Application –

In multimedia each object is compressed and then stored therefore while giving back it need to decompress. Application layer performs compression and decompression. Hence each architecture has application as the first layer. Multimedia applications such as educational, online training electronic messaging, multimedia repositories and video conferencing applications are used at very first level of architecture.

## 2. General user interface –

To access the multimedia applications it should interface with standard user interfaces such as Microsoft windows, X windows or with presentation manager.

## 3. System Hardware –

To process various multimedia application software the system hardware requires special DSP processing capabilities.

## 4. Multimedia extension –

Multimedia application like full motion digital video requires extending the basic GUI provided by windows. E.g. Due to Web camera (add on) video – conferencing(extension) is possible.

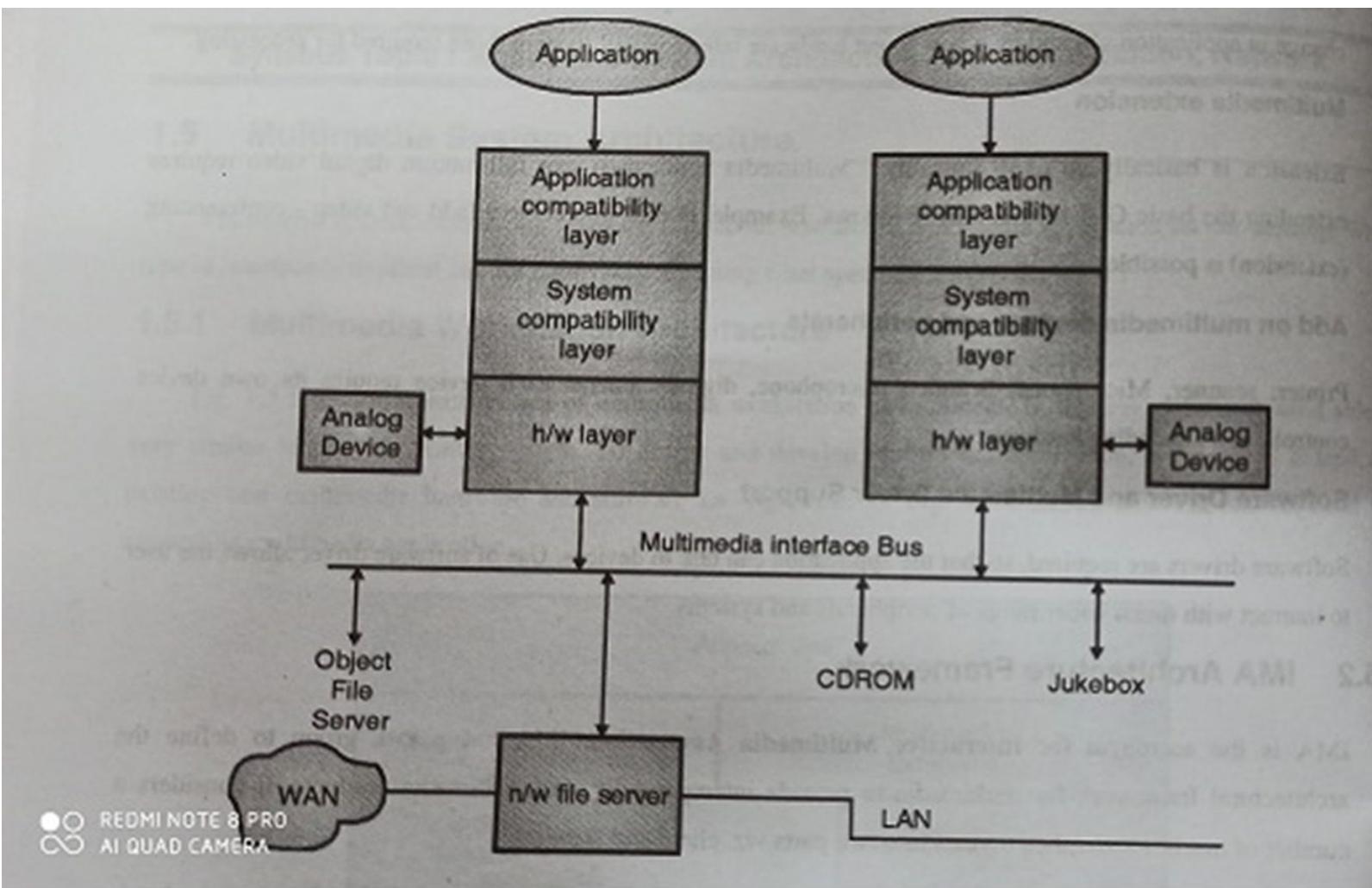
## 5. Add on multimedia devices and peripherals –

Printer, scanner, Microphone, digital cameras each device require its own device controller & encoding hardware.

## 6. Software Driver & Multimedia Driver Support –

Use of Software driver allows the user to interact with much wider range of peripherals and systems.

# IMA Architecture Framework



## **IMA Architecture Framework**

**IMA( Interactive Multimedia Association )** has a task group to define the architectural framework for multimedia to provide interoperability for multimedia products. It considers a number of machines and then divides into two parts viz. Client and Server.

Server decides various class libraries for multimedia objects i.e. server decides what type of data is and what is required to run the data, which software support is needed etc.

Client defines various format conversations.

IMA architecture provides MIB(Multimedia Interface Bus). MIB is wide and fast. MIB gives parallel 32 bits of data transfer.

Since MIB is 32 bit, whereas other applications are 8-16 bit, hence Application Compatibility Layer (ACL) act as a buffer.

System Compatibility Layer is used to achieve machine independence. That is this layer offers interface between multimedia application with system. E.g. OS.

Hardware Layer offers compatibility of hardware or add-on devices with multimedia applications through the computer system.

**Network Architecture for Multimedia System –** In multimedia system large volumes of image and video message are being transferred. Therefore multimedia have special networking environment.

e.g. Ethernet LAN, FDDI or ATM networks.

# Multimedia Applications

1. Document Imaging
2. Image Processing and Image Recognition
3. Image Enhancement
4. Image Animation
5. Image Annotation
6. Optical Character Recognition(OCR)
7. Digitizer
8. Full Motion Digital Video
9. Multimedia e-mailing

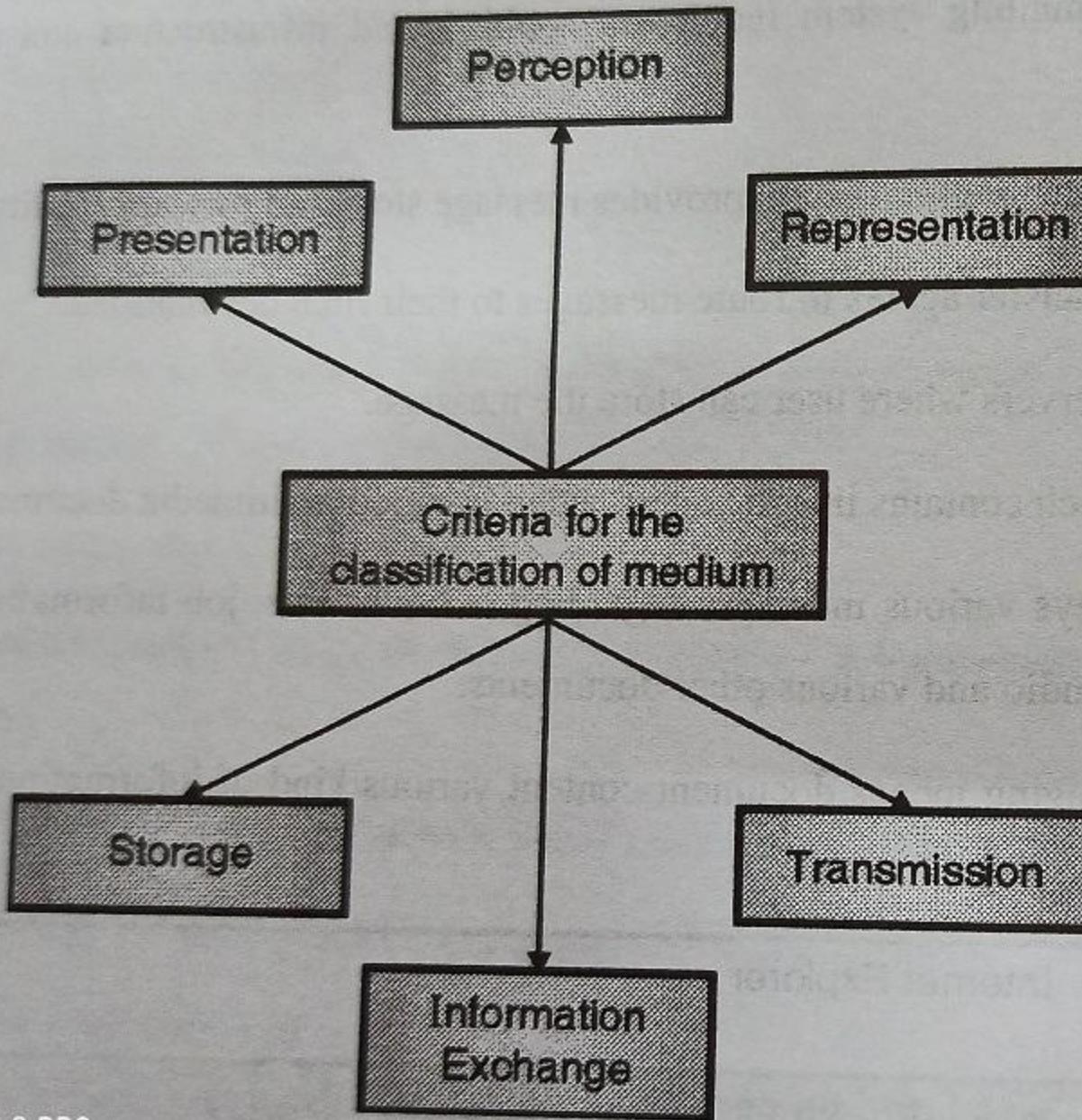
## **Types of Medium**

Medium is means for distribution and presentation of information.

Classification based on perception (text, audio, video) is appropriate for defining multimedia

**Medium can be classified into –**

1. Perception Medium
2. Representation Medium
3. Presentation Medium
4. Storage Medium
5. Transmission Medium
6. Information Exchange Medium



# Classification of Multimedia

## 1. Perception Medium –

It is medium through which data are perceived by a user

e.g. Sound as perceived by a human ear, graphics as perceived by a human eye. The Perception medium refers to the nature of information as perceived and processed by a human.

## 2. Representation Medium –

It refers to the construction in any medium of aspects of ‘reality’ such as people, places, objects, events, cultural identities and other abstract concepts. Such representation may be in speech or writing as well as still or moving pictures.

e.g. Text is encoded using ASCII. ASCII is a character encoding scheme based on the ordering of the English alphabet. ASCII codes represent text in computers, communication equipment and other devices that use text.

Audio is coded using pulse-code modulation. PCM is a method used to digitally represent sampled analog signals. PCM stream is a digital representation of an analog signal in which the magnitude of the analog signal is sampled regularly at uniform intervals, with each sample being quantized to the nearest value within a range of digital steps.

Image is coded using JPEG ( Joint Photographic Expert Group)

Video sequence can be coded in different TV standard format(PAL, SECAM, NTSC) and stored in computer using MPEG format.

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# Classification of Multimedia

## 3. Presentation Medium –

It is the medium into which the stored document, which has been distributed over the distribution medium, is converted to facilitate viewing or reading by the end user.

This medium engage the range of human senses(e.g. Visual, auditory, kinaesthetic)

Mental activity is stimulated through our five senses with the visual sense being the most powerful.

e.g. Keyboard, mouse, camera, printer, scanner, speaker, microphone.

## 4. Storage Medium –

Storage medium is any technology(including devices and materials) used to place , keep, and retrieve data.

The term storage includes both primary storage (memory), a storage medium usually means a place to hold secondary storage such as that on a hard disk or tape.

It can be arranged for access in many ways.

Hard drive, external Hard drive, floppy disk, memory stick, CD\_ROM and Recordable DVD are storage devices.

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# Classification of Multimedia

## 5. Transmission Medium –

It describes the type of physical system used to carry a communication signal from one system to another.

Transmission media is a material substance (solid, liquid, gas or plasma) that can propagate energy waves. E.g. the transmission medium for sound received by the ears is usually air, but solids and liquids may also act as transmission media for sound.

The absence of medium(The vacuum of empty space) can be considered as a transmission medium for electromagnetic waves such as light and radio waves. In the absence of physical medium the propagation of electromagnetic waves usually affected by the transmission media they pass through for instance by absorption or by reflection or refraction at the interfaces between media.

e.g. Guided media – Metallic cable ( twisted-pair cable, coaxial cable) and optical fibres.

Unguided transmission media– Radio signals and satellite

Contd....

# **Classification of Multimedia**

## **6. Information Exchange Medium –**

It is the medium used to transport the stored encoded document to the presentation or viewing device

Information Exchange Technology refers to the technology used to distribute or deliver the stored encoded document from one point to another.

Example – Email

## **Objects of Multimedia System**

**Text**

**Images- Visible , Non Visible, Abstract**

**Audio**

**Video**

# Evolving Technologies for Multimedia System

1. Hypertext
2. Hypermedia document
3. Hyper Speech
4. HDTV and UDTV
5. Fuzzy logic

## **Interaction Techniques**

Interactive Multimedia Services on the Internet

Multimedia capable web client

# Peripherals of Multimedia Systems

- 1. Multimedia Input Peripherals
- 2. Multimedia Output Peripherals
- 3 Multimedia Storage Peripherals

# Input Devices

## 1. Electronic Pen

A digital pen is an input device which captures the handwriting of a user and digitizes them so that they may be downloaded to computer and displayed on its monitor. The data can then be interpreted by handwriting software(OCR) and used in various applications.

A digital pen is generally larger and has more features than stylus. Digital pen typically contain internal electronics, and have features such as touch sensitivity, input buttons, memory, Bluetooth transmission capabilities, and electronic erasers.

In electronic pen, digitizer encodes x, y co-ordinates of pen. The pen status includes whether pen is touching the digitizer surface (usually the screen) or not, pen pressure, pen angle, pen rotation & so on.

Some pens are capable of measuring pressure level at surface that can be encoded as part of pen stylus.

**Digitizer –**

Digitizer touch screens have sensors in the screen to recognize pressure or a change in the electronic current going through them. Digitizer encode x , y coordinates of pen.

**Pen driver –**

It interact with the digitizer to receive all the digitized information about pen location. Pen system should generate x , y coordinate 120 times per second.

Pen driver builds pen packets for recognition context manager.

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# Input Devices

## Recognition context manager –

RC manager is one of the important component of pen system. It works with the device driver, recognizer, dictionary and application to perform the recognition and requested task. RC manager is responsible for routing the inking message directly to display driver. If the pen behaves like mouse, the RC manager sends messages to window to process those pen messages.

## Recognizer –

The conversion of handwriting to text is performed by a technology component called a recognizer. Recognizers are written specifically for each supported language. Their default behaviour is to recognize vocabulary words that appear in a dictionary for a particular language.

## Dictionary –

The recognizer feeds the character to dictionary system. Pen system uses dictionary to validate the recognition result. The recognised word is compared against dictionary word to achieve the best possible validation.

## Display Driver –

The display driver under windows in DLL which interacts graphics device interface and display hardware. Display driver renders the objects whether characters, symbols, or graphical object on the screen.

# **Input Devices**

## **2. Scanner**

A scanner is an acquisition peripheral for scanning documents, i.e. converting a paper document to a digital image. Scanner is one of the device to capture the images in the Document imaging application.

### **Characteristics of a Scanner –**

Resolution: Expressed in dots per inch(dpi), the resolution defines the fineness of the order of the magnitude of the resolution is around 1200 per 2400dpi. The horizontal resolution is very much dependent on the quality and number of captors, whereas vertical resolution is closely linked to the accuracy of the drive motor.

Optical resolution is the actual resolution of the scanner from the interpolated resolution. Interpolation is a technique involving defining intermediate pixels from among actual pixels, by calculating the mean of the colours of neighbouring pixels.

### **The format of the document –**

Depending on their size, scanners are able to accommodate documents of different sizes, generally A4(21 X 29.7cm) or rarely A3(29.7 X 42cm).

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# Scanner

## **Acquisition speed –**

Expressed in pages per minute(ppm), the acquisition speed represents the scanner's ability to pick up a large number of pages per minute. The acquisition speed depends on the document format and the resolution chosen for the scan.

## **Physical characteristics –** Other element may be taken into account while choosing the scanner.

- Size, in terms of the physical dimensions of the scanner
- Weight
- Electricity consumption, expressed in watts(W).
- Operating and storage temperatures.
- Noise level : Scanners can be noisy, and this may cause considerable disturbance.
- Accessories: The drivers and user manual are usually provided and also connection cables.

# Operating principle for a scanner

The scanner moves over the document line by line.

Each line is broken down into “basic dots” which correspond to pixel.

A captor analyses the colour of each pixel.

The colour of each pixel is broken down into 3 components (red , green , blue)

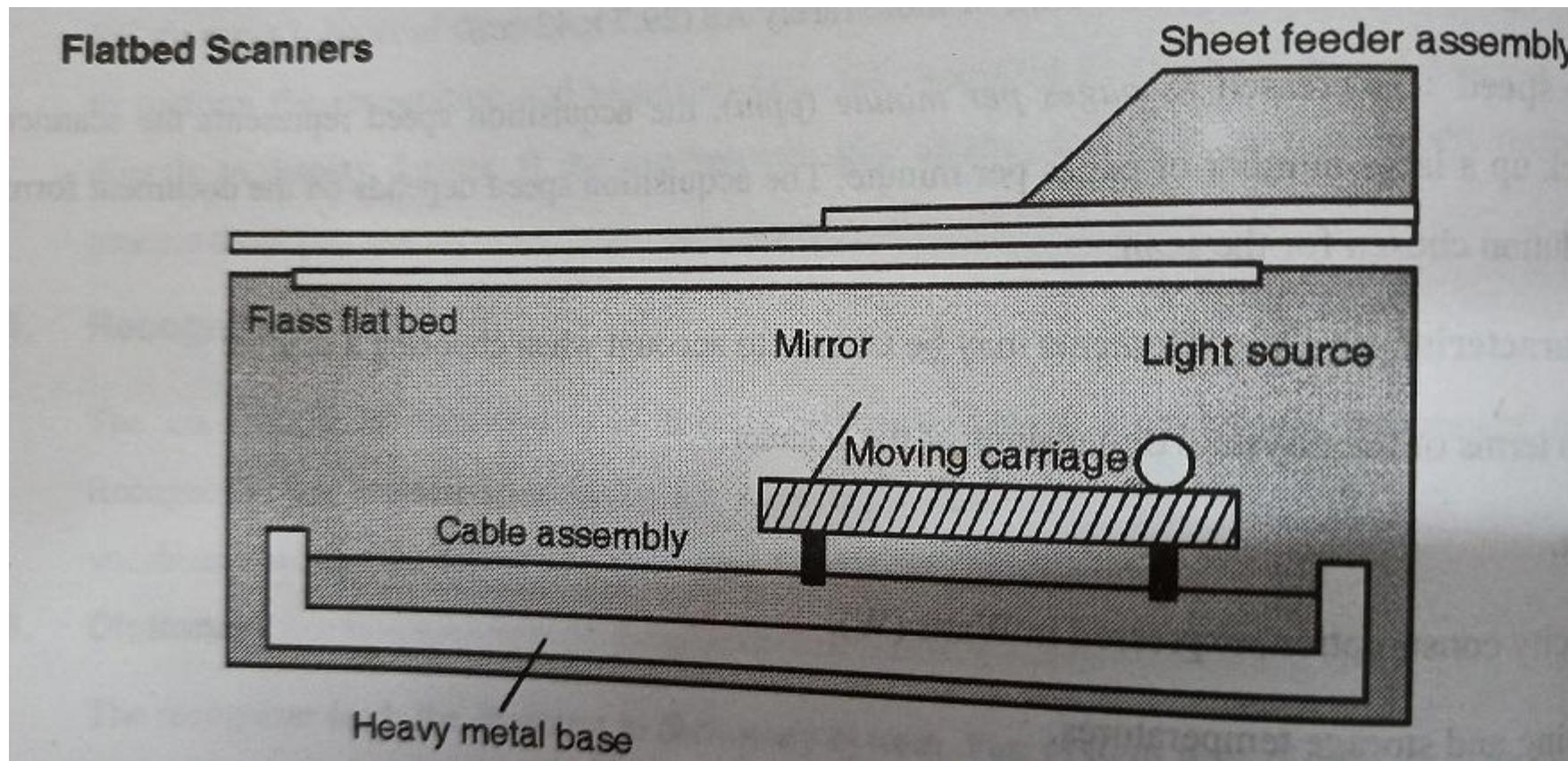
Each colour component is measured and represented by a value. For 8-bit quantification, each component will have a value between 0 and 225 inclusive.

## Types of Scanner

1. Flatbed scanner
2. Rotary drum scanner
3. Handheld scanner

Operating mode of above scanner are same . The only difference is the feeding of the document.

# 1. Flatbed Scanners



# Flatbed Scanner

A Flatbed Scanner has a clear pane of glass covering the inner workings and components.

A fluorescent or xenon light sits underneath the pane and lights up the image placed on the scanner.

Sensors placed below the light contain shades of red , blue and green.

These lights and sensors strobe and reflect against the image.

When the image is placed on the scanner, the upper covering is laid down on top of the image.

This cover blocks out ambient light and any other light source in the area.

The sensors run along the glass pane, reading the image based on its light reflection.

This works only with images that have a solid background such as coloured writing on a white page.

It also involves work on the part of the user, to place the image correctly into the scanner and press the right button to begin the scanning process.

## Components of the flatbed scanner :

1. Glass
2. Light Source
3. Sensor
4. Carrier

Contd ....

# Flatbed Scanner

## 1. Glass –

A good quality tempered Glass is the first element in a flat bed scanner. To scan an image or document, open the scanner and place the document face down on the glass. Because the scanner uses light reflected from the document through the glass, the quality of the scanner's glass can affect the quality of the final scan.

## 2. Light Source –

Flat-bed scanners have a built in light source. In many scanners, the light source is LED light. Other scanners use fluorescent bulbs. The light source is usually connected to a ballast or other voltage regulator to ensure consistency of light over the scan pass.

## 3. Sensor –

It is a device that “reads” the light reflected from the document or image. Most scanners use a charge Coupled Device(CCD) array. A sensor array contains light sensitive diodes that convert analog light waves into a digital signal. Some scanner arrays contain three rows of sensors. Each row is calibrated to measure red , blue or green light.

## 4. Carrier –

The sensor and light are mounted on a carrier that moves down the length of the scanner. The carrier moves at a constant rate and is driven by an electrical stepping motor using either a drive belt or a rack and pinion system.

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# Flatbed Scanner

## The Scanning process –

Once a document or image has been placed on the glass, the carriage moves to a collaboration strip inside the scanner case.

The sensor takes a series of measurements to calibrate colour balance, contrast and brightness.

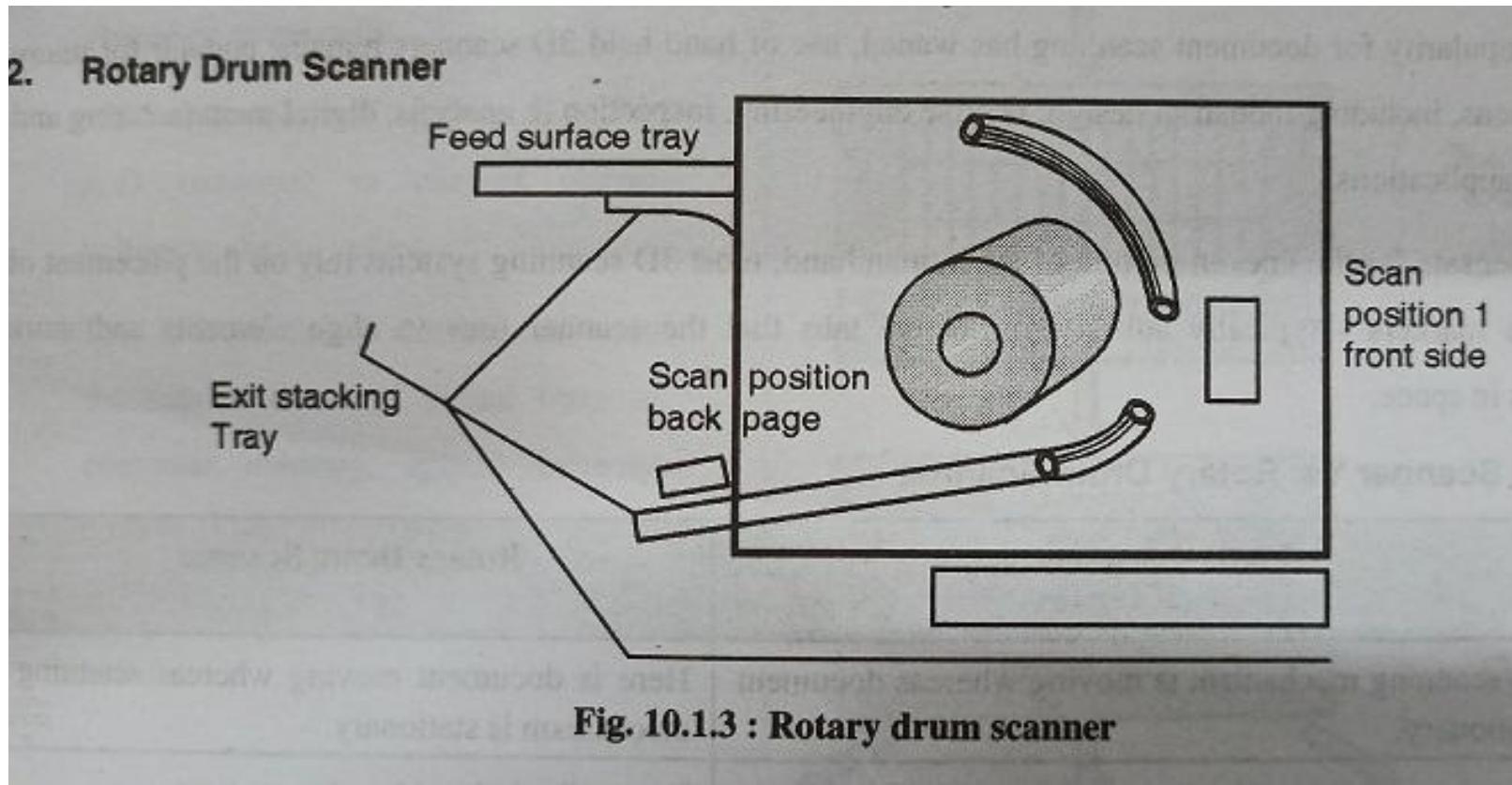
Once calibrated it moves to the start of the area of the document to be scanned and scans the selected area by taking a series of “slices” of the image.

Circuitry in the scanner then assembles these slices sequentially to create the whole image for transfer to a computer.

Once the scan is complete, the image is transferred to a computer.

This usually is done via a USB or FireWire interface. Some older scanners use SCSI interfaces for image transfer.

## 2. Rotary Drum Scanner



# **Rotary Drum Scanner**

In case of flatbed scanner at a time we can scan only one side of paper. But mechanism of rotary drum scanner is somewhat different that is in which two digital cameras with CCD array are mounted in a fixed position near the drum.

As per the name suggest this scanner contains drum to wrap the paper and two set of belts , three set roller guides to guide the paper.

So this rotary drum scanner will scan both the sides of papers in single attempt and scanning mechanism with CCD array is same like flatbed scanner.

A fixed CCD array absorbs reflected light and generates analog voltage which in turn gets converted to a digital value.

Colour handheld scanners work just like grey scale scanners except that they need 3 passes on scanline to capture Red , Green and Blue components.

First pass reacts to Red pixels, second pass to the Green pixels and third pass to the Blue pixels.

# Handheld Scanner

It has two forms : **Document** and **3D** scanners.

Hand held **document scanners** are manual devices that are dragged across the surface of the image to be scanned. Scanning documents in this manner requires a steady hand, as an uneven scanning rate would produce distorted images- a little light on the scanner would indicate if the motion was too fast.

It typically have “start” button, which is held by the user for the duration of the scan; some switches to see the optical resolution and a roller, which generates a clock pulse for synchronization with the computer.

Many Handheld scanners are monochrome and produced light from an array of green LEDs to illuminate the image. A typical hand scanner also had a small window through which the document being scanned could be viewed.

**3D scanners** are used in industrial design, reverse engineering, inspection & analysis, digital manufacturing and medical applications

To compensate for the uneven motion of the human hand, most 3D scanning system rely on the placement of reference markers – typically adhesive reflective tabs that the scanner uses to align elements and mark position in space.

# Digital Camera

Digital camera works on CCD Mechanism to capture the image. Digital camera captures image and stores in digital form.

## Advantages –

Smaller size

Better efficiency

Film processing is not required

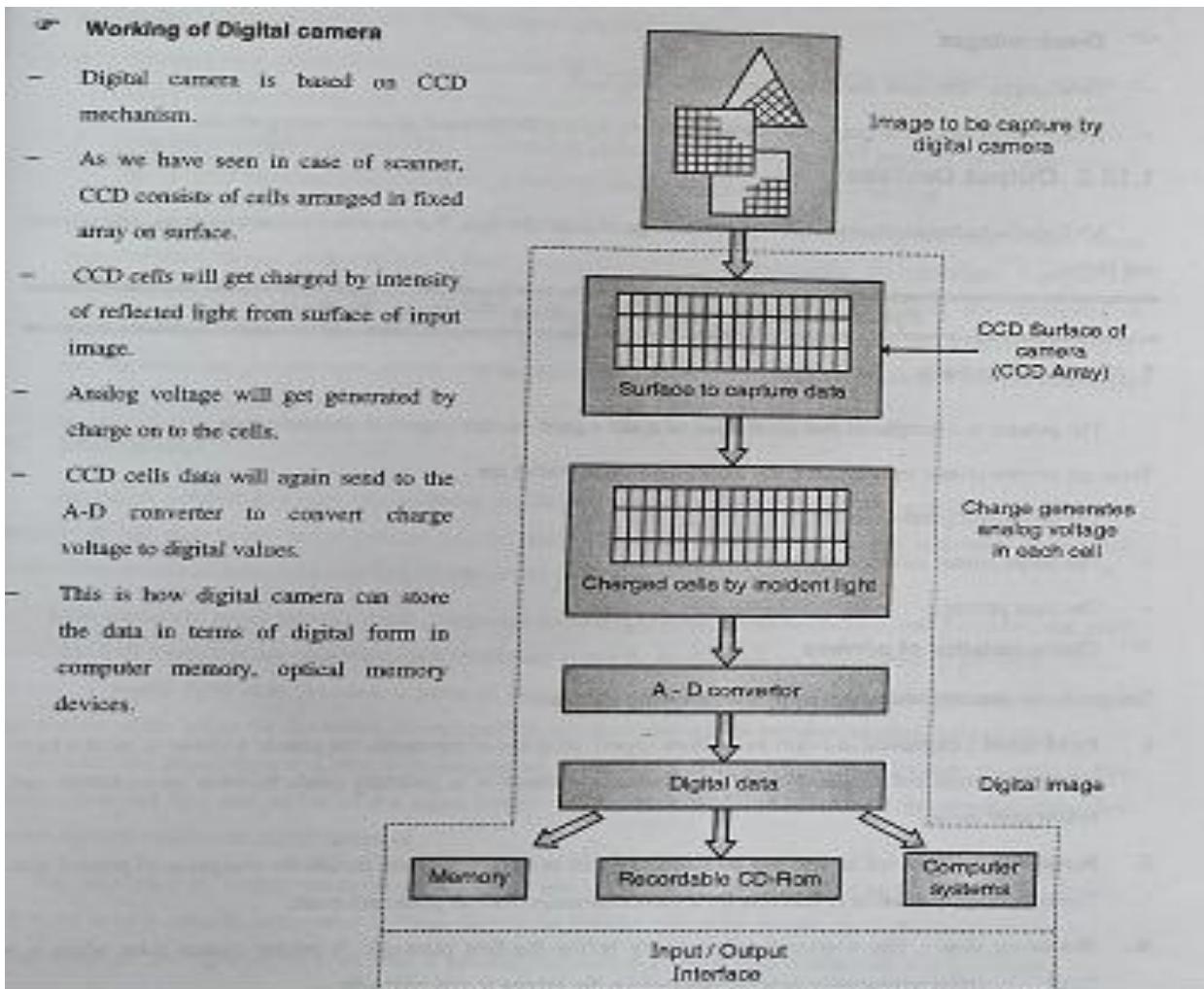
Directly can download to computer memory, optical memory.

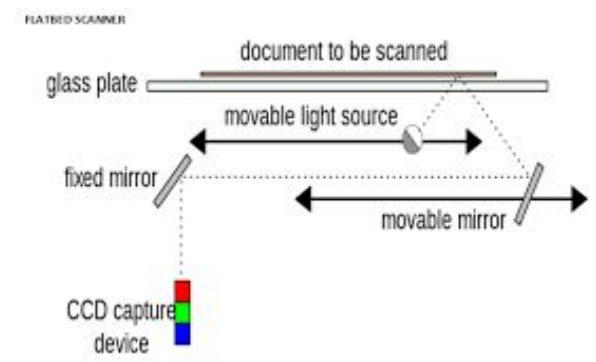
It captures all shades of grey, wide range of colours, light reflection and shadows perfectly.

# Digital Camera

## Working of Digital camera

- Digital camera is based on CCD mechanism.
- As we have seen in case of scanner, CCD consists of cells arranged in fixed array on surface.
- CCD cells will get charged by intensity of reflected light from surface of input image.
- Analog voltage will get generated by charge on to the cells.
- CCD cells data will again send to the A-D converter to convert charge voltage to digital values.
- This is how digital camera can store the data in terms of digital form in computer memory, optical memory devices.

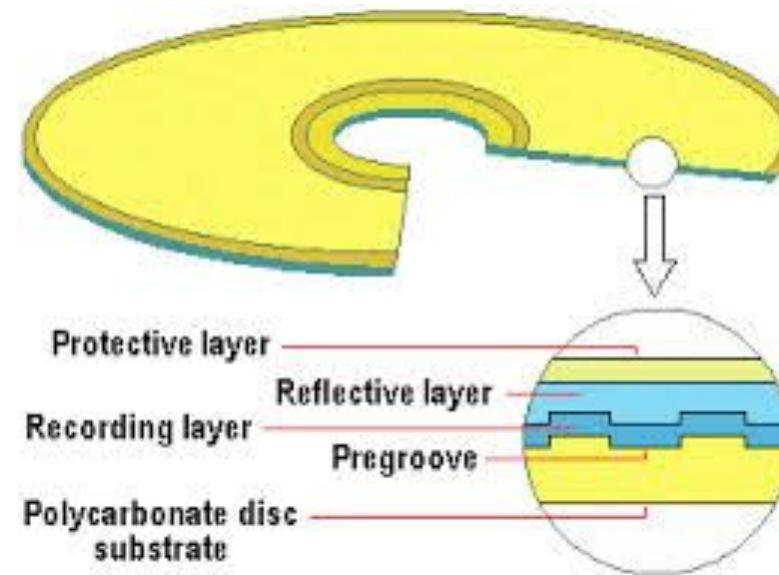
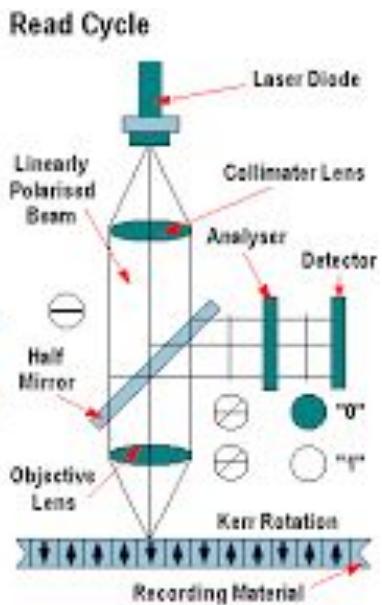
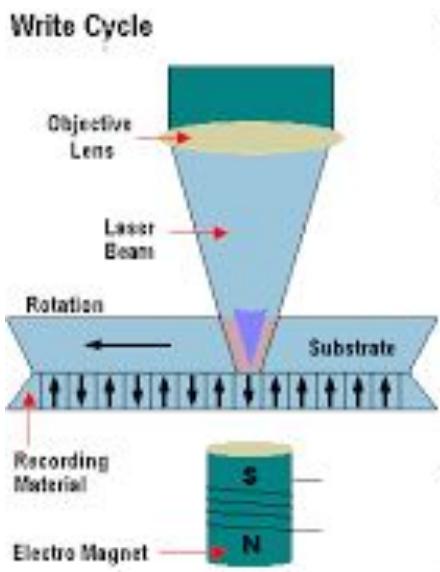












# Output Devices- Printer and Plotter

## Several Printer Technologies

- The Dot matrix printer
- The ink jet printer and the bubble jet printer
- The Laser printer

## Characteristics of Printer –

- Print Speed
- Resolution
- Warm-up time
- On-board memory
- Paper format
- Paper feed
- Cartridges

# The inkjet Printer

An inkjet printer is a type of computer that creates a digital image by propelling variable sized droplets of ink onto paper.

To eject a droplet from each other, a pulse of current is passed through the heating element causing a rapid vaporisation of the ink in the chamber to form a bubble, which causes large pressure increase, propelling a droplet of ink onto the paper. The ink's surface tension as well as the condensation and thus contraction of the vapour bubble, pulls a further charge of ink into the chamber through a narrow channel attached to an ink reservoir.

The ink used are usually water based and use either pigments or dyes as the colorant. The inks used have a volatile component to form the various bubble otherwise droplet ejection can not occur.

We summarize the process into 3 steps:

- The squirt is initiated by heating the ink to create a bubble until the pressure forces it to burst and hit the paper
- The bubble then collapses as the element cools.
- The resulting vacuum draws ink from the reservoir to replace the ink that was ejected.

# Laser Printer

It produces high quality text and graphics on plain paper.

In this the image is produced by the direct scanning of a laser beam across the printer's photoreceptor.

The printer receives the document in form of file. This file is generated by the application that actually issues the print command to the printer. The file is the logical image of the document.

At initial stage of the printing, a light sensitive drum is given a positive charge with the help of a wire and the drum starts revolving.

As the drum starts revolving the printer shines a laser beam on the surface of the drum to create some discharge points. In this way laser draws the letters and images to be printed as pattern of electrical charges. In order to draw the pattern on drum, the laser receives the page data(tiny dots that make up text and images) one horizontal line at a time. Also the laser does not move the beam itself instead it emits the beam on a movable mirror. The mirror moves and shines through series of lenses on the surface of the drum.

After the pattern is set, the printer coats the negatively charged surface of the drum toner – a type of fine black powder. Since the toner is positively charged, it sticks only on negative discharged points on the drum.

Contd ....

# Laser Printer

With powder pattern attach, the drum rolls over the sheet of paper coming from paper tray. This paper sheet is positively charged. The positive charge is strong enough to attract the negatively charged toner particles from the drum. The toner particles leave the drum and go onto the paper. At this point, the image is on the paper, however the particles are held only by their opposite

The printer passes the pages through the user, a pair of heated rollers. As the paper passes through these rollers, the loose toner powder melts, fusing with the fibers in the paper. The fuser rolls the paper to the output tray and user have finished the page. The fuser also heats up the pages.

Lastly the drum is cleaned to remove any toner particles left on it. Then the drum surface passes the discharge lamp. The bright light of the lamp exposes the entire surface of the drum, erasing the pattern of electric charges.

Then corona wire reapplies the positive charge to the drum, making drum ready for next printing job.

The various manufacturers of laser printer categorize the working of laser printer in 6 steps :

1. Conditioning
2. Writing
3. Developing
4. Transferring
5. Fusing
6. Cleaning.

# Plotter

A plotter is a computer device for printing vector graphics. Pen plotters print by moving a pen or other instrument across the surface of a piece of paper. It means that plotters are restricted to line art, rather than the raster graphics.

HP developed desktop sized plotters. In this pens were mounted on a travelling bar, whereby the y-axis was presented by motion up and down the length of the bar and the X-axis was presented motion of the bar back and forth across the plotting table. Due to the mass the bar, these plotters operated relatively slowly.

Plotters are used primarily in technical drawing and CAD applications, where it has the advantage of working on very large size while maintaining high resolution.

# Storage Devices

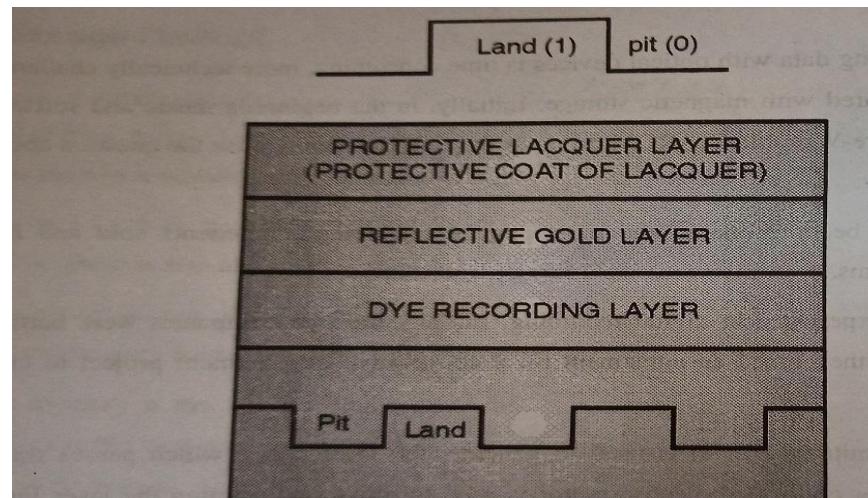
These are the data storage devices used in the computer to store the data.

Types : Floppy Disk drives, CD ROM, DVD ROM, The flash memory, the USB data card etc.

Optical Storage Media : In this data is burnt and removed by using a focused optical beam. In Optical tape storage, optical disk storage and in optical card storage the optical techniques are used. Combined with the other technologies such as magneto optical storage technique which is used for WORM drives, optical Jukeboxes, WORM devices.

In CD ROM a special LED is used to generate the laser beam, which passes through a beam splitter. A small computer controlled electric motor is used to over and position the laser lens head in the correct position to read the required data. A photo-detector picks up the reflections of the laser beam and interprets the data.

Physical Construction of CD-ROM :- □



## **5. DVD (Digital Versatile Disc)**

- The DVD (Digital Versatile Disc, or less commonly Digital Video Disc) is an "alternative" to the Compact Disc (CD) with six times as much storage space.
- The DVD is designed to make data addressable and accessible at random (non-sequentially). It has a complex structure which provides greater interactivity.
- DVD is plastic discs of 12 cm in diameter and 1.2 mm thick, which are read using a laser beam. DVD burners use a red laser with a wavelength of 635 nm or 650 nm.
- The main reason to use DVDs is their storage capacity, which makes them an excellent medium for video. A 4.7 GB DVD can store more than two hours of compressed video in MPEG-2 (Motion Picture Experts Group), a format used for compressing images while still keeping them high-quality.

### **☞ Structure of DVD**

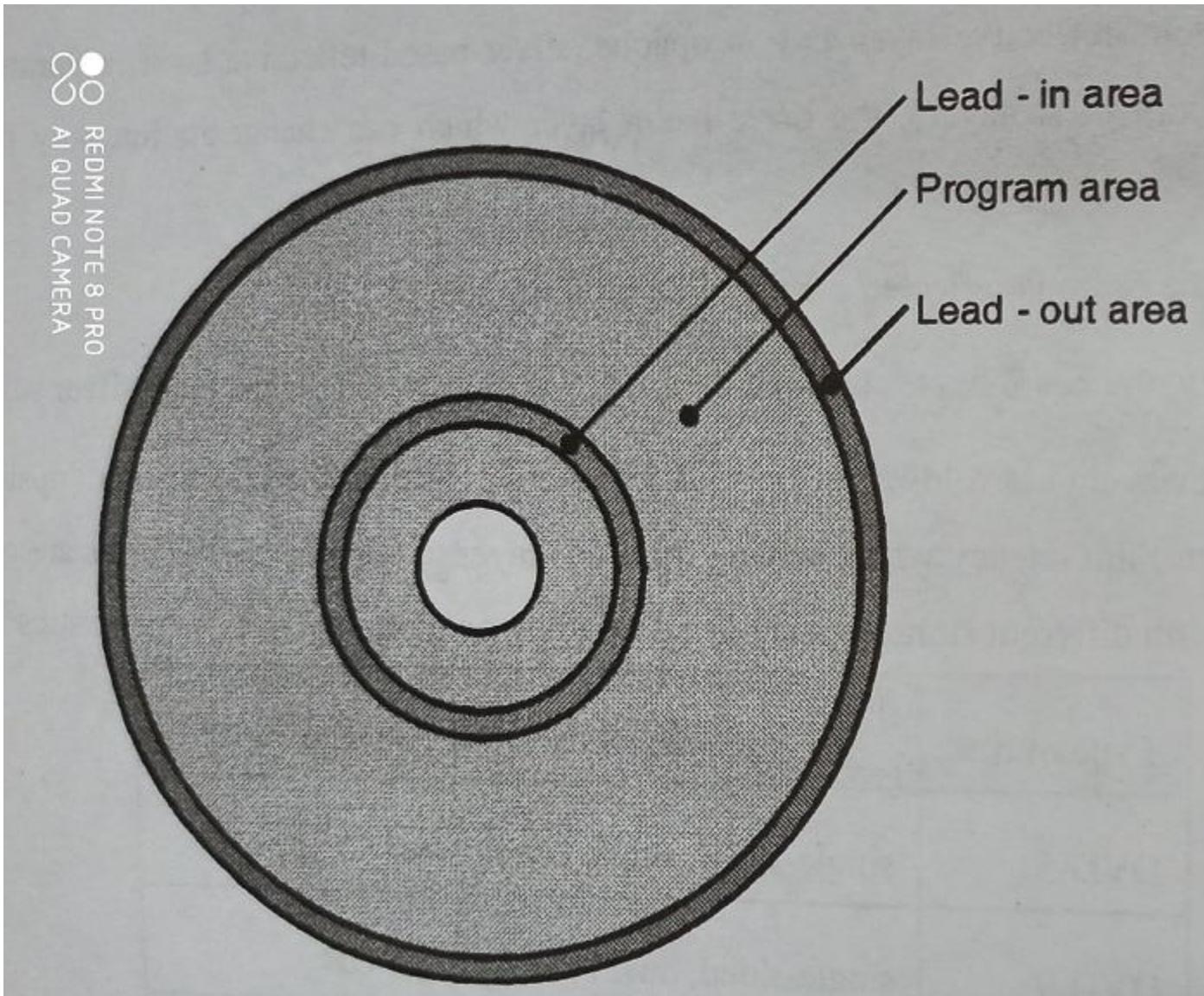
#### **i. Physical structure**

DVDs exist in both "single layer" and "dual layer" (DL) versions. Dual layer discs are made up of a translucent, gold-based semi-reflective layer and an opaque, silver-based reflective layer, separated by a bonding layer. In order to read both these layers, the drive has a layer which can change its intensity by modifying its frequency and focus :

- with low intensity the beam is reflected off the outer gold surface;
- with higher intensity, the beam passes through the first layer is reflected off the inner silver surface.

The inner layer, however, has a lower density. Additionally, it stores the information "upside down" on an inverted spiral, in order to limit latency when moving from one layer to the other. DVD discs are generally divided into four families, each with different storage capacities depending on their physical characteristics :

Type of disc	Characteristics	Storage capacity
DVD-5	single-sided, single layer	4.7 GB
DVD-9	single-sided, dual layer	8.5 GB
DVD-10	double-sided, single layer	9.4 GB
DVD-17	double-sided, dual layer	18 GB



∞ REDMI NOTE 8 PRO  
AI QUAD CAMERA

#### Logical structure

- DVD is essentially made up of three zones, which represent the *information area* :
  - The **Lead-in Area** (or *LIA* for short) only contains data which describes the disc's contents (this information is stored in the *Table of Contents*, or *TOC*). The Lead-in Area lets the DVD player/drive follow the spiral pits in order to synchronise itself with the data found in the *program area*.
  - The **Program Area** is the area which contains the data.
  - The **Lead-Out Area** (or *LOA* for short), containing null data (silence on an audio DVD) marks the end of the DVD.
- Besides the three areas described above, a recordable DVD contains a **PCA** (*Power Calibration Area*) and an **RMA** (*Recording Management Area*) located before the Lead-In Area.
  - The PCA can be seen as a testing area for the laser, so that it can calibrate its power depending on the disc being read. This area is what makes it possible to sell blank CDs that use different dyes and recording layers. Each time it is readjusted, the burner notes that it has carried out a test. Up to 99 tests are allowed per disc.

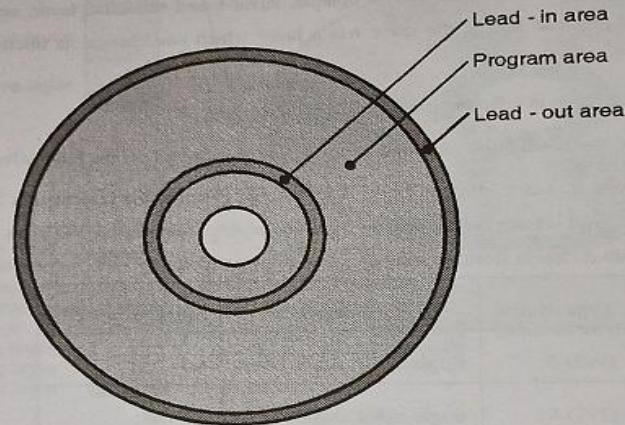


Fig. 1.10.9

#### Standard DVD formats

The official specifications for DVD are divided into five books :

- Book A for DVD-ROM;
- Book B for DVD Video;
- Book C for DVD Audio;

#### **1.10.4 Multimedia Database Management**

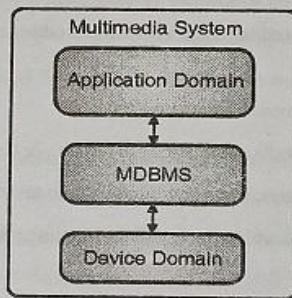
Multimedia database is a kind of database like any other database containing multimedia collections. Multimedia is defined as the combination of more than one media, they may be of two types-static and dynamic media. Text, graphics and images are categorized as static media; on the other hand, objects like animation, music, audio, speech, video are categorized as dynamic media. Graphic images may consist of cliparts, photographs, logos and custom drawings. Sound consists of voice narration, speech, music etc.

Video data encompasses sound as well as photos. To manage these data multimedia database management system is essential. Multimedia database management system can be defined as a software system that manages a collection of multimedia system can be defined as a software system that manages a collection of multimedia data and provides access to users to query and retrieve multimedia objects.

Generally, multimedia database contains text, image, animation, video audio, movie sound etc. But, all data are stored in the database in binary form.

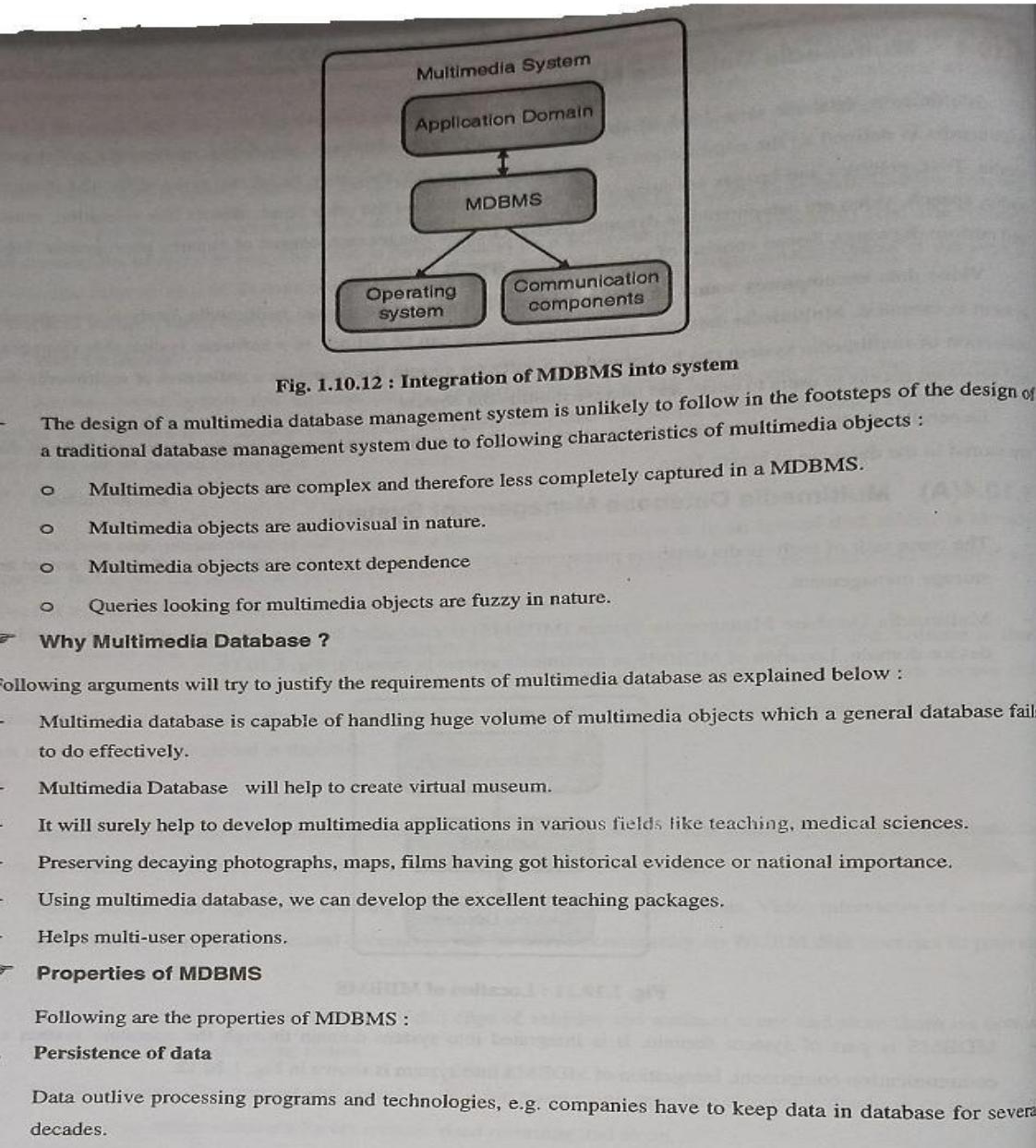
#### **1.10.4(A) Multimedia Database Management System**

- The main task of multimedia database management system is to abstract from the details of storage access and storage management.
- Multimedia Database Management System (MDBMS) is embedded between the application domain and the device domain. Location of MDBMS in multimedia system is shown in Fig. 1.10.11.



**Fig. 1.10.11 : Location of MDBMS**

- MDBMS is part of system domain. It is integrated into system domain through the operating system and communication component. Integration of MDBMS into system is shown in Fig. 1.10.12.



**2. Consistent view of data**

Synchronisation protocols provide a consistent view of data in a multi-user system.

**3. Security of data**

Transaction concepts ensure security and integrity protection in case of system failure. Recovery of lost data.

**4. Query and retrieval of data**

Query languages such as SQL (Structured Query Language) enable formulating database queries.

Each entry has its state information that can be retrieved correctly.

**1.10.4(B) Characteristics of MDBMS**

A MDBMS (Multimedia Database Management System) can be characterized based on its objective at the time of handling multimedia objects :

- 1. Corresponding Storage Media :** Multimedia data should be stored according to characteristics of storage media.
- 2. Descriptive Search Methods :** user should have content-based access to multimedia information.
- 3. Device-independent Interface :** The interface to multimedia database should be device independent.
- 4. Format independent Interface :** Database queries should be independent of media format. MMDBMS should provide information in formats requested by the applications (GIF, TIFF, SUN Raster,...).
- 5. View Specific and Simultaneous data Access :** Object sharing is the capability for different documents share parts of their contents. Such a capability is especially necessary for multimedia documents as the amounts of storage space required to store a document might be quite large.
- 6. Management of Large Amounts of Data :** MMDBMS must be capable of handling and managing large amounts of data
- 7. Relational Consistency of Data Management :** This requirement ensures multimedia database consistency through rules, which impose some form of execution order on concurrent transactions.
- 8. Real time data Transfer :** DBMS must perform read and write operations of continuous data in real time. Continuous data transfer should have higher priority than other action.
- 9. Long Transaction :** The transfer of large amount of data will take a long time and must be done in a reliable fashion.

**1.10.4(C) Multimedia Database Content**

Multimedia database generally holds the following multimedia components like-text, graphic, animation, sounds, video etc.

# **Structure of Multimedia Database**

Multimedia database components

1. Data analysis – How data are structured? How to access these data?
2. Data modelling - concentrates on conceptual design of the database
3. Data Storage - Usual data storage technologies
4. Data Retrieval - Retrieval process of active and passive objects
5. Query language – DBMS-SQL query language to retrieve the multimedia database
6. Multimedia Communication –Distributed multimedia system features multiuser environment allowing multiple user to communicate at each other simultaneously.

# **Operations on Data**

Different class of operation needed to for archival and retrieval of data

- **Insert/record operation** – Data will be written to the database, raw and registering data always needed
- **Output operation** – Reads the raw data from the database according to the registering data.
- **Modification operation** – Changing of raw, registering and descriptive data, data conversion from one format to another.
- **Deletion operation** – Remove an entry from the database, the consistency of the data must be preserved.
- **Comparison operation** – Many queries of the database consists of a search and retrieval of the stored data, queries are based on comparison information
- **Evaluation operation** – Individual patterns in the particular medium are compared with the stored raw data, pattern matching, search in descriptive data etc.