UNIT – 01: INTRODUCTION TO COMPUTER GRAPHICS AND MULTIMEDIA

- Introduction to multimedia.
- Concepts of animation and simulation.
- Various applications of multimedia in
  - education,
  - research and development,
  - business and games,
  - training,
  - entertainment.

Questions to be discussed:

1. What is multimedia? Discuss various elements of multimedia.
2. What is meant by the term static and dynamic media?
3. Difference between raster and vector image.
4. Discuss about application of multimedia in:
   a. Education
   b. Research and development
   c. Entertainment
5. What is animation? Write the application of animation.
6. Differentiate between animation and simulation.

What do you mean by Media?

- The communication channels through which we disseminate data or information from one location to another is called media.
- The media which used to disseminate data or information in multiple forms is called Multi-media.
- Example:
  - Internet
  - Television
  - Radio
  - Magazines
  - Newspapers etc.

- There are two types of media:
  1. Static media
  2. Dynamic media

What is meant by the terms static media and dynamic media?

Static media	Dynamic media
Static media content doesn't change.	Dynamic media content is constantly updated.
Static media is literal in the sense that the media it includes does not move.	Dynamic media is the complete opposite of static media and includes websites, social networking and online forums.
Newspapers, magazines, posters and books are all examples of static media.	For example, an Internet Social networking websites like Facebook, Twitter and LinkedIn.
Static media can also refer to those parts of your website that rarely change(landing pages, homepages).	A website is considered dynamic when it is frequently updated or changed.
Easy to create and control.	Difficult to create and control.
No interaction	Interactive

What do you mean by Mass Media?

- Mass media is any form of media used in communication to larger audience.
- It is a channels or networks used to communicate to people either in audio, visual, written, or orally.
- It is the primary means of communication used to reach the vast majority of the general public.
- The most common platforms for mass media are newspapers, magazines, radio, television, and the Internet.

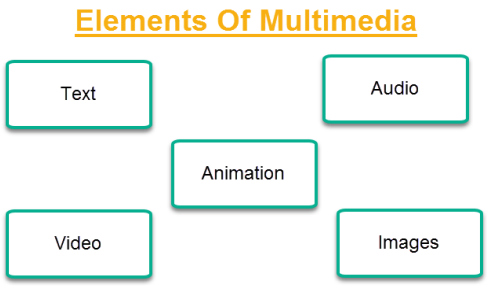
What is Multimedia?

- The word multi and media are combined to form the word multimedia.
- The word "multi" means "many" and media means communication channel/medium.
- Multimedia is a representation of information in an attractive and interactive manner with the use of a combination of text, audio, video, graphics and animation.
- In other words we can say that Multimedia is a computerized method of presenting information.
- For examples: E-Mail, Yahoo Messenger, Video Conferencing, and Multimedia Message Service (MMS).
- Multimedia as name suggests is the combination of Multi and Media that is many types of media (hardware/software) used for communication of information.

Elements of Multimedia:

There are 5 elements of multimedia :

1. Text
2. Image
3. Audio
4. Video and
5. Animation



Text:

- Text can be of any type like, a word, a single line or a paragraph.
- Any type of text editor can be used to develop textual data for multimedia.

Multimedia

MULTIMEDIA

MULTIMEDIA

Image:

- Image are an important component of multimedia.
- Basically multimedia presentations are graphics or image based.
- Information communication is much easier to remember and understand if it is represented through image.
- The images are generated by the computer in two ways:
  1. Bitmap or Raster image
  2. Vector image

Difference between raster and vector image:

Raster	Vector
Raster images are constructed through pixels.	It constructed through lines, curves, and fills.
Raster uses graphic formats like GIF, JPEG,PNG etc.	Vector uses graphic formats like EPS, WMF, & PICT etc.
They work best when it comes to editing photos.	They work best when it comes to drawings, illustrations, and logos.
We can use raster in Photoshop, and paint shops.	We can use vectors in CorelDraw and Inkscape.
It is complex and time consuming to transform a raster file to a vector photograph.	We can easily convert a vector image into a raster image.
We can easily convert a raster file into any file format.	We cannot change the vector files.

File extension	Type of file
.bmp	Bitmap image
.gif	Graphical Interchange Format
.png	Portable Network Graphic
.jpeg/.jpg	Joint Photographic Expert Group
.psd	Photoshop Document
.tiff	Tagged Image File Format

Audio:

- Sound is probably most important elements of multimedia.
- Any sound, whether it's music, conversation, or something else.
- Decibels are a unit of measurement for volume and sound pressure level.
- The various formats of sound/audio are:
  - MIDI (Musical Instruments Digital Interface)
  - Digital Audio

File extension	Type of file
.mid, midi	Musical Instruments Digital Interface
.rm, .ram	Real Audio File
.wav	Wave File
.wma	Windows Media Audio File
.mp3	MP3 Audio File

Video:

- Video can be defined as the display of recorded real events on a television screen.
- It can be refers to the sequence of natural scenes captured using analog or digital video capturing device.
- The video can be categorized in two types:
  1. Analog video
  2. Digital video

Animations:

- A sequence of still photographs is being flipped through.
- It's a set of visuals that give the impression of movement.
- Animation is the process of making a still image appear to move.

Types of Multimedia:

There are two types of multimedia:

1. Interactive multimedia
2. Non-interactive multimedia

Interactive multimedia:

- In-interactive multi-media, the sequence and timing of media objects can be controlled by the user.
- For example; take any video game, like Candy Crush is which user is able to control the direction and position of candies to crush with one another.

Non-interactive Multimedia:

- In-interactive multimedia the user simply watches the media as it plays from beginning to the end.
- He/she has no control over the flow.
- For example; a corporate presentation or a multimedia demo.

Applications of Multimedia:

Education

- Multimedia has a huge impact on education.
- Many College use different types of computer based teaching software.
- It is used to produce study materials which is very efficient for students.
- It is not necessary that teacher is available in class.
- Edutainment, which combines education and entertainment.
- This system gives learning in the form of enjoyment to the user.

Research:

- In the area of mathematical and scientific research, multimedia is primarily used for modelling and simulation.
- For example, looking at a molecular model by a scientist of a particular substance and manipulate it to arrive at a new substance.

Development:

- A multimedia designer create interactive games, product demonstrations, simulations, and eLearning courses for the web, desktops, mobile devices, DVDs, CDs, etc.
- Displayed in either linear or non-linear formats, the work of a multimedia designer can combine a wide variety of content, including bitmap images, vector artwork, audio, video, animation, native 3D, and text/hypertext.

Business

- Applications of multimedia in business are presentation, training, marketing, advertising, product demos, networked communication, etc.
- With the use of multimedia, the audience can easily understand a concept.
- It provides an effective and efficient way to grab the attention of the visitors and share information about various products easily.
- It is also used in business marketing to persuade customers to buy the products.

Gaming Industry:

- One of the most exciting applications of multimedia is games.
- Nowadays the live internet is used to play gaming with multiple players has become popular.
- In fact, the first application of multimedia system was in the field of entertainment and that too in the video game industry.
- The integrated audio and video effects make various types of games more entertaining.

Entertainment

- Entertainment and media industry are benefitted by multimedia technology.
- Images, animation and sound are broadly used for creation animation movies.
- A computer is broadly used by musicians to record, edit and mix sounds.
- The entertainment sector makes extensive use of multimedia.
- It's particularly useful for creating special effects in films and video games.
- Video games are more interesting because of the integrated audio and visual effects.

What is animation?

- An animation is a technique of building progressive image and running it in a sequence to create an effect of motion.
- It contains a series of rapidly changing objects which gives the illusion of movement.
- The image are called frames.
- These frames are rapidly moved in front of human eye and this is look like as the motion.
- In animation, the speed of each object is replaced by next, so the eye receive this as motion.
- Because our eyes can only retain an image for approx 1/10 of a second, when multiple images appear in fast succession, the brain blends them into a single moving image.
- Early cartoons are examples of this, but today, most animated movies are made with computer.
- The term animation is derived from the Latin word "anima" which means the soul.
- Animators create the art of animation.
- J. Stuart Blackton made the first animated film in 1906.
- Computer animation is the process used for digitally generating animated images.

What is Simulation?

- Simulation is an imitation or replication from the real thing.
- It is the representation of specific behavior of a selected system.
- It is used in safety engineering, teaching, testing and video games.
- Simulation is also used in scientific modeling for getting information about their working.
- Simulation is a mathematical model and it does not need a picture.
- It can be completely mathematical.
- Even if simulation is done in a cartoon, it is based on mathematical model including every aspect like background motion, human body motion, camera etc.
- All the movements are assessed with accuracy in simulation while in animation the artists have to just create sequence of any frame.

Difference Between Simulation and Animation:

Simulation	Animation
Simulation refers to creating replicas from the real version.	Animation is the method of creating an illusion of any movement by using rapid display images.
Simulation is a mathematical model that does not necessarily need pictures, it can be wholly mathematical.	Animation is a cartoon representation of a particular object or scenario.
Simulation is also used in scientific modeling for getting information about their working.	Animation can be also used on simulation.
All the movements are assessed with accuracy in simulation.	In animation the artists have to just create sequence of any frame.

UNIT – 02: MULTIMEDIA SYSTEM AND ITS APPLICATIONS

- Sound and Video cards.
- Compression techniques.
- Memory & Storage devices.
- Input devices, Output hardware,
- Communication device.
- Introduction of Multimedia authoring tools & its types.

Questions to be discussed:

1. What is multimedia system?
2. Discuss about sound card and video card in details.
3. Explain different types of compression technique in multimedia.
4. What is multimedia authoring tools? Discuss different types of authoring tools in multimedia.
5. Write short notes on:
   a. Communication devices
   b. Storage devices

What are Multimedia Systems?

- Any system that process multimedia data like text, sound, video, graphics, and animation is called multimedia system.
- It is responsible for developing a multimedia files.
- A multimedia files is a bundle of different kinds of data.
- It system is a system that can process and store two or more types of media materials in digital form.

What is sound card?

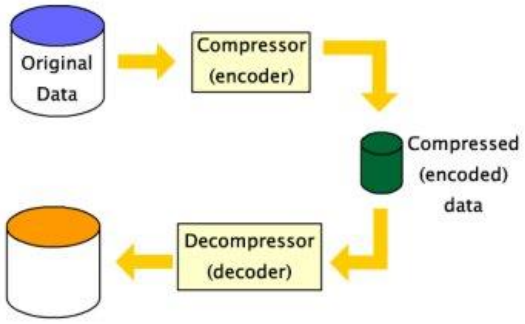
- A sound card is an expansion card for producing sound on a computer.
- A sound card mainly digitizes the analog signal and these digitized voice can be stored on hard disk.
- Its output sound can be heard with the help of speakers or headphones.
- A sound card is also known as an audio output device, sound board, or audio card.
- It was invented by Sherwin Gooch in 1972.
- The primary use of a sound card is to provide sound that you hear from playing music.
- There are many applications where a sound card can be used :
  - Games.
  - Watch movies.
  - Audio and video conferencing.
  - Business presentations.
  - Listening to music.

What is video card?

- Video card is hardware component of computer.
- It is used to create videos or images on the computer screen.
- A video card is an expansion card that connects to the motherboard.
- Video card is also known as graphics card, video adapter or video controller etc.
- IBM developed their first two video cards, the MDA (Monochrome Display Adapter) and CGA (Color Graphics Adapter), in 1981.

Compression techniques:

- It is a technique in which the size of data is reduced without loss of information.
- Data compression is used whenever there is a need to reduce the size of data.
- The use of data compression techniques in digital communication greatly helps in
  - reducing the time for a file transfer,
  - the cost of storage, and
  - traffic in the network.
- It is also known as compaction**.**
- There are two types of data compression techniques:
  1. Lossy
  2. Lossless



Difference between Lossy Compression and Lossless Compression:

Lossy Compression	Lossless Compression
Lossy compression reduces the size of data.	Lossless Compression does not reduce the size of data. It only "packs" data into a smaller file size.
In Lossy compression, Data's quality is compromised.	But Lossless Compression does not compromise the data's quality.
In Lossy, A file does not restore in its original form.	While in Lossless, A file can be restored in its original form.
It is also termed as irreversible compression.	It is also termed as reversible compression.
Lossy compression is used in Images, audio, video.	Lossless Compression is used in Text, images, sound.

Memory & Storage devices:

- A storage unit is a part of the computer system where data & instructions to be processed and stores the result after processing when required.
- Without a storage device, a computer would not be able to run or even boot up.
- we can say that a storage device is hardware that is used for storing data files.
- It can also store information/data both temporarily and permanently.
- Computer storage is of two types:
  1. Primary Storage Devices
  2. Secondary Storage Devices

Primary Storage Devices:

- It is also known as internal memory and main memory.
- This is a section of the CPU that holds program instructions, input data, and intermediate results.
- It is generally smaller in size, costly and high speed semiconductor memory.
- RAM (Random Access Memory) and ROM (Read Only Memory) are examples of primary storage.

Secondary Storage Devices:

- Secondary storage is a memory that is stored external to the computer.
- It is mainly used for the permanent and long-term storage of programs and data.
- Hard Disk, CD, DVD, Pen/Flash drive, SSD, etc, are examples of secondary storage.

Input Devices:

- It is a hardware component of computer system.
- It is used to enter the data & instruction into the computer.
- Input device enables the user to send data, information, or control signals to a computer.
- The CPU of a computer receives the input and processes it to produce the output.
- Some of the popular input devices are:
  - Keyboard
  - Mouse
  - Scanner
  - Joystick
  - Light Pen etc.

Output hardware:

- Presentation of multimedia project needs some devices through which the multimedia elements may be delivered to the user.
- It is a hardware component of computer system which is used to view result.
- Some of the popular output hardware are:
  - Monitor
  - Amplifiers & speakers
  - Video digitizing board
  - Projectors etc.

Communication device:

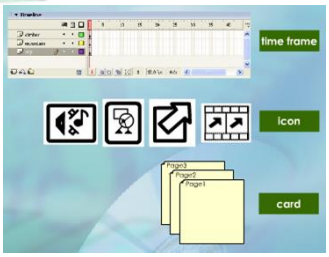
- Any hardware that can send & receive data, instructions & information is called communications device.
- It is a hardware device capable of transmitting an analog or digital signal over the telephone, other communication wire, or wirelessly.
- The most common example of a communication device is a computer modem.
- Communication device examples:
  - Bluetooth devices
  - Infrared devices
  - Modem (over phone line)
  - Network card (using Ethernet)
  - Smartphone
  - Wi-Fi devices.

Multimedia Authoring:

- Multimedia authoring is a process of assembling different types of media contents like text, audio, image, animations and video as a single stream of information with the help of various software tools.

Multimedia Authoring tools:

- An authoring tool is a software program that enables the developer to create presentation by combining text, audio, video, graphics and animation.
- Multimedia Authoring tools are also known as author ware.
- It gives the framework for organizing and editing the components of a multimedia project.
- These are the tools which provide the capability for creating complete multimedia presentations.
- There are 4 types of multimedia authoring tools:
  1. Card or Page based authoring tools
  2. Icon based or Event driven authoring tools
  3. Time based authoring tools



Card or Page based authoring tools:

- In these authoring tool, elements are organized as pages of a book or a stack of cards.
- It contains media objects such as text fields, buttons and graphics object.
- It provides facility for linking object to page and cards.
- You can jump from page to another page because all pages can be interrelated.
- Every page or cards may contain many media elements like sounds, videos and animations etc.
  - Hypercard(Mac)
  - Tool book (Windows)
  - PowerPoint (Windows)

Advantages

- Easy to understand.
- One screen = 1card or 1page.
- Easy to use as these tools provide template.
- Short development time.

Disadvantages

- Some run only on one platform.
- Tools are not powerful.

Icon based or Event driven authoring tools:

- Icon-based tools has simplest and easiest authoring process.
- It contains multimedia elements that are organized in the form of flowchart.
- Flowchart can be built by dragging appropriate icons from the library and adding the content.
- Each icon does a specific task, for example- plays a sound, open an image etc.
- Some examples of icon based tools are:
  - Author ware Professional (Mac/Windows)
  - Icon Author (Windows)

Advantages:

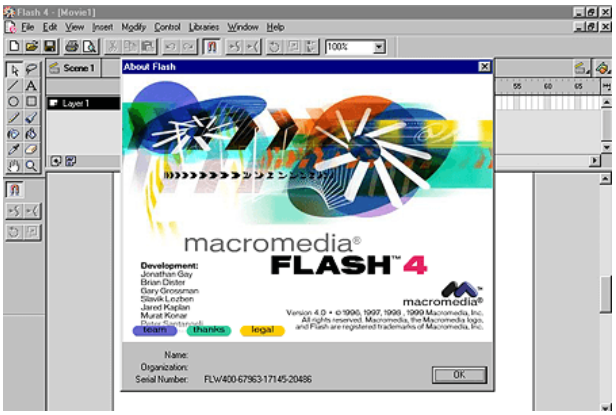
- Clear Structure.
- Easy editing and updating

Disadvantages:

- Difficult to learn.
- Expensive.

Time based authoring tools:

- Time based authoring tools allow the designer to arrange various elements and events of the multimedia project along a well defined time line.
- As the time advances from starting point of the project, the events begin to occur, one after another.
- The speed at which these transitions occur can also be accurately controlled.
- These tools are best to use for those projects, wherein the information flow can be directed from beginning to end much like the movies.
- Some example of Time based tools are:
  - Macromedia's Director
  - Macromedia Flash



Advantages

- Good for creating animation.
- Branching, user control, interactivity facilities.

Disadvantages

- Expensive
- Large file size

UNIT – 03: MULTIMEDIA SOFTWARE

- Features of any one of authoring tools such as
  - Macro-media
  - Adobe Photoshop
  - 3-D studio
  - Paint-Shop Pro
  - Animator Pro
  - Harvard graphics.

Questions to be discussed?

1. What is Multimedia software? Write the name of any four multimedia software.
2. **Describe the features of Macro-media and 3-D Studio authoring tools.**
3. **Describe the features of Adobe PhotoShop.**
4. Write short notes on:
   a. Adobe Photoshop
   b. 3-D studio
   c. Paint Shop Pro
   d. Harvard graphics

What is multimedia software?

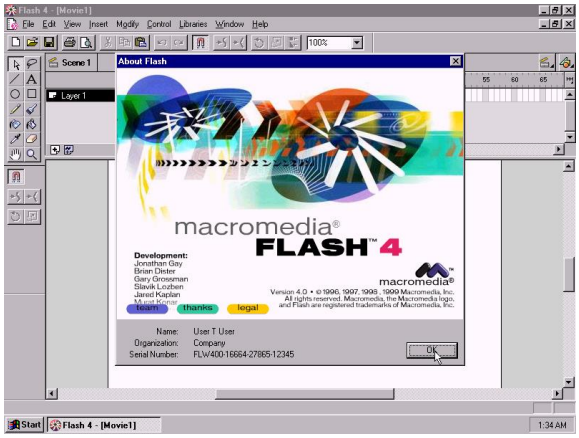
- In general, multimedia is a combination of different types of texts, graphics, sounds, effects, animations, images and video that can be effective to deliver our content.
- So, any software which helps us to deal with any of the above can be considered multimedia software.
- Like Adobe Photoshop, which is used to create an amazing effect in images, and Kinemaster is used for video editing.
- Examples:
  - Adobe Photoshop
  - Word Press
  - Video recorder
  - Audio recorder
  - VLC Media.
  - KMP Player.
  - Vid Mate.
  - iTunes.
  - Windows Media Player.

What is Macro-media?

- Macromedia is a web development software.
- It is a program that creates interactive animated media such as videos, presentations and websites.
- You can control an object's actions and behaviors using the Behavior panel and the Timeline.
- Macromedia formed in 1992 when Authorware and MacroMind/ParaComp merged.
- In 2002, Flash MX, an expanded Web development program, and Flash Player 6 are released.

Features of Macromedia in multimedia?

- Macromedia is an Authoring tool designed to build rich content that delivers real results.
- It is used to integrate interactive:
  - audio,
  - video,
  - bitmaps,
  - vectors,
  - text,
  - fonts, and more.

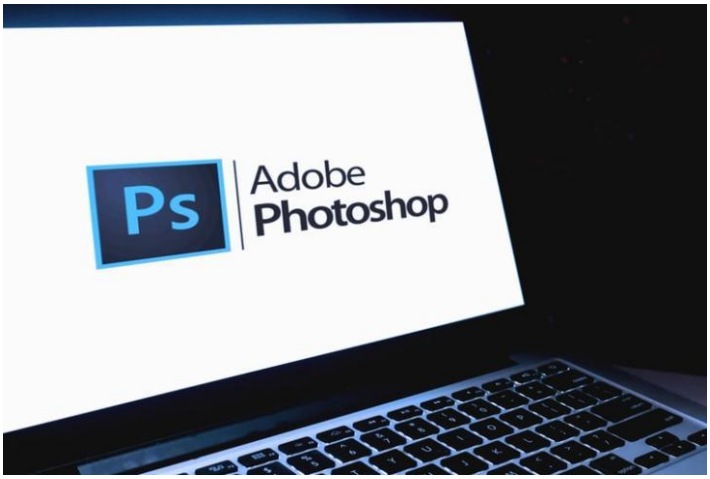


What is Adobe Photoshop?

- Adobe Photoshop is a popular multimedia software.
- Photoshop is a popular graphic design and photo editing software developed by Adobe.
- It can be used to create and edit digital images, as well as artwork for both digital and print media.
- Adobe Photoshop was first released in 1988.
- It is created by Thomas and John Knoll.
- It is published for both macOS and Windows, but not Linux.

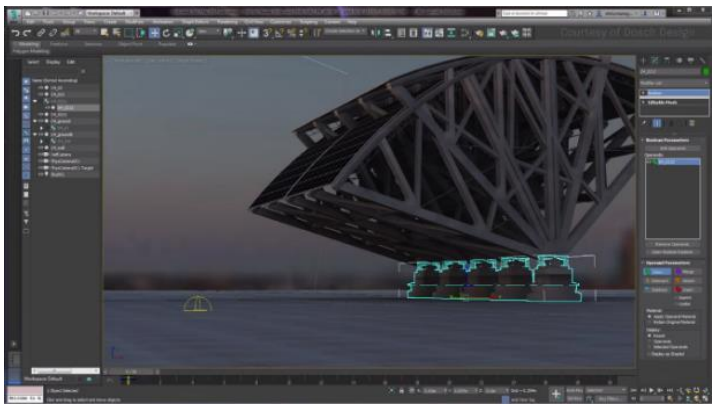
Features of Adobe Photoshop:

- Layers
- Adjustment Layers
- History Panel
- Regular Healing Brush
- Crop Tool
- Color Balance
- Levels and Curves
- Clone Stamp Tool
- Blending Modes
- Making a Selection



What is 3D studio?

- It is a professional 3D computer graphics program for making 3D animations, models, games & images.
- 3D studio is developed and produced by Autodesk Media and Entertainment.
- Now a days a 3D studio is known as 3D Max.
- It is a software program used to create 3D animation, models and imagery.
- It is a architectural software that is used in civil, mechanical & automobile engineering.
- It is also used in film industry and advertisement.



Paint Shop Pro:

- Paint Shop Pro software is specially designed for Microsoft Windows operating systems.
- Paint Shop Pro software is a raster as well as a vector graphics editor.
- It was originally published by Jasc Software.
- In October 2004, Corel purchased Jasc Software and the distribution rights to Paint Shop Pro.

Animator Pro:

- Animator Pro is a 256 color paint and animation package for MS-DOS.
- It was popular in the early 1990's for game art, online animation, business presentations etc.
- Originally released in 1989 by Autodesk, and licensed from Yost Group.
- Ani Pro was created by Peter Kennard, Gary Yost and Jim Kent.
- Autodesk Animator is a 2D computer animation and painting program published in 1989 for MS-DOS. It was considered groundbreaking when initially released.

Harvard Graphics:

- It is a graphic presentation program developed for DOS and later for Microsoft Windows.
- It allowed users to mix text, information, graphics, and charts into custom slide show presentations.
- Harvard Graphics was developed in 1986 by Software Publishing Corporation (SPC).
- It was the first desktop business application software that offered the ability to mix text and graphics to create visual slides for commercial purposes.
- Harvard Graphics was discontinued in 1991.

UNIT – 04: INTRODUCTION TO VIRTUAL REALITY

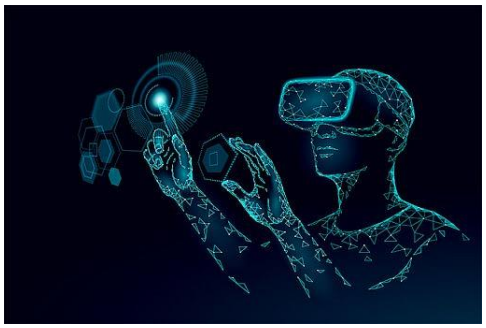
- Basic Concepts of virtual reality.

Questions to be discussed:

1. What is virtual reality? Write the application of virtual reality.
2. Explain different types of virtual reality.
3. Why we need a virtual reality?

What is virtual reality?

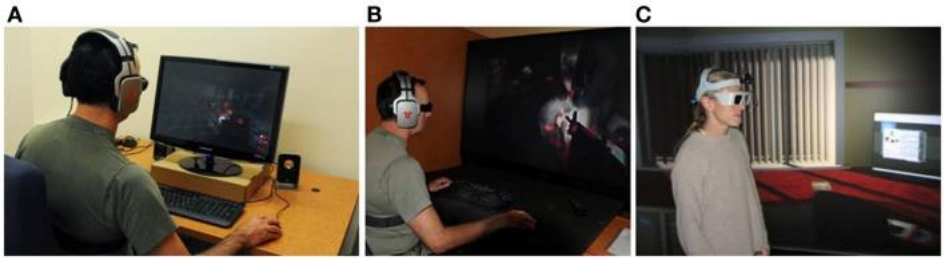
- The virtual reality derived from for two terms 'virtual' and 'reality'.
- The meaning of 'virtual' is near and reality is what we experience as human beings.
- So the term 'virtual reality' basically means 'near-reality'.
- VR is a computer-generated environment with scenes and objects that appear to be real.
- The environment is created with computer hardware and software.
- The users might also need to wear devices such as helmets or goggles to interact with the environment.



Types of virtual reality?

There are three types of VR:

1. Non-immersive VR
2. Semi-immersive VR
3. Full immersive VR

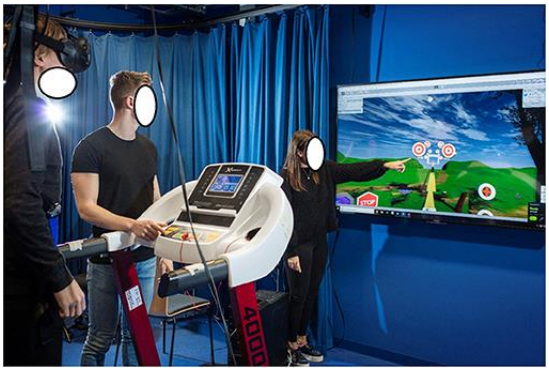


Non-immersive VR:

- It is a computer-based virtual environment where users can interact with a few characters or actions.
- It offers a less intense experience as compared to fully immersive is more affordable and widely used.
- The environment might also generate sound, depending on the program.
- The user has some control over the virtual environment using a keyboard, mouse or other device.
- Non-immersive virtual reality is commonly used in training programs
- A video game is a good example of non-immersive VR.

Fully immersive VR:

- Fully immersive virtual reality, also known as immersive VR.
- It is a technology that guarantees that the user's experience in the virtual world is real.
- It creates a complete sensory immersion that makes the user feel as though they are physically present in the virtual environment.
- This type of VR delivers the greatest level of virtual reality.
- Users wear special equipment such as helmets or goggles and able to interact with environment.
- There are two types of immersive experiences:
  1. One being when you are actually in a physical environment.
  2. The other type of experience is where you are shown around a real or imagined environment via desktop, tablet, mobile or via VR (Virtual Reality) headset.



Semi-immersive VR:

- It is a hybrid of non-immersive and fully immersive virtual reality.
- It makes a 3D virtual world that users can move around in.
- This type of VR offers a partial virtual experience that's accessed through a computer screen or some type of glasses or headset.
- It focuses on the visual 3D aspect of virtual reality and does not incorporate physical movement.
- A common example of semi-immersive VR is the flight simulator, which is used by airlines and militaries to train their pilots.

Need for Virtual Reality?

- It allows users to create simulated, interactive, and specifically designed environments for specific use.
- It is designed for human interaction or for a specific reason to create experiences.
- Unlike other reality technologies like AR and MR, VR enhances the user experience to the next level with its fully immersive and interactive technology.

Applications of Virtual Reality:

1. In Education

2. Training.

3. Medical terms' analysis and research are easier via VR.

4. In entertainment.

5. Prototyping helps the automotive industry avoid multiple designs and reduce resources by creating virtual designs using VR.

6. In terms of Defense, VR helps our brave men experience the battlefield environments in real-time to avoid unconditional situations in Reality.

UNIT – 05: MULTIMEDIA SYSTEM AND ITS APPLICATIONS

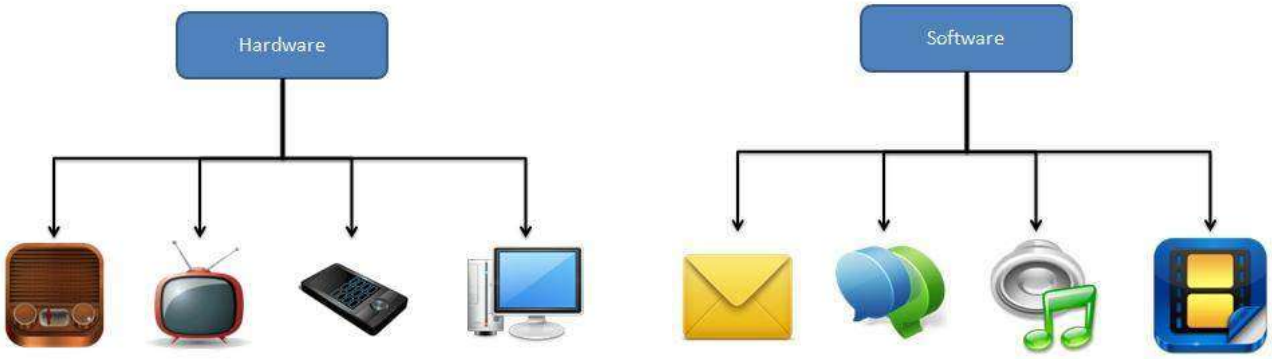
- Text & Images: Introduction, file format.
- Music & Sound: Audio basic concepts, Audio file format,
- Analog and Digital concepts,
- MIDI hardware, MIDI file, MIDI versus digital.
- Sound- editing process.
- Analog Video & Digital Video,
- Video capture & editing, Video file format.

Questions to be discussed:

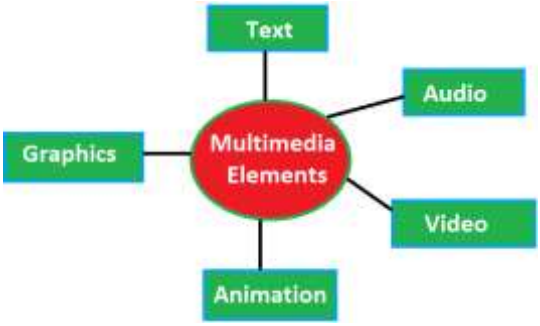
1. Define text and explain the use of text in multimedia with proper examples.
2. What do you mean by audio? Explain different types of audio file format.
3. What do you mean by MIDI? Explain analog and digital signal.
4. Compare the MIDI and Digital audio.
5. What is the use of video? Discuss about digital video.
6. Explain the process of video capturing and editing.

Multimedia:

- Multimedia is a computerized method of presenting information combining textual data, audio, video, graphics and animations.
- Examples: E-Mail, Yahoo Messenger, Video Conferencing, and Multimedia Message Service (MMS).
- Multimedia is the combination of Multi and Media that is many types of media (hardware/software).



Components of Multimedia: Text, Audio, Video, Graphics and Animation.



What is Text?

- Text is a component of multimedia.
- They are characters that are used to create words, sentences and paragraphs.
- It consists of alphanumeric characters, which are used to create information.
- The text provides information that has a meaning.
- Text is the simplest data type that requires the least storage and we can design the text accordingly.
- Text in multimedia presentations makes it easy to communicate a huge amount of information with relatively little storage.

Uses of text in multimedia:

- Text are used to construct words, phrases, and sentences.
- Text alone offers only one information source.
- They are the most popular communication elements in multimedia.
- Text is a piece of writing that you can read or make.
- Text messages are used for personal, family, business and social purposes.
- Governmental and non-governmental organizations use text messaging for communication between colleagues.

Audio:

- Sound is a meaningful speech in any language.
- A multimedia application may require the use of speech, music and sound effects.
- These are called audio or sound element of multimedia.
- Speech is also a perfect way for teaching.
- Audio are of analog and digital types.
- Analog audio or sound refers to the original sound signal.
- Computer stores the sound in digital form therefore, the sound used in multimedia is digital audio.

Audio file format:

- An audio file format is a file format for storing digital audio data on a computer system.
- Based on application different type of audio format are used.
- Audio formats are broadly divided into three parts:
  1. Uncompressed Format
  2. Lossy Compressed format
  3. Lossless Compressed Format

Uncompressed Audio Format:

- **PCM** –Pulse-Code Modulation.
- **WAV** –Waveform Audio File Format, it was developed by Microsoft and IBM in 1991.
- **AIFF** –Audio Interchange File Format. It was developed by Apple for Mac systems in 1988.

Lossy Compressed Format:

- It is a form of compression that loses data during the compression process.
  - **MP3** –MPEG Audio Layer 3. It was released in 1993 and became popular.
  - **AAC** –Advanced Audio Coding. It was developed in 1997 after MP3.
  - **WMA** –Windows Media Audio. It was released in 1999.

Lossless compression:

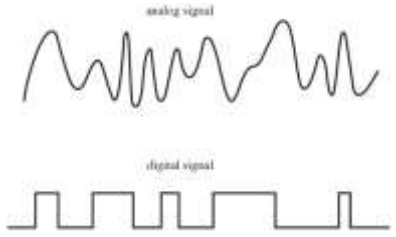
- This method reduces file size without any loss in quality.
  - **FLAC** –Free Lossless Audio Codec. It is most popular in its category and is open-source.
  - **ALAC** –Apple Lossless Audio Codec. It was launched in 2004 and became free after 2011.
  - **WMA** –Windows Media Audio. But it is least efficient in term of compression and is not open-source.

Difference between Lossy and Lossless file format:

Lossy	Lossless
Quality degrades due to higher rate of compression.	No loss in quality. Slight decreases in file sizes.
Permanently removes file data.	Restores and rebuilds compressed data.
When file information loss is acceptable.	When file information loss is unacceptable.
Applications in images, video, audio.	Applications in text, images, audio.
Image: JPG, JPEG **Audio:** MP3, AAC **Video:** MPEG, AVC, HEVC	**Images:** GIF, PNG, RAW, BMP **General:** ZIP **Audio:** WAV, FLAC

What is Signal?

- A signal is an electromagnetic or electrical current that is used for carrying data from one system to another.
- There are two types of signal:
  1. Analog signal
  2. Digital signal



What is an Analog Signal?

- A signal that is continuous function of time is known as a digital signal**.**
- These kind of signals works with physical values and natural phenomena such as earthquake, frequency, volcano, speed of wind, weight, lighting, etc.

What is a Digital Signal?

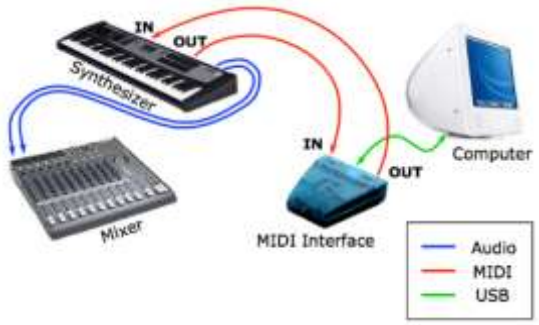
- A signal that is discrete function of time is known as a digital signal**.**
- The digital signals are represented in the binary form(0 and 1).

Differences between Analog and Digital Signal:

Analog	Digital
An analog signal is a continuous signal.	Digital signals are the discontinuous signal.
It is denoted by sine waves.	It is denoted by square waves.
It uses a continuous range of values to represent information.	Digital signal uses discrete 0 and 1 to represent information.
Temperature sensors, FM radio signals, Photocells, Light sensor are examples of Analog signals.	Computers, CDs, DVDs are some examples of Digital signal.
The analog signal bandwidth is low.	The digital signal bandwidth is high.
It is suited for audio and video transmission.	It is suited for Computing and digital electronics.

What is MIDI?

- MIDI stands for Musical Instrument Digital Interface.
- It is a technical standard that describes a communications protocol, digital interface, and electrical connectors that connect various electronic musical instruments, computers, and related audio devices for playing, editing, and recording music.
- It's a way to connect devices that make and control sound — such as synthesizers, samplers, and computers — so that they can communicate with each other, using MIDI messages.
- It is a description of how to create the sound based on pre-defined sound.
- MIDI recording never contains the human voice.
- MIDI does not transmit recorded sounds.
- MIDI was first announced in 1982, and by December it actually appeared on an instrument.
- It is used in instruments that have sound cards, synthesizers and sound generators that control music.
- The filename extension of MIDI format is .MIDI or .MID.



Synthesizer: It is an electronic musical instrument that generates audio signals.

Sampler: It is an electronic musical instrument that records and plays back samples (portions of sound recordings).

MID File Format:

- A file having .MID or .MIDI file extension is the MIDI file.
- It doesn't carry the actual audio content; hence, is quite smaller in size.

Differentiate between MIDI and Digital audio:

MIDI	Digital Audio
A MIDI file is a software for representing musical information in a digital format.	A digital audio refers to the reproduction and transmission of sound stored in a digital format.
MIDI recording never contains the human voice.	It recording contains the human voice.
Do not contain a recording of sound	Contain a recording of sound
No actual sound stored in MIDI file	Actual sound stored in digital audio file

What is video?

- The term video refers to the moving picture with sound such as a picture in television.
- Video element of multimedia application gives a lot of information in small duration of time.
- Digital video is useful in multimedia application for showing real life objects.
- Video have highest performance demand on the computer memory and on the bandwidth if placed on the internet.

Digital video:

- Digital video files can be stored in the computer and the quality of the video can still be maintained.
- The digital video files can be transferred within a computer network.
- The digital video clips can be edited easily.

Uses of video:

- Videos provides more personal feel to your message.
- Video provides strong visual cues.
- More effective in learning.
- You will be far more likely to connect on an emotional level with your audience.

Video file formats:

- There are various video file formats available that can be used for videos.
- It provide different-different video quality.
- Some of them are given below:
  - **.3GP:** 3GP is a compression file format created by 3GPP (3rd Generation Partnership Project).
  - **.MP4:** MP4 is a file format that was introduced in 1998, which stands for MPEG-4
  - **.AVI:** An AVI file is a sound and motion picture file, stands for Audio Video Interleaved.
  - **.MOV:** MOV stands for Metal oxide varistor is a MPEG 4 file format introduced by Apple in 1998.
  - **.WMV:** The WMV stands for Windows Media Video and is developed by Microsoft.

Video capturing:

- It is the process of converting an analog video signal to digital video and sending it to local storage.
- The resulting digital data are called digital video stream, simply video stream.

Video editing:

- Video editing includes cutting segments (trimming), re-sequencing clips, and adding transitions and other special effects.
- Several video clips from different tapes are recorded and after editing we can combine a single tape in the order that they will appear.