

CTEVT, DIPLOMA, QUESTION & SOLUTION

Multimedia Technology

(For Diploma III Yrs. II Part)

6th Semester



Arjun Chaudhary

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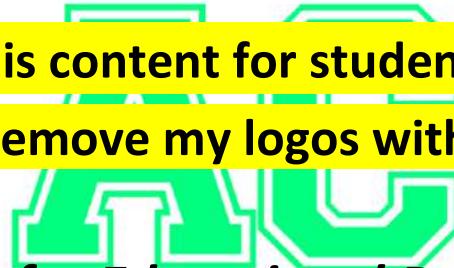
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ARJUN CHAUDHARY
2222120014283943

Multimedia Technology (DCOM/IT) 6th Sem

(2077) Question Paper Solution.

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1. What is multimedia? Classify different types of medium.

➤ **Multimedia** is a form of communication that combines different content forms such as text, audio, images, animations, or video into a single interactive presentation, in contrast to traditional mass media which featured little to no interaction from users, such as printed material or audio recordings.

➤ **The different types of media or mediums in multimedia are:-**

❖ Text :-



Text is the most common medium of representing information. In multimedia, the text is mostly used for titles, headlines, menus, etc. The most commonly used software for viewing text files are Microsoft Word, Notepad, Word pad, etc. Mostly the text files are formatted with, DOC, TXT, etc extensions.

❖ Audio :-

In multimedia audio means related to recording, playing, etc. Audio is an important component of multimedia because this component increases the understandability and improves the clarity of the concept. audio includes speech, music, etc. The commonly used software for playing audio files are:

- Quick Time
- Real player
- Windows Media Player

❖ **Graphics :-**

Every multimedia presentation is based on graphics. The use of graphics in multimedia makes the concept more effective and presentable. The commonly used software for viewing graphics is Windows Picture, Internet Explorer, etc. The commonly used graphics editing software is Adobe Photoshop through which graphics can be edited easily and can be made effective and attractive.

❖ **Video:-**

Video means moving pictures with sound. It is the best way to communicate with each other. In multimedia, it is used to make the information more presentable and it saves a large amount of time. The commonly used software for viewing videos are:



- Quick Time
- Window Media Player
- Real Player

❖ **Animation:**

In computers, animation is used to make changes to the images so that the sequence of the images appears to be moving pictures. An animated sequence shows a number of frames per second to produce an effect of motion in the user's eye.

2. Explain different attributes of sound waves in brief. Also Describe MIDI basic Concept.

➤ The different attributes of sound waves are:-

- **Wavelength:** The most important characteristic of sound waves may be the wavelength. Sound consists of a longitudinal wave that includes compressions and rarefactions as they travel through a given medium. The distance that one wave travels before it repeats itself is the wavelength. It is the combined length of a compression and the adjacent rarefaction, or the distance between the centers of two consecutive rarefactions or compressions.
- **Amplitude:** The amplitude is the size of a given wave. Think of it as sort of like the wave's height as opposed to its length. The amplitude is more accurately defined as the maximum displacement of the particles the sound wave disturbs as it passes through a medium.
- **Frequency:** The frequency of sound refers to the number of sound waves a sound produces per second. A low-frequency sound has fewer waves, while a high-frequency sound has more. Sound frequency is measured in hertz (HZ) and is not dependent upon the medium the sound is passing through.
- **Time period:** The time period is almost the opposite of the frequency. It is the time required to produce a single complete wave, or cycle. Each vibration of the vibrating body producing the sound is equal to a wave.
- **Velocity :-** finally, the velocity of the wave, sometimes referred to as the speed, is the amount of distance in meters per second that a wave travels in one second.

- **Musical Instrument Digital Interface (MIDI)** is a standard to transmit and store music, originally designed for digital music synthesizers. MIDI does not transmit recorded sounds. Instead, it includes musical notes, timings and pitch information, which the receiving device uses to play music from its own sound library.



Before MIDI, digital piano keyboards, music synthesizers and drum machines from different manufacturers could not talk to each other.

MIDI was developed in the early 1980s to provide interoperability between digital music devices. It was spearheaded by the president of Roland instruments and developed with Sequential Circuits, an early synthesizer company that Yamaha purchased in 1987. Other early adopters included Yamaha, Korg, Kawai and Moog.

The first MIDI-compatible instruments were released in 1983.

❖ Basic Concept of MIDI:-

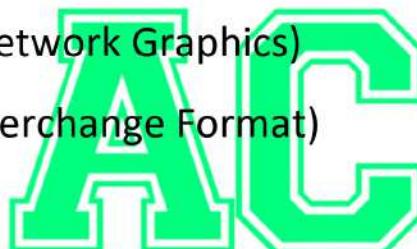
- MIDI involves sending and receiving digital messages between devices to control various aspects of sound production.
- Messages are encoded as binary data and transmitted through interfaces like USB, MIDI cables, or wireless connections.
- Messages consist of channels, each assignable to a specific instrument or sound, and can include control parameters such as volume and modulation.

3. What is an image? List the different file format of image. differentiate between vector and raster graphics.

➤ An image is a visual representation of an object, scene, or concept. It can be a photograph, a painting, a graphic, or any other visual medium that conveys meaning or information. Images are widely used in various fields such as art, advertising, education, and science.

➤ The most common file formats of images are:

- JPEG (Joint Photographic Experts Group)
- PNG (Portable Network Graphics)
- GIF (Graphics Interchange Format)
- BMP (Bitmap)
- TIFF (Tagged Image File Format)
- SVG (Scalable Vector Graphics)
- PSD (Adobe Photoshop Document)



➤ The Difference between Vector and Raster Graphics :-

Vector Graphics	Raster Graphics
They are composed of paths.	They are composed of pixels.
Vector displays flicker when the number of primitives in the image become too large.	In Raster Graphics, refresh process is independent of the complexity of the image.
Scan conversion is not required.	Graphic primitives are specified in terms of end points and must be scan converted into corresponding pixels.
Vector graphics draw continuous and smooth lines.	Raster graphics can draw mathematical curves, polygons and boundaries of curved primitives only by pixel approximation.
Vector graphics cost more as compared to raster graphics.	Raster graphics cost less.
They occupy less space.	They occupy more space which depends on image quality.
File Format:- .SVG, .EPS, .PDF, .AI, .DXF etc.	File Format:- .BMP, .TIFF, .GIF, .JPG, PDF etc.
Vector are best option for drawings, illustrations, and logos.	Raster are best option for photo editing.



4. Differentiate between video and animation. Explain different stages of computer based animation.



Feature	Video	Animation
Definition	A sequence of moving images with audio.	The illusion of motion created by displaying a series of frames.
Creation	Recorded through cameras or generated digitally.	Crafted by designing individual frames or images.
Nature	Represents real-life or digitally created content.	Can be computer-generated, hand-drawn, or stop-motion.
Components	Series of frames captured in real-time.	Intentionally designed frames played sequentially.
Purpose	Documenting events, storytelling, movies.	Entertainment, education, simulations, visual effects.
File Format	MP4, AVI, MOV, MKV.	GIF, APNG, SWF, various video formats (depending on style).

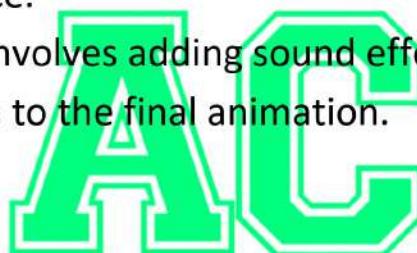


➤ Computer-based animation involves several stages in its creation.

Here are the typical stages:-

- **Planning:** This involves defining the scope of the project, identifying the target audience, and determining the overall message or story to be conveyed.
- **Storyboarding:** This stage involves creating a visual outline of the project, with rough sketches of each scene and an overview of the action and dialogue.
- **Design:** This stage involves creating the characters, objects, and backgrounds that will be used in the animation. This can be done in 2D or 3D using specialized software.

- **Modeling:** If the animation is 3D, this stage involves creating digital models of the characters, objects, and environments.
- **Rigging:** In 3D animation, this stage involves adding a digital "skeleton" to the models so that they can be animated and moved realistically.
- **Animation:** This stage involves creating the movement of the characters and objects. This can be done through traditional frame-by-frame animation, motion capture, or using software to create keyframes that define the movement.
- **Lighting and Texturing:** In 3D animation, this stage involves adding lighting and textures to the models and environments to make them look more realistic.
- **Rendering:** This stage involves converting the digital assets into a final video or image sequence.
- **Post-Production:** This involves adding sound effects, music, and any additional visual effects to the final animation.



5. What do you mean by data compression? Differentiate between Lossless compression method and lossy compression method.

- Data compression is the process of reducing the size of digital data while keeping the important information. It involves re-encoding data using fewer bits than the original representation. Lossy compression and Lossless compression are the categories of data compression.

S.NO	Lossy Compression	Lossless Compression
1.	Lossy compression is the method which eliminate the data which is not noticeable.	While Lossless Compression does not eliminate the data which is not noticeable.
2.	In Lossy compression, A file does not restore or rebuilt in its original form.	While in Lossless Compression, A file can be restored in its original form.
3.	In Lossy compression, Data's quality is compromised.	But Lossless Compression does not compromise the data's quality.
4.	Lossy compression reduces the size of data.	But Lossless Compression does not reduce the size of data.
5.	Algorithms used in Lossy compression are: Transform coding, <u>Discrete Cosine Transform</u> , Discrete Wavelet Transform, fractal compression etc.	Algorithms used in Lossless compression are: <u>Run Length Encoding</u> , <u>Lempel-Ziv-Welch</u> , <u>Huffman Coding</u> , Arithmetic encoding etc.
6.	Lossy compression is used in Images, audio, video.	Lossless Compression is used in Text, images, sound.
7.	Lossy compression has more data-holding capacity.	Lossless Compression has less data-holding capacity than Lossy compression technique.
8.	Lossy compression is also termed as irreversible compression.	Lossless Compression is also termed as reversible compression.

6. Explain the importance of Hypermedia database in modern application. Explain different types of multimedia database.

- A Hypermedia Database is a type of database that allows the integration of various types of media, such as text, images, audio, video, and hyperlinks, to be interconnected and linked together.
- **Why Hypermedia Databases are important in modern applications:-**
- Multimedia Integration: Hypermedia Databases facilitate the smooth integration of text, graphics, music, and video, thereby increasing the multimedia experience in modern applications.
 - Enhanced User Engagement: Increase user happiness by offering an immersive and interesting user experience through interactive content.
 - Cross-Platform Compatibility: Ensure that users have a consistent experience by supporting content accessibility across a range of devices and platforms.
 - Dynamic and Interactive Content: As current users' expectations change, support the development of dynamic and interactive content.
 - Effective Communication: Integrate several media formats to facilitate efficient information sharing, which would help apps like content management systems and e-learning platforms.
 - Hyperlinking for Navigation: Increase navigation and let people explore relevant material by using hyperlinks to link related pieces of information.

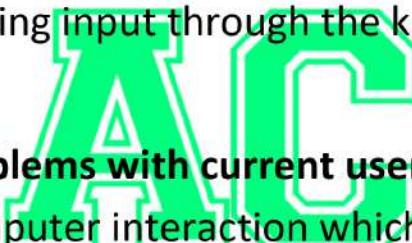
➤ The different types of multimedia database are :-

- **Relational Multimedia Databases:** These databases are based on the relational database model and use SQL as a query language to access multimedia data. They store multimedia data in binary large object (BLOB) data types. Relational multimedia databases are commonly used in business applications that require storing multimedia data such as images and videos.
- **Object-oriented Multimedia Databases:** These databases store multimedia data as objects, which can be manipulated using object-oriented programming concepts such as inheritance and polymorphism. Object-oriented multimedia databases are commonly used in applications that require complex data modeling, such as 3D modeling and simulation.
- **Time-series Multimedia Databases:** These databases are designed to store time-varying multimedia data, such as audio and video streams. They are commonly used in applications that require real-time processing of multimedia data, such as video surveillance and traffic monitoring systems.
- **Spatial Multimedia Databases:** These databases are designed to store spatial multimedia data such as images, videos, and maps. They provide support for spatial queries, which allow users to search for multimedia data based on their location.
- **Multimedia Document Databases:** These databases store multimedia data as documents, which can be accessed using document-oriented query languages such as XQuery. They are commonly used in applications that require managing large volumes of multimedia data such as digital libraries and content management systems.

7. Explain user Interface. Explain general design issues in multimedia in brief.

➤ **User interface** is the layer of the software or the program with which the end users interact in order to get his things done for e.g. processing of the information. This interaction today occurs with a graphical layer with which the user can interact with several input devices like keyboard, mouse, track balls, data gloves etc.

Multimedia user interface is just another computer interface where the users can interact with the computer by the use of multiple media, sometimes using multiple modes such as written text together with spoken language. Example is Microsoft word where the user can document his information either by giving input through the keyboard or through the microphone



➤ **There are still some problems with current user interfaces:-**

- One problem is computer interaction which is still neither natural nor effective.
- Another problem is the specification of object movement (specification of movement of graphics or text is more difficult than using a video motion).

➤ **The General design issues in multimedia include:-**

- **Content:** The content of the multimedia application must be relevant, engaging, and informative. It should be designed keeping the target audience in mind and should be presented in a way that is easy to understand.

- **Navigation:** The navigation of the multimedia application should be intuitive and easy to use. Users should be able to move around the content easily and find what they are looking for without much effort.
- **Layout:** The layout of the multimedia application should be visually appealing and consistent. The use of appropriate fonts, colors, and graphics should be consistent throughout the application.
- **Interactivity:** Interactivity is an important aspect of multimedia. The multimedia application should allow users to interact with the content in meaningful ways. Users should be able to control the playback, adjust the settings, and interact with the various elements of the multimedia presentation.
- **Compatibility:** The multimedia application should be compatible with different devices and platforms. It should be designed to work well on different screen sizes and resolutions.
- **Performance:** The multimedia application should perform well and should not be slow or unresponsive. It should be designed to load quickly and work smoothly even on slower devices.
- **Accessibility:** The multimedia application should be accessible to all users, including those with disabilities. It should be designed to be accessible to people with different levels of vision, hearing, and physical abilities.
- **Feedback:** The multimedia application should provide feedback to the user at all times. Users should be informed about what is happening and what actions they need to.

8. Describe about the four-layer synchronization reference model.

➤ The four-layer synchronization reference model are:-

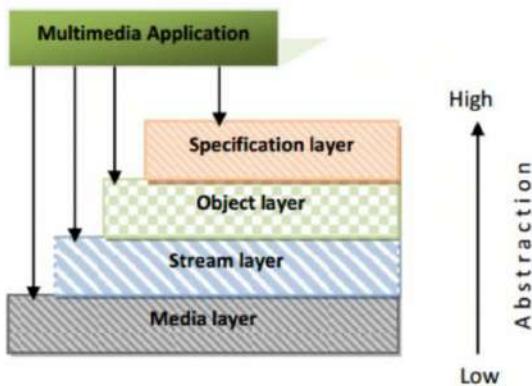


Figure: Four-layer reference model

- **Media layer** :- At the media layer, an application operates on a single continuous media stream, which is treated as a sequence of LDU. The abstraction offered at this layer is a device independent interface with operation like read and write. Media layer implementation can be classified into simple implementation and implementation that provide across two interleaved media stream.
- **Stream layer** :- Stream layer operates on continuous media stream as well as on groups of media streams. In a group, all streams are presented in parallel by using mechanisms for inter stream synchronization. Continuous media is seen in the stream layers as a data flow with implicit time constraint. Individual LDUs are not visible. The streams are executed in real time environment, where all processing is constrained by well-defined time specification. An application using the stream layer is responsible for starting, stopping and grouping the stream for the definition of the required QoS in terms of timing parameters supported by the stream layer. It is also responsible for the synchronization with time independent media object.

- **Object layer:-** Object layer operates on all types of media and hides the differences between discrete and continuous media. The abstraction offered to the application is that of a complete, synchronized presentation. This layer takes a synchronization specification as input and is responsible for the correct schedule of the overall presentation. The task of this layer is to close the gap between the needs for the execution of a synchronized presentation and the stream-oriented services. The functions located at the object layer are to compute and execute complete presentation schedule that include the presentation of the non-continuous media object and the calls to the stream layer.
- **Specification layer:-** The specification layer is an open layer. It doesn't offer an explicit interface. This layer contains application and tools are located that allow to create synchronization specification. Such tools are synchronization editors, multimedia document editors, and authoring systems. It also contains tools for converting specification to an object layer format. It is also responsible for mapping QoS requirements of the user level to the qualities offered at the object layer interface.

9. Write short notes on: (Any Two)

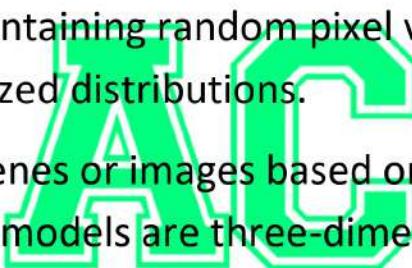
a) Trends in multimedia application

- Multimedia applications have come a long way since their inception, and today they are more advanced and diverse than ever before. Here are some current trends in multimedia applications:-
- **Augmented Reality (AR) and Virtual Reality (VR):** AR and VR technologies are being used to create more immersive and interactive multimedia experiences. They are particularly popular in the gaming industry but are also being used in fields such as education, healthcare, and architecture.
 - **Artificial Intelligence (AI):** AI is being used to enhance multimedia applications by providing intelligent features such as voice recognition, facial recognition, and object detection. AI can also be used to generate content, such as automated video editing or image generation.
 - **360-Degree Video:** This technology allows users to view content from every angle, creating a more immersive and engaging experience. 360-degree videos are particularly popular in the travel and tourism industry.
 - **Interactive Storytelling:** Interactive multimedia applications allow users to actively participate in the storytelling process. Users can make decisions that affect the outcome of the story, creating a more personalized experience.
 - **Cloud-Based Multimedia:** Cloud computing has made it easier for multimedia applications to be accessed and used from anywhere with an internet connection. This has led to the rise of cloud-based multimedia applications, which offer more flexibility and scalability than traditional on-premises applications.

- **Mobile-first Design:** With the increasing use of mobile devices, multimedia applications are being designed with a mobile-first approach. This means that the applications are optimized for use on smaller screens and touch interfaces.

b) Image Synthesis

- Image synthesis is the process of creating new images from some form of image description. The kinds of images that are typically synthesized include:
 - Test Patterns, Scenes with simple two dimensional geometric shapes.
 - Image Noise, Images containing random pixel values, usually generated from specific parametrized distributions.
 - Computer Graphics, Scenes or images based on geometric shape descriptions. Often the models are three-dimensional, but may also be two-dimensional.



Synthetic images are often used to verify the correctness of operators by applying them to known images. They are also often used for teaching purposes, as the operator output on such images is generally 'clean', whereas noise and uncontrollable pixel distributions in real images make it harder to demonstrate unambiguous results. The images could be binary, gray level or color.

c) Toolkits.

➤ **Toolkits** are used for controlling the audio and video data processing in a programming environment. Toolkit hides the process structures. It represents interfaces at the system software level.

Toolkits are also known as software development kits (SDKs), are sets of pre-designed software components that developers can use to build applications or software products. These components can include libraries, user interface controls, application programming interfaces (APIs), and other tools that simplify the development process.

Toolkits can be specific to a particular platform, programming language, or technology, such as web development, mobile app development, or game development. They can also be designed for specific purposes, such as data visualization, machine learning, or multimedia development.

Some popular toolkits used in software development include Microsoft Visual Studio, Java Development Kit, Android SDK, iOS SDK, and Unity Game Engine. By using toolkits, developers can focus on building the core functionality of their applications rather than worrying about low-level details, which can help them save time and improve the quality of their software products.

-The End-

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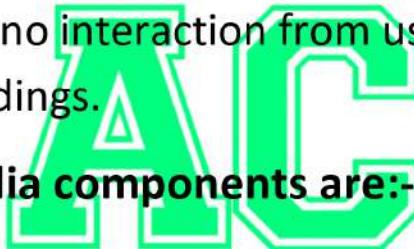
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1. Define multimedia. Explain various multimedia components.

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- **The Various multimedia components are:-**



❖ Text :-

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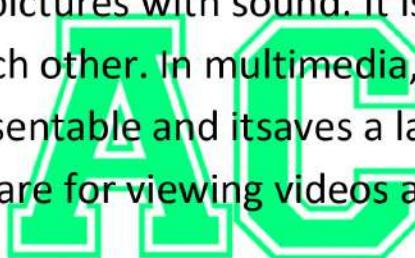
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❖ **Video:-**

Video means moving pictures with sound. It is the best way to communicate with each other. In multimedia, it is used to make the information more presentable and it saves a large amount of time. The commonly used software for viewing videos are:

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❖ **Animation:**

In computers, animation is used to make changes to the images so that the sequence of the images appears to be moving pictures. An animated sequence shows a number of frames per second to produce an effect of motion in the user's eye.

2. Define external storage and Graphical processing unit.

Describe about graphic and image editing in multimedia.

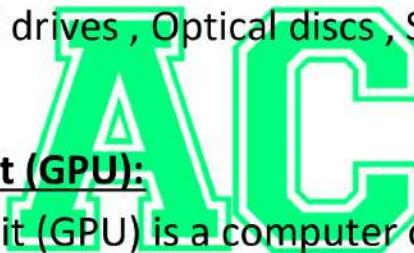
❖ External storage:

➤ External storage is a device that stores data outside of a computer's main system. It's also known as secondary storage or auxiliary storage.

External storage is non-volatile, meaning it can be disconnected and accessed elsewhere. It's often used for:

- Backups
- Transporting data between systems
- Increasing a computer's storage space

Some examples of external storage devices include: - Flash drives ,USB drives , CDs , DVDs ,Hard drives , Optical discs ,Solid state drives (SSDs) , Flash memory cards etc.



❖ Graphical Processing Unit (GPU):

➤ A graphics processing unit (GPU) is a computer chip that can render images and graphics. GPUs are used in many devices, including: Mobile phones, Personal computers, Workstations, Game consoles, Smartphones.

GPUs are designed to accelerate computer graphics and image processing. They can perform mathematical calculations at high speeds. Some features of GPUs include:

- Rendering polygons in 2D and 3D graphics
- Digital output to flat panel display monitors
- Texture mapping
- Support for high-intensity graphics software
- Support for YUV color space
- Hardware overlays
- MPEG decoding

GPUs are used for both professional and personal computing. They are best known for their use in providing the smooth graphics that consumers expect in modern videos and games.

❖ Graphic editing in multimedia

➤ Graphic editing in multimedia is the process of improving the quality of graphics or text. It involves adding, subtracting, or amending materials. The goal of graphic editing is to make the graphic item more readable, understandable, or communicable.

Graphic editing software allows users to create or edit computer graphics. These graphics can include:- App icons, Web graphics, Images, Clip arts, Illustrations, Designs etc.

Graphic editing software can be used to manipulate shapes, colors, and textures. This can create visual content for various media, such as: Print, Web, Multimedia, Advertising, Web design.



Graphic editing software can be grouped into three types:

- Vector graphics editors
- Raster graphics editors
- 3D modelers

Some common features of graphics packages include:

- Entering text
- Changing the size and style of font
- Changing the size of an object
- Rotating objects
- Stretching objects

❖ **Image editing in multimedia**

➤ Image editing is the process of enhancing or altering digital images using software tools and techniques. The goal is to improve the overall quality of the image or achieve a specific visual effect.

Some tasks that can be performed during image editing include:-

- Removing unwanted elements
- Adjusting the geometry
- Correcting lens aberrations
- Sharpening or softening the image
- Making color changes
- Adding special effects
- Adjusting white balance
- Adjusting exposure and contrast
- Adjusting color vibrancy and saturation



Some image editing tools include: -

- Adobe Photoshop
- Adobe Photoshop Lightroom
- Canva for Enterprise
- Photos
- Adobe Photoshop Lightroom Classic
- Photoshop Elements
- Adobe Photoshop Express
- GIMP
- Visme
- Canva

Some basic steps for editing photos include: -

- Cropping
- Cleaning up
- Adjusting white balance
- Adjusting exposure and contrast
- Adjusting color vibrancy and saturation
- Finalizing and sharing

3. Explain about hypertext and hypermedia. What do you mean by typeface and font?

➤ **Hypertext** is a method of linking digital documents that allows users to navigate between related information. Hypertext is text that contains links to other texts. Hypertext documents are interconnected by hyperlinks, which are typically activated by a mouse click, keypress set, or screen touch.



Hypertext is the backbone of the World Wide Web (WWW). It allows users to jump from one piece of information to another related piece of information. For example, reading an article on a website and clicking on an image takes the user to its associated page.

Hypertext can also include graphics, video, and sound. This is called Hypermedia.

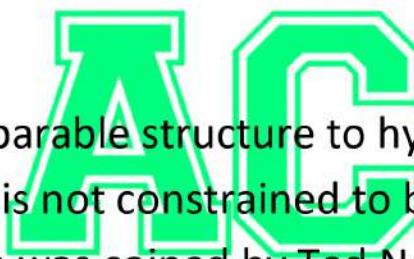
The term hypertext was coined by Ted Nelson around 1965.

➤ **Hypermedia** is a nonlinear medium of information that includes graphics, audio, video, plain text, and hyperlinks. It's an extension of the term hypertext. Hypermedia is different from multimedia, which may include non-interactive linear presentations.

Hypermedia is a way to build information systems made up of nodes of various media connected together by a collection of associative links. Hypermedia allows users to click images, movies, graphics, and other media apart from text to create a nonlinear network of information.

Here are some examples of hypermedia:

- World Wide Web :- Allows users to access multiple web locations.
- Microsoft Office :- Allows clients to embed hypertext and hyperlinks into documents



Hypermedia has a comparable structure to hypertext.

Hypertext is text which is not constrained to be linear. It contains links to other texts. The term was coined by Ted Nelson around 1965.

➤ **A typeface** is a set of characters of the same design. These characters include letters, numbers, punctuation marks, and symbols. Some popular typefaces include Arial, Helvetica, Times, and Verdana. While most computers come with a few dozen typefaces installed, there are thousands of typefaces available. Because they are vector-based (not bitmaps), typefaces can be scaled very large and still look sharp. The term "typeface" is often confused with "font," which is a specific size and style of a typeface. For example, Verdana is a typeface, while Verdana 10 pt bold is a font. It's a small difference but is good to know.

➤ **Font** :- A font is a variation in the weight and size of a typeface. So when a typeface is aroman, bold, italic, condensed, size, or any other variable, that's called a font.

4. What is graphics? List and explain various image formats.

➤ A **graphic** is an image or visual representation of an object. Therefore, computer graphics are simply images displayed on a computer screen. Graphics are often contrasted with text, which is comprised of characters, such as numbers and letters, rather than images. Computer graphics can be either two or three-dimensional.

❖ **There are two types of graphics used in multimedia:-**

- Bitmaps: Also called raster graphics, bitmaps represent images as an array of dots called pixels.
- Vectors: Also called draw graphics.

➤ There are various image formats used to store and display digital images. **Here are some of the most common formats and their explanations:-**

- **JPEG (Joint Photographic Experts Group)**: It is a lossy compression format that is commonly used for photographs and other complex images with lots of color variations. The format is widely supported, and the compression can be adjusted to control file size.
- **PNG (Portable Network Graphics)**: It is a lossless compression format that is commonly used for graphics, logos, and icons. The format preserves image quality and supports transparency, making it useful for web design and other applications where images need to be overlaid on other elements.

- **GIF (Graphics Interchange Format)**: It is a format that supports animated images and short video clips. It uses a lossless compression method and supports transparency, making it useful for web design and social media.
- **BMP (Bitmap)**: It is a format that stores images as pixels without any compression. The format is primarily used in Windows environments and is not suitable for images with a large file size.
- **TIFF (Tagged Image File Format)**: It is a lossless compression format that is commonly used in professional photography and printing. The format supports high-quality images and can store multiple images in a single file.
- **RAW**: It is a format used in professional photography that captures all of the image data from a camera sensor without any compression or processing. The format provides the highest quality images but requires specialized software to convert to other formats.
- **SVG (Scalable Vector Graphics)**: It is a format that stores vector graphics, which are images made up of mathematical shapes rather than pixels. The format can be scaled to any size without losing quality and is commonly used for logos, icons, and illustrations on the web.
- **PDF**:- Pdf is an abbreviation that stands for **Portable Document Format**. It's a versatile file format created by Adobe that gives people an easy, reliable way to present and exchange documents-regardless of the software, hardware, or operating system being used by anyone who views the document.

These are some of the most common image formats, each with its own strengths and weaknesses, and are chosen based on the specific needs of the user

5. Describe the standards for Video broadcasting. Explain about Graphics editing Software.

➤ There are several standards for video broadcasting, which define various aspects of the video signal such as resolution, frame rate, aspect ratio, and color space. Some of the most common standards include:-

- **NTSC (National Television Standards Committee)**: It is a standard used primarily in North America and parts of South America and Asia. It uses a resolution of 720 x 480 pixels and a frame rate of 29.97 frames per second (fps).
- **PAL (Phase Alteration Line)**: It is a standard used primarily in Europe, Australia, and parts of Asia. It uses a resolution of 720 x 576 pixels and a frame rate of 25 fps.
- **SECAM (Système Electronique Pour Couleur Avec Mémoire)** : It is a standard used primarily in France, Russia, and parts of Asia. It uses a resolution of 720 x 576 pixels and a frame rate of 25 fps.
- **HDTV (High Definition Television)**: It is a high-definition standard that uses a resolution of 1920 x 1080 pixels and a frame rate of 60 fps. It is used primarily for broadcast television and Blu-ray discs.
- **4K/UHD**: It is an ultra-high-definition standard that uses a resolution of 3840 x 2160 pixels or 4096 x 2160 pixels and a frame rate of 60 fps. It is used for high-end televisions and digital cinema.
- **ATSC (Advanced Television Systems Committee)** : It's a non-profit organization that develops technical standards for digital terrestrial television and data broadcasting. ATSC standards are used for digital television transmission over cable, satellite, and terrestrial networks.

➤ **Graphics editing software** is used to create, edit, and manipulate digital images and graphics. There are several software tools available, each with its own features and capabilities. Some of the most popular graphics editing software include:-

- **Adobe Photoshop:** It is a powerful graphics editing software that is widely used by photographers, designers, and artists. It includes a wide range of tools for image editing, retouching, and compositing.
- **Adobe InDesign:** Adobe InDesign is a desktop publishing software application used for creating and designing digital or print materials such as flyers, brochures, magazines, newspapers, books, and more. It is developed by Adobe Systems and was first released in 1999.
- **Adobe Illustrator:** It is a vector graphics editor that is used for creating illustrations, logos, and other types of graphics. It includes tools for drawing, painting, and typography.
- **CorelDRAW:** It is a vector graphics editor that is similar to Adobe Illustrator. It includes tools for drawing, painting, and typography, as well as tools for page layout and design.
- **GIMP:** It is a free and open-source graphics editing software that is similar to Adobe Photoshop. It includes tools for image editing, retouching, and compositing.
- **Inkscape:** It is a free and open-source vector graphics editor that is similar to Adobe Illustrator. It includes tools for drawing, painting, and typography.

These software tools are used for various purposes such as digital painting, graphic design, web design, and photo editing.

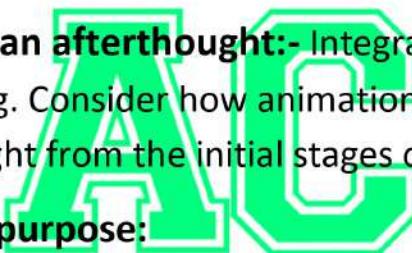
6. What is animation? Write down the guideline for using animation. Explain briefly about morphing.

➤ **Animation** is a method of photographing successive drawings, models, or even puppets, to create an illusion of movement in a sequence. 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. In traditional animation, pictures are drawn or painted on transparent celluloid sheets to be photographed. Early cartoons are examples of this, but today, most animated movies are made with computer-generated imagery or CGI.

➤ **The guideline for using animation are:-**

1. Animation shouldn't be an afterthought:- Integrate animation into the design process from the beginning. Consider how animation can enhance user interactions and convey information right from the initial stages of design.

2. Animation must serve a purpose:



a) Soften harsh cuts:- Use animations to create smooth transitions between different states or screens, avoiding abrupt changes that may be jarring to users.

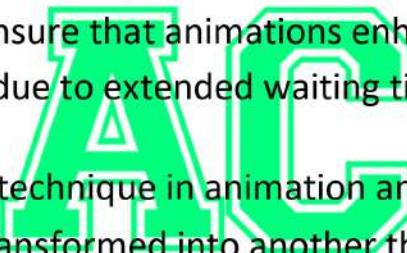
b) Provide context:- Use animations to give users a sense of context, guiding them through the interface and helping them understand relationships between different elements.

c) Provide orientation:- Utilize animations to highlight changes in the interface and guide users, making it clear where they are and how they got there

d) Provide instant feedback:- Use animations to acknowledge user actions promptly, providing feedback that helps users understand that their interactions have been recognized.

e) Make the content feel alive:- Employ subtle animations to breathe life into the interface, making it more engaging and dynamic without distracting from the main content.

- f) **Storytelling**:- Use animations to tell a narrative, guiding users through a sequence of actions or providing information in a story-like manner.
3. **Animation must reflect the brand**:- Ensure that the style and behavior of animations align with the overall brand identity, maintaining consistency throughout the user experience.
4. **Animation shouldn't be the hero**:- Avoid excessive or flashy animations that steal attention from the main content or functionality. Animations should complement the user experience, not overshadow it.
5. **Animation must feel natural**:- Design animations that mimic real-world movements and interactions. Natural-feeling animations contribute to a more intuitive and user-friendly experience.
6. **Animation must not waste time**:- Optimize the duration and speed of animations to avoid unnecessary delays. Ensure that animations enhance the user experience without causing frustration due to extended waiting times.



➤ **Morphing** is a special effect technique in animation and motion pictures where one image or shape is gradually transformed into another through a seamless transition. This effect is typically accomplished using computer software that can morph one image into another by creating a series of in-between frames.

Morphing can be used to create smooth transitions between objects or to transform characters in a story. For example, it can be used to show a character transforming into a different form or shape, such as a werewolf transforming from a human form. Morphing can also be used to create special effects, such as showing a building morphing into a spaceship.

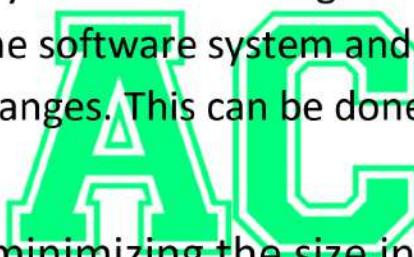
The process of morphing involves breaking down the two original images into a series of points or "control points," and then using algorithms to interpolate between the control points to create the in-between frames. This creates a smooth and seamless transition between the two images, giving the impression that they are morphing into one another.

Morphing is commonly used in special effects for movies, TV shows, and video games, and can be a powerful tool for creating visually stunning and engaging content.

7. What is regression testing? Explain about image and Video Compression.

- **Regression testing** is a type of software testing that involves retesting the existing software system after making any changes or modifications to ensure that it continues to function as intended and that the changes do not have any unintended consequences. The purpose of regression testing is to ensure that the changes made to the software do not cause any new defects or problems in the existing functionality.

Regression testing typically involves creating a set of test cases that cover the existing functionality of the software system and then executing those test cases after making any changes. This can be done manually or using automated testing tools.



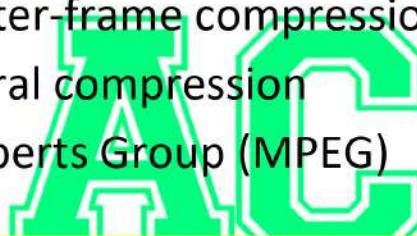
- **Image compression** is minimizing the size in bytes of a graphics file without degrading the quality of the image to an unacceptable level. The reduction in file size allows more images to be stored in a given amount of disk or memory space. It also reduces the time required for images to be sent over the Internet or downloaded from Web pages.

There are two main types of image compression:-

- **Lossless Compression:** Lossless image compression doesn't take away the image's quality but leaves it in a bigger file size
- **Lossy Compression:** Lossy image compression has a slight loss in quality but keeps images in a smaller file size.

- **Video compression** is the process of reducing the total number of bits needed to represent a given image or video sequence. Video compression is most commonly performed by a program with a specific algorithm or formula for determining the best way to shrink the size of the data. Video compression algorithms such as H.264/AVC or H.265/HEVC reduce the raw content data by as much as 1,000 times.
- Video compression can be done using any of the following techniques:-

- Lossy compression and Lossless compression
- Intra-frame and inter-frame compression
- Spatial and temporal compression
- Moving Picture Experts Group (MPEG)



8. What are the applications of Photoshop? Differentiate between lossy and lossless compression.

- Photoshop is a powerful software tool that has many applications across a wide range of industries. Some common applications of Photoshop include:-
 - **Photo editing and retouching:** Photoshop is widely used for editing and retouching photos to improve their appearance, adjust colors, remove unwanted objects, and more.
 - **Graphic design:** Photoshop is a popular tool for graphic designers, who use it to create logos, brochures, business cards, and other marketing materials.

- **Digital painting:** Photoshop's painting tools make it a favorite among digital artists who create illustrations, character designs, and other artwork.
- **Web design:** Photoshop is commonly used for designing and creating web graphics, including website layouts, buttons, and icons.
- **Image composition:** Photoshop's layer-based editing system makes it ideal for combining multiple images into a single composition, creating collages, and more.
- **Video editing:** Photoshop can also be used to edit and enhance video footage, including adding effects, color correction, and more.
- **3D modeling:** Photoshop can be used for creating 3D models, textures, and other assets for use in video games, movies, and other applications.
- **Textile design:** Photoshop is also used in the textile industry to create patterns and designs for fabrics, wallpaper, and other materials.



Overall, Photoshop is a versatile tool with a wide range of applications, making it an essential tool for many creative professionals.

➤ **The different between lossy and lossless compression are:-**

S.NO	Lossy Compression	Lossless Compression
1.	Lossy compression is the method which eliminate the data which is not noticeable.	While Lossless Compression does not eliminate the data which is not noticeable.
2.	In Lossy compression, A file does not restore or rebuilt in its original form.	While in Lossless Compression, A file can be restored in its original form.
3.	In Lossy compression, Data's quality is compromised.	But Lossless Compression does not compromise the data's quality.
4.	Lossy compression reduces the size of data.	But Lossless Compression does not reduce the size of data.
5.	Algorithms used in Lossy compression are: Transform coding, <u>Discrete Cosine Transform</u> , Discrete Wavelet Transform, fractal compression etc.	Algorithms used in Lossless compression are: <u>Run Length Encoding</u> , <u>Lempel-Ziv-Welch</u> , <u>Huffman Coding</u> , Arithmetic encoding etc.
6.	Lossy compression is used in Images, audio, video.	Lossless Compression is used in Text, images, sound.
7.	Lossy compression has more data-holding capacity.	Lossless Compression has less data-holding capacity than Lossy compression technique.
8.	Lossy compression is also termed as irreversible compression.	Lossless Compression is also termed as reversible compression.

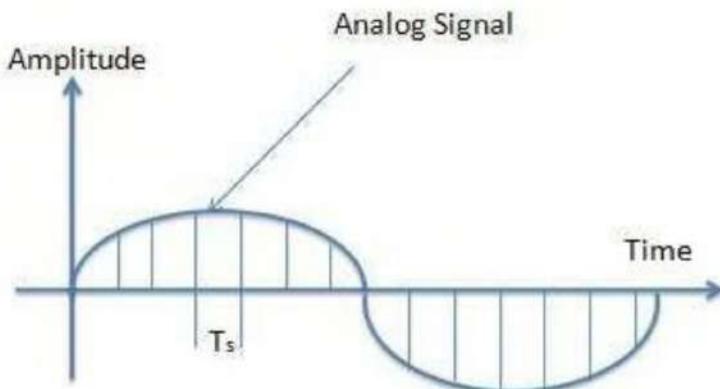
9. Write short notes on : (Any Two)

a) Bitmap Vs Vector

BITMAP	VECTOR
A type of graphics that represents a rectangular grid of pixels, viewable via a monitor, paper or another display medium	A type of graphics defined in terms of 2D points that are connected by lines, curves to form polygons and other shapes
Uses pixels	Uses basic geometric shapes
.jpg, .gif, .png, .tiff, .psd are some types	.ps, .eps, .svg, .ai,.cdr and .svg are some types
Resolution dependent, so they are not resizable without reducing the picture quality	Resolution independent, so they are resizable without reducing the picture quality
File size is more	File size is less
Possible to edit images to some extent	Possible to edit images without reducing the quality
Suitable for photographs	Suitable for logos, icons, clipart, and abstract images

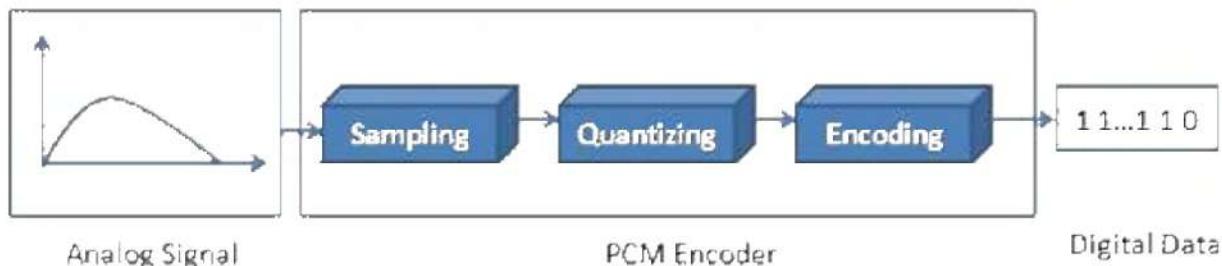
b) Audio Digitization

➤ Digitization is the process of converting analog signals to digital signals. **There are three steps of digitization of sound:-**



- **Sampling :-** Sampling is a process of measuring air pressure amplitude at equally spaced moments in time, where each measurement constitutes a sample. A sampling rate is the number of times the analog sound is taken per second. A higher sampling rate implies that more samples are taken during the given time interval and ultimately, the quality of reconstruction is better. The sampling rate is measured in terms of Hertz, Hz in short, which is the term for Cycle per second.
- **Quantization :-** Quantization is a process of representing the amplitude of each sample as integers or numbers. How many numbers are used to represent the value of each sample known as sample size or bit depth or resolution. Commonly used sample sizes are either 8 bits or 16 bits. The larger the sample size, the more accurately the data will describe the recorded sound. An 8-bit sample size provides 256 equal measurement units to describe the level and frequency of the sound in that slice of time. A 16-bit sample size provides 65,536 equal units to describe the sound in that sample slice of time.

- **Encoding** :- Encoding converts the integer base-10 number to a base-2 that is a binary number. The output is a binary expression in which each bit is either a 1(pulse) or a 0(no pulse).



c) Application of multimedia

➤ To communicate the message in the form of pictures, sound, video, animation is the primary role of multimedia. Some of the applications of multimedia are as follows:



❖ **Multimedia in Education**:- Multimedia is becoming popular in the field of education. It is commonly used to prepare study material for the students and also provide the proper understanding of different subjects. Nowadays Edutainment, a combination of Education and Entertainment has become very popular. This system provides learning as well as provides entertainment to the user.

❖ **Multimedia in Entertainment**:- Computer graphics techniques are now commonly used in making movies and games. This increases the growth of multimedia.

- **Movies**:- Multimedia used in movies gives a special audio and video effect. Today multimedia has totally changed the art of making movies in the world. The difficult effects, actions are only possible through multimedia.

- **Games:-** Multimedia used in games by using computer graphics, animation, videos has changed the gaming experience. Presently, games provide fast action, 3-D effects, and high-quality sound effects which is only possible through multimedia.
- ❖ **Multimedia in Business:-** Today multimedia is used in every aspect of a business. These are some of the applications:

- **Videoconferencing:-** This system enables communication using audio and video between two different locations through their computers. When the information is sent across the world, this technology provides cost benefits to the business which saves their time, energy, and money.
- **Marketing and advertising:-** Nowadays different advertising and marketing ideas about any product on television and the internet are possible with multimedia.



-The End-

Multimedia Technology (DCOM) 6th Sem

(2079) Question Paper Solution.

Compile & Written by © Arjun Chy

Website :- www.arjun00.com.np

Facebook :-www.facebook.com/Arjun00.com.np

1. Define multimedia. Write the components of multimedia.

Explain the application of multimedia.

➤ Multimedia is a form of communication that combines different content forms such as text, audio, images, animations, or video into a single interactive presentation, in contrast to traditional mass media which featured little to no interaction from users, such as printed material or audio recordings.

➤ **The Various multimedia components are:-**

- **Text** :- Text is the most common medium of representing information.
- **Audio** :- In multimedia audio means related to recording, playing, etc.
- **Graphics** :- Every multimedia presentation is based on graphics.
- **Video**:- Video means moving pictures with sound.
- **Animation**: Animation is used to make changes to the images so that the sequence of the images appears to be moving pictures.

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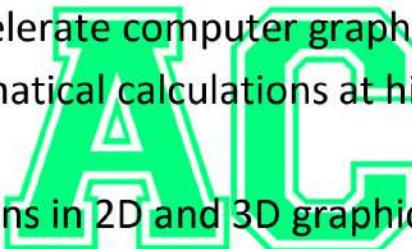
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- **Marketing and advertising**:- Nowadays different advertising and marketing ideas about any product on television and the internet are possible with multimedia.

2. What is analog and digital data? Explain about USB, graphics card and graphical processing unit (GPU).

- **Analog data** refers to a method of representing information through continuous signals that exhibit smooth variations over a range and can assume an infinite number of values. Examples of analog data encompass the continuous movement of clock hands, fluctuating voltage levels, or the gradual changes in temperature within a space.
- **Digital data** is a means of representing information using discrete signals, typically in the binary system with 0s and 1s. In the digital realm, information is categorized into distinct values, enabling efficient storage, processing, and transmission. Computers rely on digital principles, employing binary code to represent and manipulate data. Instances of digital data include text, images, videos, and various forms of information processed by digital devices.
- **USB (Universal Serial Bus)** is a communication port that connects peripheral devices like keyboard, mouse, speaker, printer, mobile phone with the computer. It is developed with the target of connecting slow to fast speed device. It has replaced many varieties of serial and parallel port. It also provides electrical power supply to low powered devices. Different versions of USB are: USB 1.0, USB 2.0 and USB 3.0.

- **Graphics card** is a hardware which is used to increase the video memory of a computer, and make its display quality more high-definition. It makes the computer more powerful and gives it the capacity to do more high-level works. The quality of the image depends on the quality of the graphics card. It is very much important for gaming and video editing on a PC.
- A **graphics processing unit** (GPU) is a computer chip that can render images and graphics. GPUs are used in many devices, including: Mobile phones, Personal computers, Workstations, Game consoles, Smartphones.

GPUs are designed to accelerate computer graphics and image processing. They can perform mathematical calculations at high speeds. Some features of GPUs include:-



- Rendering polygons in 2D and 3D graphics
- Digital output to flat panel display monitors
- Texture mapping
- Support for high-intensity graphics software
- Support for YUV color space
- Hardware overlays
- MPEG decoding

GPUs are used for both professional and personal computing. They are best known for their use in providing the smooth graphics that consumers expect in modern videos and games.

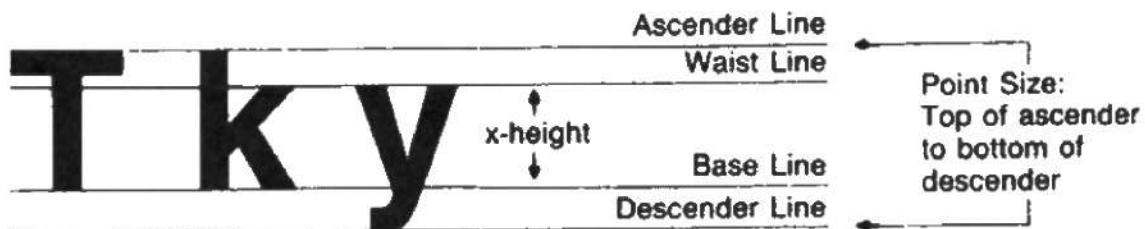
3. Differentiate between hypertext and hypermedia. Write the guidelines for text design.



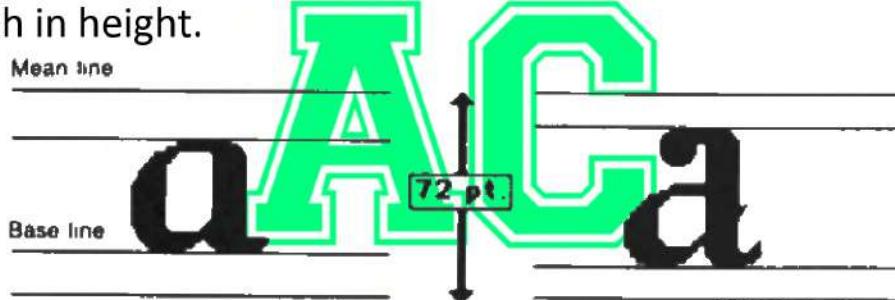
Features	Hypertext	Hypermedia
Definition	Hypertext is the text that connects to other text blocks in the same or a distinct document.	Hypertext is an extension of hypermedia, which is not just text-based.
Involvement	It involves only text.	It involves images, video, graphics, audio, etc.
User Experience	The usage of hypertext encourages the user to move across the document and also from one page to another.	Hypermedia is more attractive to users than hypertext since it allows for greater mobility.
Application	Users may easily switch between documents by clicking on the hypertext or goto links.	It expands the capabilities of hypertext and allows users to move to another page by clicking text or other multimedia.
Relation	It is a part of hypermedia.	It comes in the superior-level entity.
Method	It is a non-linear way.	It is a linear way.
Link	Only the text becomes a component of the link in this case.	It is an improved version of hypertext in which, in addition to text, other multimedia becomes a part of the link.

❖ Text Design Guidelines

- Text is measured in points. The point size of the type is determined by measuring the height of the type body. The point size is found by measuring the distance from the uppermost limit of an upward-reaching letter (ascender), such as b, f, h, k, or l; to the lowermost limit of a downward-projecting letter (descender), such as g, j, p, or y.



1 point equals 0.0138 inches and 72 points equal 1 inch. So a 72 point font will be 1 inch in height.



Text sizes usually used for reading matter and/or body copy are 9 to 12 points. Display sizes usually used for headlines (heads), titles, and subhead lines (subheads) are 14 points and larger

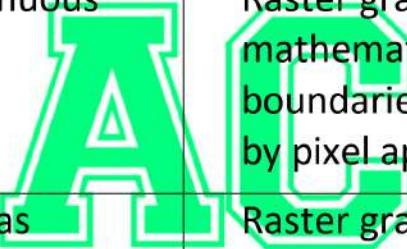
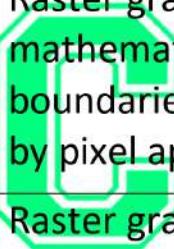
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4. List the different graphics editing software. Differentiate between raster and vector image with example.

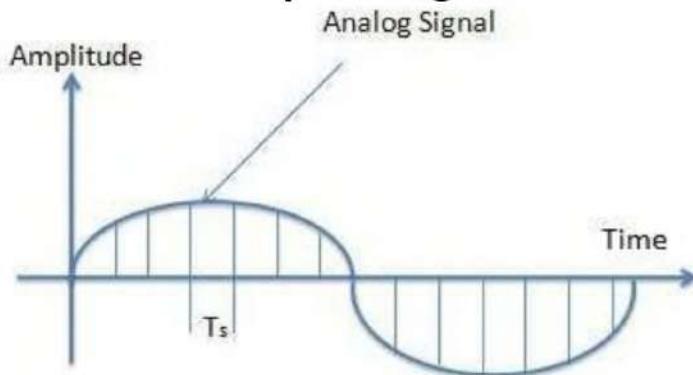
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Vector image	Raster image
They are composed of paths.	They are composed of pixels.
Vector displays flicker when the number of primitives in the image become too large.	In Raster Graphics, refresh process is independent of the complexity of the image.
Scan conversion is not required.	Graphic primitives are specified in terms of end points and must be scan converted into corresponding pixels.
Vector graphics draw continuous and smooth lines. 	Raster graphics can draw mathematical curves, polygons and boundaries of curved primitives only by pixel approximation. 
Vector graphics cost more as compared to raster graphics.	Raster graphics cost less.
They occupy less space.	They occupy more space which depends on image quality.
File Format:- .SVG, .EPS, .PDF, .AI, .DXF etc.	File Format:- .BMP, .TIFF, .GIF, .JPG, PDF etc.
Vector are best option for drawings, illustrations, and logos.	Raster are best option for photo editing.
For example :- 	For Example :- 

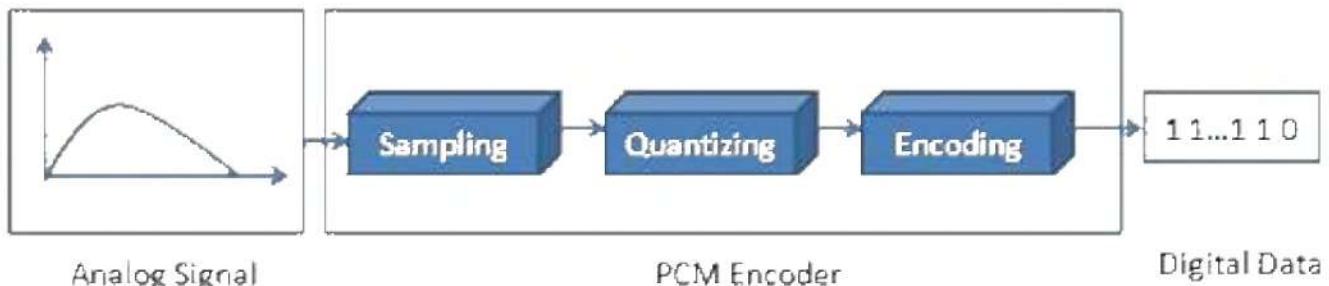
5. Define and explain audio digitization. Write about audio file formats.

- Digitization is the process of converting analog signals to digital signals. **There are three steps of digitization of sound:-**



- **Sampling** :- Sampling is a process of measuring air pressure amplitude at equally spaced moments in time, where each measurement constitutes a sample. A sampling rate is the number of times the analog sound is taken per second. A higher sampling rate implies that more samples are taken during the given time interval and ultimately, the quality of reconstruction is better. The sampling rate is measured in terms of Hertz, Hz in short, which is the term for Cycle per second.
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- **Encoding** :- Encoding converts the integer base-10 number to a base-2 that is a binary number. The output is a binary expression in which each bit is either a 1(pulse) or a 0(no pulse).



❖ **Audio File Format**

➤ Some Audio Formats:-

- .EC3 - Enhanced Audio Codec 3 File
- .WPROJ - Wwise Project File
- .WEBA - WebM Audio File
- .FLP - FL Studio Project
- .ABC - ABC Music Notation
- .MP3 - MP3 Audio File
- .CKB - Cricket Audio Bank File
- .SDT - Electronic Arts Sound Data File
- .L - Left Audio Channel File
- .CGRP - Pro Tools Clip Group File
- .UST - UTAU Sequence Text File
- .4MP - 4-MP3 Database File
- .WAV - WAVE Audio File
- .VLC - VLC Playlist
- .OGG - Ogg Vorbis Audio File

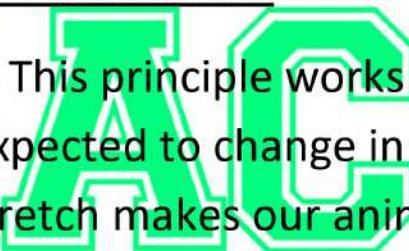


6. What is animation? Explain the principles of animation. List application of animation.

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➤ The Principles of animation are:-

- **Squash and Stretch:-** This principle works over the physical properties that are expected to change in any process. Ensuring proper squash and stretch makes our animation more convincing.



For Example: When we drop a ball from height, there is a change in its physical property. When the ball touches the surface, it bends slightly which should be depicted in animation properly.

- **Anticipation:-** Anticipation works on action. Animation has broadly divided into 3 phases:-
 - a) Preparation phase
 - b) Movement phase
 - c) Finish

In Anticipation, we make our audience prepare for action. It helps to make our animation look more realistic.

For Example: Before hitting the ball through the bat, the actions of the batsman comes under anticipation. These are those actions in which the batsman prepares for hitting the ball.

- **Arcs:-** In Reality, humans and animals move in arcs. Introducing the concept of arcs will increase the realism. This principle of animation helps us to implement realism through projectile motion also.

For Example, The movement of the hand of the bowler comes under projectile motion while bowling.

- **Slow in-Slow out:-** While performing animation, one should always keep in mind that in reality the object takes time to accelerate and slow down. To make our animation look realistic, we should always focus on its slow in and slow out proportion.

For Example, It takes time for a vehicle to accelerate when it is started and similarly when it stops it takes time.



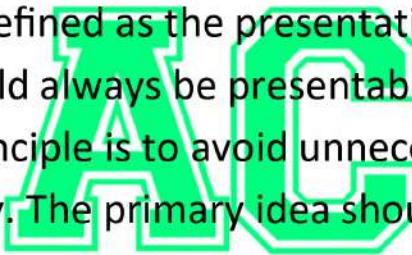
- **Appeal:-** Animation should be appealing to the audience and must be easy to understand. The syntax or font style used should be easily understood and appealing to the audience. Lack of symmetry and complicated design of character should be avoided.
- **Timing:-** Velocity with which the object is moving effects animation a lot. The speed should be handled with care in case of animation.

For Example, An fast-moving object can show an energetic person while a slow-moving object can symbolize a lethargic person. The number of frames used in a slowly moving object is less as compared to the fast-moving object.

- **3D Effect:-** By giving 3D effects we can make our animation more convincing and effective. In 3D Effect, we convert our object in a 3-dimensional plane i.e., X-Y-Z plane which improves the realism of the object.

For Example, a square can give a 2D effect but a cube can give a 3D effect which appears more realistic.

- **Exaggeration:-** Exaggeration deals with the physical features and emotions. In Animation, we represent emotions and feeling in exaggerated form to make it more realistic. If there is more than one element in a scene then it is necessary to make a balance between various exaggerated elements to avoid conflicts.
- **Staging:-** Staging is defined as the presentation of the primary idea, mood or action. It should always be presentable and easy to manner. The purpose of defining principle is to avoid unnecessary details and focus on important features only. The primary idea should always be clear and unambiguous.
- **Secondary Action:-** Secondary actions are more important than primary action as they represent the animation as a whole. Secondary actions support the primary or main idea.



For Example, A person drinking a hot tea, then his facial expressions, movement of hands, etc comes under the secondary actions.

- **Follow Through:-** It refers to the action which continues to move even after the completion of action. This type of action helps in the generation of more idealistic animations.

For Example: Even after throwing a ball, the movement of hands continues.

- **Overlap:-** It deals with the nature in which before ending the first action, the second action starts.

For Example: Consider a situation when we are drinking Tea from the right hand and holding a sandwich in the left hand. While drinking tea, our left-hand starts showing movement towards the mouth which shows the interference of the second action before the end of the first action.

➤ **The application of animation are:-**

- Entertainment
- Advertising
- Education
- Scientific and engineering studies
- Training
- Marketing



7. What is software testing? List the different software testing.

Write about the compression techniques used in multimedia.

- **Software Testing** is a method to check whether the actual software product matches expected requirements and to ensure that software product is Defect free. It involves execution of software/system components using manual or automated tools to evaluate one or more properties of interest. The purpose of software testing is to identify errors, gaps or missing requirements in contrast to actual requirements.

➤ The different levels of Software testing :-

- **Unit Testing:** This is the testing of individual software components or modules to ensure that they function correctly and meet their specifications. Unit testing is usually performed by developers themselves as part of the development process.
- **Integration Testing:** Integration testing is the process of testing how different software components work together as a whole. This is done to ensure that the system is functioning as intended and that all the components are working together seamlessly.
- **System Testing:** This is the testing of the complete software system as a whole. System testing checks if the software meets its functional and non-functional requirements and if it meets the user's needs. This testing is typically performed by a dedicated testing team.
- **Acceptance Testing:** Acceptance testing is performed to ensure that the software product meets the customer's requirements and that it is ready for deployment. This testing is usually performed by the customer or end-users of the software.
- **Performance Testing:** Performance testing is performed to test the speed, scalability, and stability of the software system under different conditions, such as different user loads or network speeds.
- **Regression Testing:** Regression testing is performed to ensure that changes made to the software system do not adversely affect the existing functionality of the system. It is done after any change to the software to make sure that everything still works as expected.

- **Security Testing:** Security testing is performed to identify and mitigate potential security risks and vulnerabilities in the software system. It is done to ensure that the system is secure and protected from external threats.
- **Usability Testing:** Usability testing is performed to evaluate the software's user interface and overall user experience. It is done to ensure that the software is user-friendly and easy to use.
- **Alpha Testing:** This is a form of internal acceptance testing performed mainly by the in-house software QA and testing teams. Alpha testing is the last testing done by the test teams at the development site after the acceptance testing and before releasing the software for beta test.

Alpha testing can also be done by potential users or customers of the application. Still, this is a form of in-house acceptance testing.



- **Beta Testing :** This is a testing stage followed by the internal full alpha test cycle. This is the final testing phase where companies release the software to a few external user groups outside the company's test teams or employees. This initial software version is known as the beta version. Most companies gather user feedback in this release.
- **Gamma Testing :** Gamma testing is the final stage of the testing process conducted before software release. It makes sure that the product is ready for market release according to all the specified requirements. Gamma testing focuses on software security and functionality.

Each type of testing has its own goals and objectives, and they are all necessary for ensuring the quality of the software product.

➤ There are two primary types of compression techniques used in multimedia are :- Lossy and Lossless Compression.

S.NO	Lossy Compression	Lossless Compression
1.	Lossy compression is the method which eliminate the data which is not noticeable.	While Lossless Compression does not eliminate the data which is not noticeable.
2.	In Lossy compression, A file does not restore or rebuilt in its original form.	While in Lossless Compression, A file can be restored in its original form.
3.	In Lossy compression, Data's quality is compromised.	But Lossless Compression does not compromise the data's quality.
4.	Lossy compression reduces the size of data.	But Lossless Compression does not reduce the size of data.
5.	Algorithms used in Lossy compression are: Transform coding, <u>Discrete Cosine Transform</u> , Discrete Wavelet Transform, fractal compression etc.	Algorithms used in Lossless compression are: <u>Run Length Encoding</u> , <u>Lempel-Ziv-Welch</u> , <u>Huffman Coding</u> , Arithmetic encoding etc.
6.	Lossy compression is used in Images, audio, video.	Lossless Compression is used in Text, images, sound.
7.	Lossy compression has more data-holding capacity.	Lossless Compression has less data-holding capacity than Lossy compression technique.
8.	Lossy compression is also termed as irreversible compression.	Lossless Compression is also termed as reversible compression.

8. Write short notes on: (any TWO)

a) Multimedia Network

➤ A multimedia network refers to a network infrastructure that is designed to efficiently transmit, receive, and manage multimedia data, which includes a combination of text, audio, graphics, animation, and video. Multimedia networks are essential for various applications such as video conferencing, online streaming, telecommunication, virtual classrooms, and entertainment services. These networks must have the capacity and capabilities to handle the unique requirements of multimedia data, which often involves large file sizes and real-time delivery constraints.

➤ The key aspects of multimedia networks:-

- **Bandwidth Requirements**:- Multimedia data, especially high-quality video and audio, requires substantial bandwidth for transmission. The network infrastructure must be capable of providing sufficient bandwidth to ensure smooth and high-quality multimedia streaming.
- **Quality of Service (QoS)**:- QoS mechanisms are crucial in multimedia networks to prioritize and manage traffic effectively. This ensures that real-time multimedia applications receive the necessary network resources to maintain acceptable quality levels.
- **Protocols and Standards**:- Specific protocols and standards are employed to facilitate the efficient transfer of multimedia data. Examples include Real-Time Transport Protocol (RTP) and Real-Time Streaming Protocol (RTSP) for streaming multimedia content.

- **Real-Time Communication:-** Some multimedia applications, such as video conferencing and online gaming, demand low latency and minimal delay to support real-time communication. Multimedia networks need to minimize packet loss and latency to provide a seamless user experience.
- **Multimedia Compression:-** Compression techniques are widely used to reduce the size of multimedia files, making them easier to transmit over networks. Compression algorithms like those used in JPEG for images or MPEG for video are common in multimedia applications.
- **Content Delivery Networks (CDNs):-** CDNs are often employed to enhance the distribution of multimedia content by strategically placing copies of content on servers closer to end-users. This reduces latency and improves overall content delivery speed.
- **Scalability:-** Multimedia networks must be scalable to accommodate a growing number of users and increasing data demands. This scalability is crucial for services like online streaming platforms that experience variable and often high levels of demand.
- **Security Considerations:-** Multimedia networks need robust security measures to protect against unauthorized access, content piracy, and other potential threats. Encryption and secure protocols play a significant role in ensuring the confidentiality and integrity of multimedia data.
- **Wireless Multimedia Networks:-** Wireless networks, including Wi-Fi and mobile networks, are integral to the proliferation of multimedia content on various devices. These networks must address challenges such as signal strength, interference, and bandwidth limitations.

b) Font and Typeface

➤ A **font** is a set of letters, numbers, punctuation, and other symbols that can be used to set text. Fonts can be used in both print and digital text. A font is a physical embodiment of a typeface.

A typeface is a design of letters, numbers, and other symbols. A typeface can include variations in size, weight, slope, and width. Each variation of a typeface is a font.

Some fonts share similarities in weight, width, and style. These fonts make up a typeface, which is a family of related fonts. So when a typeface is a roman, bold, italic, condensed, size, or any other variable, that's called a font.



➤ A **typeface** is a set of characters of the same design. These characters include letters, numbers, punctuation marks, and symbols. Some popular typefaces include Arial, Helvetica, Times, and Verdana. While most computers come with a few dozen typefaces installed, there are thousands of typefaces available. Because they are vector-based (not bitmaps), typefaces can be scaled very large and still look sharp. The term "typeface" is often confused with "font," which is a specific size and style of a typeface. For example, Verdana is a typeface, while Verdana 10 pt bold is a font. It's a small difference but is good to know.

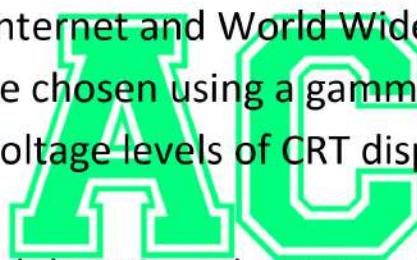
c) Computer Color

➤ A combination of Red, Green, and Blue is commonly used to represent color in computer contexts; this color model is known as RGB.

➤ The Computer Color Representation :-

- **sRGB** :- The sRGB color space (standard red, green, blue) was created jointly by Hewlett-Packard and Microsoft for use on the Internet. It has been endorsed by the W3C, Exif, Intel, Pantone, Corel, and many other industry players. It is also well accepted by open-source software such as the GIMP, and is used in proprietary and open graphics file formats such as SVG.

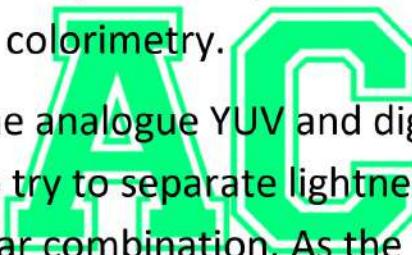
sRGB is intended as a common color space for the creation of images for viewing on the Internet and World Wide Web (WWW), the resultant color space chosen using a gamma of 2.2, the average response to linear voltage levels of CRT displays at that time.



- **Adobe RGB** :- The Adobe RGB color space was developed by Adobe Systems in 1998. It was designed to encompass most of the colors achievable on CMYK color printers, but by using RGB primary chromaticities on a device such as the computer display. The Adobe RGB color space encompasses roughly 50% of the visible colors specified by the Lab color space, improving upon the gamut of the sRGB color space primarily in cyan-greens.
- **Adobe Wide Gamut RGB** :- The Adobe Wide Gamut RGB color space was developed by Adobe Systems as an alternative to the standard sRGB color space. It is able to store a wider range of color values than sRGB. The Wide Gamut color space is an expanded version of the Adobe RGB color space, developed in 1998.

As a comparison, the Adobe Wide Gamut RGB color space encompasses 77.6% of the visible colors specified by the Lab color space, whilst the standard Adobe RGB color space covers just 50.6%. One of the downsides to this color space is that approximately 8% of the colors representable are imaginary colors that do not exist and are not representable in any medium. This means that potential color accuracy is wasted by reserving these unnecessary colors.

- **Rec. 2100 :-** Rec. 2100 is a color space standardized by ITU and used for HDR-TV. It has a peak luminance of at least 1,000 cd/m²[6] (higher than the 100 cd/m² limit of SDR and color spaces such as Rec. 709 and Rec. 2020). It uses a non-gamma transfer function (PQ or HLG) and system colorimetry (chromaticity of color primaries and white point) identical to Rec. 2020 system colorimetry.
- **YCbCr and YUV :-** The analogue YUV and digital YCbCr refer to a variety of linear methods to try to separate lightness from chroma signals in an RGB input using linear combination. As the input RGB values are gamma-corrected, such a separation does not truly produce lightness and two chroma signals, but a "luma" signal and two "chrominance" signals instead.



YUV is originally used in video: as human eyes have less resolution in its color perception, it is more economical to put more of the bandwidth in encoding Luma. The same principle is used in YCC. In YCC, separating also has the added benefit of removing most of the correlation between the input channels, therefore providing better compression. YCoCg is a version of YCbCr with extremely simple coefficients. It results in faster computation, lossless conversion, and apparently better decorrelation. ICtCp is used similarly to YCC in video compression, but is more appropriately described as a high dynamic range uniform color space.

- **CMYK and CMY:-** CMYK is used in the printing process, because it describes what kinds of inks need to be applied so the light reflected from the substrate and through the inks produces a given color. One starts with a white substrate, and uses ink to subtract color from white to create an image. CMYK stores ink values for cyan, magenta, yellow and black. There are many CMYK color spaces for different sets of inks, substrates, and press characteristics.

d) Photoshop

➤ **Photoshop** is a photo editing and raster graphic design software which allows users to create, edit, and manipulate various graphics as well as digital art. It also allows you to create and edit raster images with multiple layers and import the images in various file formats. Photoshop is developed by Adobe Systems for both Windows and MacOS.

➤ Version History of Photoshop:-

- 2003 – Photoshop CS (Version 8)
- 2005 – Photoshop CS2 (Version 9)
- 2007 – Photoshop CS3 (Version 10)
- 2008 – Photoshop CS4 (Version 11)
- 2010 – Photoshop CS5 (Version 12)
- 2012 – Photoshop CS6 (Version 13)
- 2013 – Photoshop CC (Version 14)
- 2014 – Photoshop CC 2014 (Version 15)
- 2015 – Photoshop CC 2015 (Version 16 and Version 17)
- 2016 – Photoshop CC 2017 (Version 18)
- 2017 – Photoshop CC 2018 (Version 19)
- 2018 – Photoshop CC 2019 (Version 20)
- 2019 – Photoshop 2020 (Version 21)
- 2021 – Photoshop 2021 (Version 22)

❖ Photoshop Tools :-

- **Selection Tools** :- Move (To move a part of any image), Lasso (To make any selection on an image), Quick Selection (To make a quick selection).
- **Crop and Slice Tools** :- To crop any part of the image.
- **Measuring Tools** :- Eyedropper (Allows you to sample a color from any image so that you can use it on your work).
- **Retouching Tools** :- Spot healing brush (Tool for removing blemishes from images), Clean Stamp, Eraser (Tool removes pixel information from the image just like a real eraser), Blur (It lets you blur parts of images), Dodge (Tool lets you paint in highlights in different tone ranges of your images).
- **Painting Tools** :- Brush, History Brush, Gradient.
- **Drawing and type Tools** :- Pen, Horizontal Type, Path Selection.
- **Navigation Tool** :- Hand, Zoom.



❖ Advantages of Photoshop:-

- It is a wonderful program with no limit.
- It can make artwork beautifully.
- It is greatly used in making presentations and making creative projects.

❖ Disadvantages of Photoshop:-

- It is hard for beginners to use.
- It is not free.
- It has slower processing speed due to its large size.
- It is less efficient in memory usage.

❖ Applications of Photoshop:-

- Web-Design
- Graphic Design
- Digital Painting
- Image-Writing
- Designing Quote Pictures

-The End-

Multimedia Technology (IT) 6th Sem

(2078) Question Paper Solution.

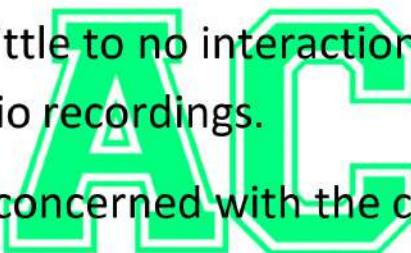
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1. What is multimedia? Explain properties of multimedia system.

➤ **Multimedia** is a form of communication that combines different content forms such as text, audio, images, animations, or video into a single interactive presentation, in contrast to traditional mass media which featured little to no interaction from users, such as printed material or audio recordings.

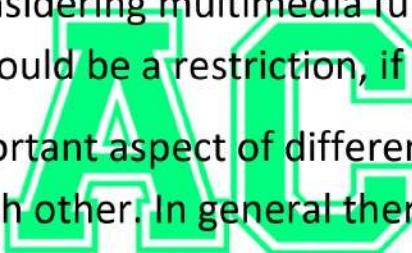


Multimedia is the field concerned with the computer-controlled integration of text, graphics, drawings, still and moving images (Video), animation, audio, and any other media where every type of information can be represented, stored, transmitted, and processed digitally.

A Multimedia Application is an application that uses a collection of multiple media sources e.g. text, graphics, images, sound/audio, animation, and/or video.

➤ **The properties of multimedia system are:-**

- **Combination of media:** A simple text processing program with incorporated image is often called a multimedia application because two media are processed through one program. But one should talk multimedia only when both continuous and discrete media are utilized. So text processing program with incorporated images is not a multimedia application.
- **Computer support integration:** Computer is idle tools for media combinations. The system should be capable of computer-controlled media processing. The system should be programmable by a system programmer or even a user.
- **Communication systems:** Communication-capable multimedia systems must be approached. A reason for this is that most of today's computers are interconnected; considering multimedia functions from only the local processing viewpoint would be a restriction, if not a step back.
- **Independence:** An important aspect of different media is their level of independence from each other. In general there is a request for independence of different media but multimedia may require several levels of independence. E.g. A computer controlled video recorder stores audio and video information's.



2. Explain concept of sound. Explain speech transmission in brief.

➤ **Sound** is a physical phenomenon produced by the vibration of the matter, such as a vibrating string or a block of wood. As the matter vibrates, pressure vibrations are created in the air surrounding it. This alternation of high and low pressure is propagating through air in a wave-like motion. When a wave reaches the human ear, a sound is heard.

❖ Concepts of sound:

- The pattern of the oscillation is called a waveform. The waveform repeats the same shape at regular intervals and this point is called a period. Since sound wave forms occur naturally, Sound waves are never perfectly smooth or uniformly periodic. Periodic sound: E.g. Musical instruments, vowel sounds, whistling wind, bird songs etc. Non-periodic sound: E.g. Unpitched percussion Instruments, coughs, sneezes, rushing water, Consonants, such as “t,” “f,” and “s”etc.

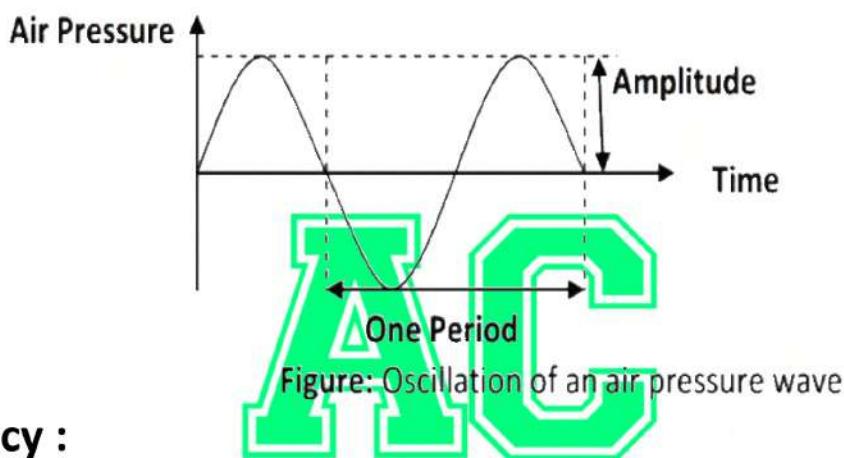


Figure: Oscillation of an air pressure wave

▪ Frequency :

The frequency of a sound is the reciprocal value of the period. It represents the number of periods in a second. It is measured in hertz (Hz) or cycles per second (cps).

$$1 \text{ KHz} = 1000 \text{ Hz}$$

Some of the frequency ranges are:

- ✓ Infra – sound – From 0 to 20 Hz
- ✓ Human hearing frequency range – From – 20 Hz to 20KHz
- ✓ Ultrasound – From 20KHz to 1GHz
- ✓ Hyper sound – From 1GHz to 10THz

Multimedia system typically makes use of sound only within the frequency range of human hearing. We will call sound in human hearing range audio and wave is called acoustics signals.

- **Amplitude :**

A sound also has amplitude, a property subjectively heard as loud less. The amplitude of a sound is the measure of the displacement of the air pressure wave from its mean or quiescent state.

- **Computer representation of sound :**

The smooth, continuous curve of a wave form is not directly represented in a computer. A computer measures the amplitude of the waveform at regular time intervals to produce a series of numbers called samples.

Audio signals are converted into digital samples through Analog-to-Digital Converter (ADC). The reverse mechanism is performed by a Digital-to-Analog Converter (DAC). E.g. of ADC is AM79C30A digital subscriber controller chip.

- **Sampling Rate**

The rate at which a continuous waveform is sampled is called the sampling rate. It is measured in Hz.



- **Quantization**

The value of sample is discrete. Resolution/Quantization of a sample value depends on the no. of bits used in measuring the height of a waveform.

❖ **Speech Transmission :-** The area of speech transmission deals with efficient coding of the speech signal to allow speech/sound transmission at low transmission rates over networks. The goal is to provide the receiver with the same speech/sound quality as was generated at the sender side. This section includes some principles that are connected to speech generation and recognition'

❖ Some Techniques for Speech Transmission

- **Pulse Code Modulation:** A straight forward technique for digitizing an analog signal is pulse code modulation. It meets the right quality demand stereo audio signals in the data rate used for CD. Its rate is 176400 bytes/s.
- **Source Encoding :-**

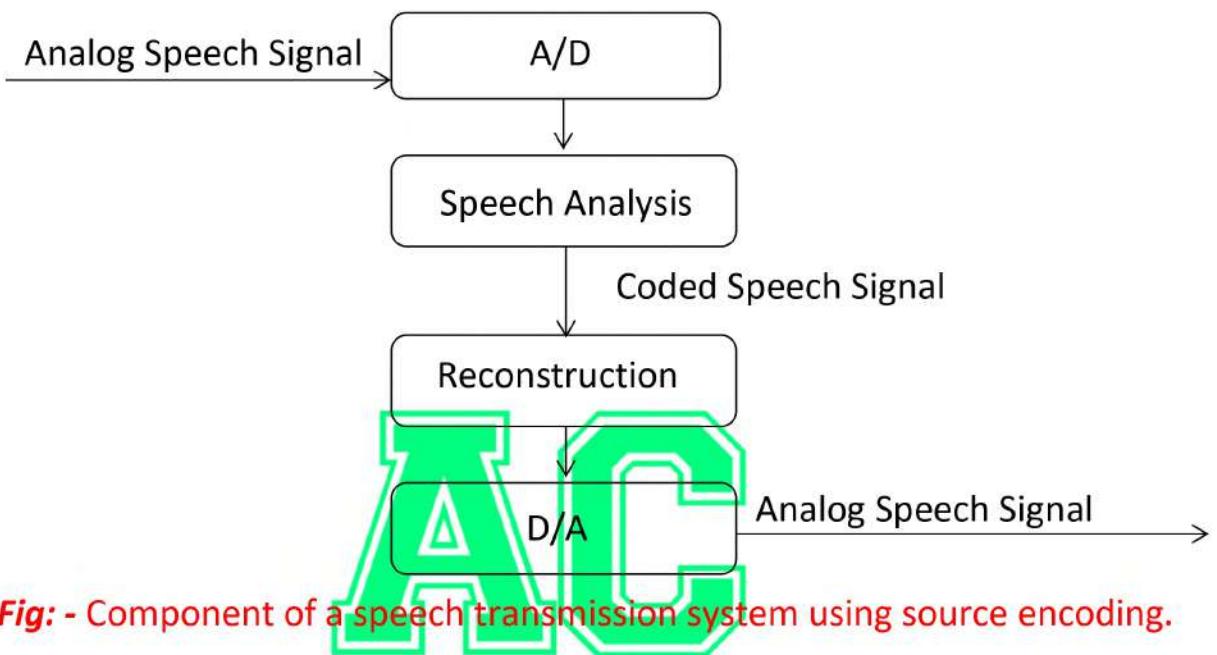


Fig: - Component of a speech transmission system using source encoding.

In source encoding transmission depends on the original signal has certain characteristics that can be exploited in compression.

- **Recognition-Synthesis Method:**

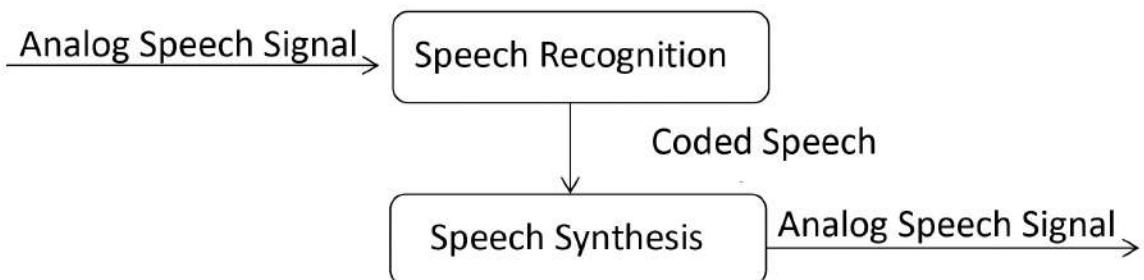


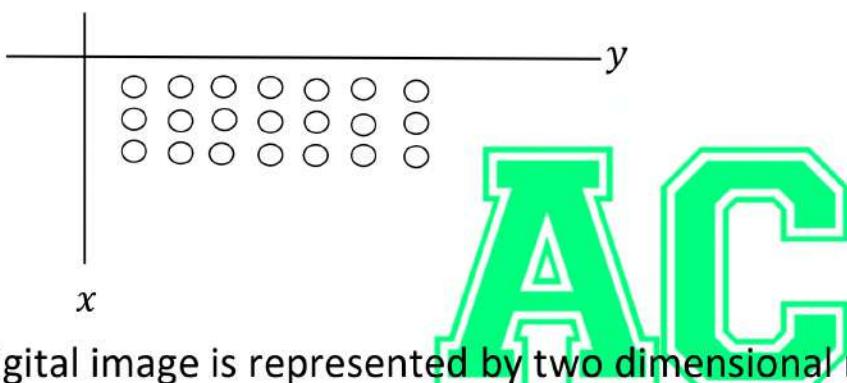
Fig: - Component of a recognition Synthesis for speech transmission.

This method conducts a speech analysis and speech synthesis during reconstruction speech elements are characterized by bits and transmitted over multimedia system. The data rate defines the quality.

3. How digital image is represented? Explain about image analysis and transmission.

➤ An image may be defined as two dimensional function $f(x, y)$ where, x y are the spatial co-ordinate and the amplitude of ' f ' at any pair of coordinates x, y is called the intensity or gray level of image at that point x, y and amplitude values of f are all finite, discrete quantities we all the image is digital image.

Representation of digital Image:



Digital image is represented by two dimensional matrix e.g. $I[x][y]$ When I is the two dimensional matrix then, $I[x][y]$ is the intensity value at the position corresponding to the row x and column y of the matrix.

Pixel:- A pixel is the smallest unit of information in a digital image.

Image Analysis:- Image analysis is concerned with techniques for extracting description from the image (shape, position, any distance, color) that are necessary for object recognition and classification.

➤ **Image Analysis:-** Image Analysis is concerned with techniques for extracting descriptions from images. By itself, knowledge of the position and value of any particular pixel almost conveys no information related to recognition of an object, the description of an objects shape, its position and orientation, the measurement of any distance on the object or whether the object is defective. Hence, image analysis techniques include computation of perceived brightness and color, partial or complete recovery of three-dimensional data in the scene, location of discontinuous corresponding to objects in the scene and characterization of the properties of uniform regions in the image.

Image analysis is important in many areas:-

- Aerial Surveillance photographs
- Slow scan television images of the moon or planets gathered from space probes.
- Television images taken from an industrial robot's visual sensor.
- X-ray images and computerized axial tomography (CAT) scans.



Sub-areas of image processing include:-

- Image enhancement
- Pattern detection and recognition
- Scene analysis and computer vision

➤ **Image Transmission:-** Image transmission takes into account transmission of digital images through computer networks. There are several requirements on the networks when images are transmitted.

- The network must accommodate busy data transport because image transmission is busy.
- Image transmission requires reliable transport.
- Time dependence is not a dominant characteristic of the image in contrast to audio/ video transmission.

Image size depends on the image representation format used for transmission. There are several possibilities.

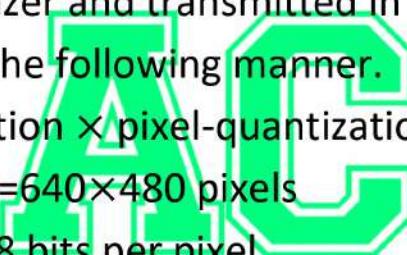
a) Raw image data transmission:- In this case, image is generated through a video digitizer and transmitted in its digital format. The size can be computed in the following manner.

$$\text{size} = \text{spatial-resolution} \times \text{pixel-quantization}$$

if image resolution=640×480 pixels

pixel quantization=8 bits per pixel

Transmission size=307200 bytes



b) Compressed Image data transmission:- In this case, the image is generated through a video digitizer and compressed before transmission. Methods such as JPEG or MPEG are used to downsize (compress) the image. The reduction of image size depends on the compression method and compression rate.

c) Symbolic image data representation:- In this case, the image is represented through symbolic data representation as image primitives (example, 2D or 3D geometric representation), attributes and other control information. This image representation method is used in computer graphics.

4. Define computer based animation. Explain methods of controlling animation.

➤ To animate something is literally to bring it to life. An animation covers all changes that have a visual effects, visual effect can be of two major types :-

- **Motion dynamic:** time varying positions
- **Update dynamic:** time varying shape, colour, texture or even lighting, camera position etc.

The visual effect is the result of exploiting the properties of human vision system. A computer animation is an animation performed by a computer using graphical tools to provide visual effects.



➤ **Methods of controlling Animation:-** Controlling animation is independent of the language used for describing it. Animation control mechanisms can employ different techniques:-

- **Full Explicit Control:-** It is a simplest type of animation control. Animator provides a description of everything that occurs in the animation, either by specifying simple changes, such as scaling, translation, and rotation, or by providing key frame information and interpolation methods to use between key frames.

This interpolation may be given explicitly or by direct manipulation with a mouse, joystick, data glove or other input device (in an interactive system). E.g. BBOP system

- **Procedural Control:-** It is based on communication between various objects to determine their properties. It is a significant part of several other control mechanisms. In physically-based systems, the position of one object may influence the motion of another (eg: balls cannot pass through walls). In actor- based systems, the individual actors may pass their positions to other actors to affect the other actors' behaviors.
- **Constraint-based Systems:-** Many objects move in a manner determined by other objects with which they are in contact, and this compound motion may not be linear at all. Such motion can be modeled by constraints. Specifying an animated sequence using constraints is often much easier to do than using explicit control. E.g. Sutherland's Sketchpad.
- **Tracking Live Action:-** Trajectories of objects in the course of an animation can be generated by tracking live action. Traditional animation uses rotoscoping. A film is made in which people/animals act out the parts of the characters in the animation. Then animators draw over the film, enhancing the background and replacing the human actors with their animated equivalents.
- **Kinematics and Dynamics:-** Kinematics refers to the position and velocity of points. The final result of an animation is the sum of all the steps. If it does not fit, the animator has to try again. This is known as forward kinematics. Inverse kinematics (IK) is concerned with moving a skeleton from one pose to another. Dynamics takes into account the physical laws that govern the masses and forces acting on the objects.

5. What is data compression? Why we need it? Explain about lossy compression.

- **Data compression** is the process of reducing the size of digital data while keeping the important information. It involves re-encoding data using fewer bits than the original representation.
- **We need it** because Data compression reduces the amount of space that files take up on a hard drive. It also reduces the time it takes to transfer or download files. This can lead to significant cost savings.
- **Lossy compression** is a data compression technique that removes less important information from a file. This makes the file smaller and easier to store, send, or handle. However, the data is permanently lost, which is why it's called "lossy". Algorithms used in Lossy compression are Transform coding, Discrete Cosine Transform, Discrete Wavelet Transform, fractal compression etc. Lossy compression is also termed as irreversible compression. Lossy compression has more data-holding capacity.
✓ **Lossy compression is often used when:-**
 - A file can afford to lose some data
 - Storage space needs to be freed up
 - The file is so large that there isn't enough space to keep all the original data.

Lossy compression can significantly reduce file size, but it can also reduce image quality to the point of distortion. This is especially true if the image is overly compressed. Some examples of lossy compression include: MP3, JPEG etc.

6. Explain development phase of multimedia.

➤ The development phase of multimedia :-

- **Initiation:-** The initiation phase marks the beginning of the multimedia development process. During this stage, the project is conceptualized, and the goals and objectives are defined. Stakeholders identify the purpose of the multimedia project, target audience, and the desired outcomes. Initial planning and feasibility assessments are conducted to ensure that the project aligns with the organization's objectives and resources.
- **Specifications:-** In the specifications phase, detailed requirements and specifications for the multimedia project are outlined. This involves defining the content, features, and functionalities that the multimedia product should have. Technical specifications, such as hardware and software requirements, are also determined. This phase serves as a blueprint for the subsequent stages of design and production, providing a clear roadmap for development.
- **Design:-** The design phase involves the creation of a comprehensive plan for the multimedia project based on the specifications. This includes visual and functional design elements, such as layout, graphics, user interface, and interactivity. Designers work on creating a prototype or mockup that represents the look and feel of the final product. The goal is to ensure that the multimedia elements align with the project's objectives and effectively engage the target audience.

- **Production:-** The production phase is where the actual development of the multimedia content takes place. This includes the creation of graphics, audio, video, and any interactive elements specified in the design phase. Multimedia developers use various tools and technologies to implement the design, ensuring that the final product meets the established specifications. Iterative testing and refinement occur throughout the production process to address any issues and enhance the overall quality of the multimedia content.
- **Review and Evaluation:-** Once the multimedia product is developed, it undergoes a thorough review and evaluation process. This phase involves assessing the product's adherence to specifications, functionality, and overall quality. Stakeholders, including designers, developers, and end-users, provide feedback, and any necessary revisions are made. This iterative process continues until the multimedia product meets the required standards and achieves the desired objectives.
- **Delivery and Implementation:-** The final phase involves the delivery and implementation of the multimedia product. This includes deploying the product to the intended platforms or distribution channels. Whether it's a website, application, or another medium, the multimedia content is made accessible to the target audience. Ongoing support and maintenance may also be part of this phase to address any issues that arise post-implementation and to ensure the longevity of the multimedia project.

7. Explain about quality of service. Explain about document architecture SGML.

- **Quality of Service (QoS)** is the ability of a network to provide different priorities to different applications, users, or data flows. It can also guarantee a certain level of performance to a data flow.
- QoS can be implemented at different layers of the Internet Protocol Suite (TCP/IP). Some QoS mechanisms include: Classification and marking, Congestion management, Congestion avoidance, Shaping, Link efficiency.

❖ QoS can be used to:

- Prioritize traffic and resources.
- Guarantee the performance of a specific application or service.
- Ensure reliable and timely delivery of data, voice, and video applications.



When processing and transporting multimedia streams, three parameters are of primary interest: Bandwidth, Latency, Loss rate.

❖ Document Architecture SGML

- Standard Generalized Markup Language (SGML) is a standard for the uniformity in the content and their representation in the document. The Content of the document is described within the tags. SGML determines the form of tags, but it does not specify their location or meaning. It is basically a set of rules that break a document into parts and identify the different parts of the document. It basically defines the syntax or the structure of the document's content. However SGML does not provide semantics.

Example:-

```
<book>
<title>Multimedia Technology</title>
<author>Mr Arjun</author>
<side>CTEVT</side>
<summary>This is his first published book</summary>
</book>
```

Processing of SGML document

Processing of SGML document is divided into two processes. Only the formatter knows the meaning of the tag and it transforms the document into a formatted document. The parser uses the tags, occurring in the document, in combination with the corresponding document type.

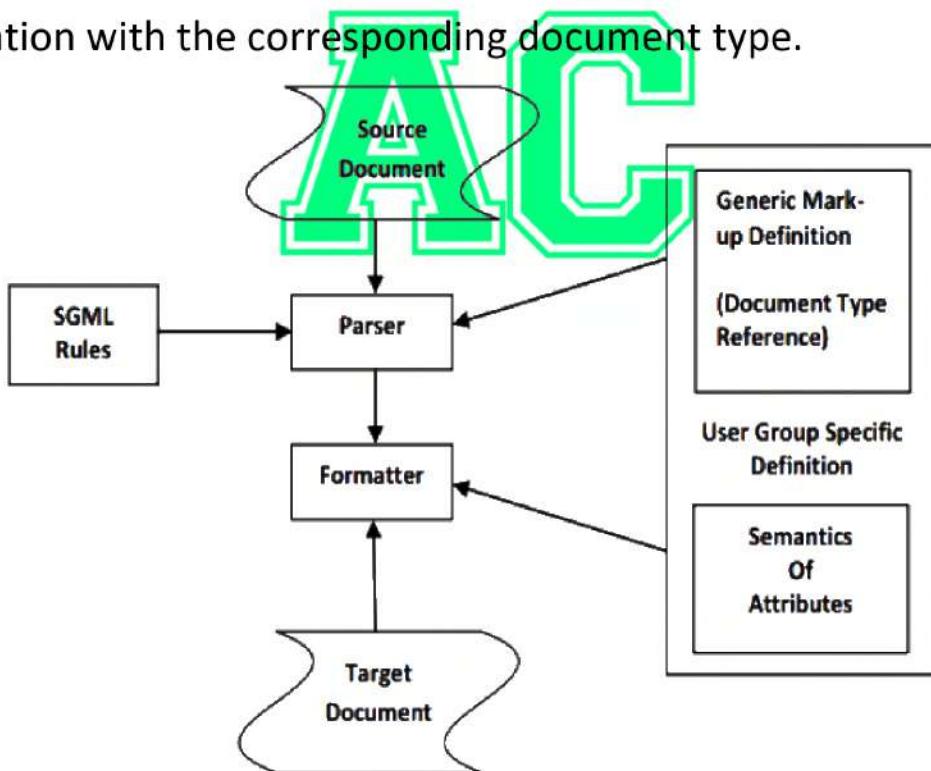


Figure: SGML Document processing - from the information to the presentation

The above figure shows the processing of SGML documents. It is divided into processes.

- **Formatter** :- Formatter knows the meaning of tag and it transforms the document into a formatted document.
- **Parser** :- The Parser uses the tags, occurring in the document, in combination with the corresponding document type.

8. What is user interface? Explain about user friendliness as the primary goal in user interface.

➤ **User interface** is the layer of the software or the program with which the end users interact in order to get his things done for e.g. processing of the information. This interaction today occurs with a graphical layer with which the user can interact with several input devices like keyboard, mouse, track balls, data gloves etc.



❖ User-friendliness as the Primary Goal

➤ User friendliness is the main property of a good user interface. The design of user-friendly graphical interface requires the consideration of many conditions. The addition of audio and video to the user interface does not simplify this process.

Some requirements for user-friendliness are as follows:-

- **Easy to Learn Instructions**:- Application instruction must be easy to learn. A multimedia application must support similar mechanisms which know to the User form other applications.
- **Content-sensitive Help Functions**:- A content-sensitive help function using hypermedia technique is very helpful *i.e.* according to the state of application, different help texts are displayed.

- **Easy to Remember Instructions:-** A user-friendly interface must also have the property that the user easily remembers the application instruction rules.- Easily remembered instructions might be supported by the intuitive association of what the user already known.
- **Effective instructions:-** The user interface should enable effective use of the application. This means:-
 - Logically connected functions should be presented together and similarly.
 - Graphical symbols or short video clips are also more effective than textual input / output.
 - Different media should be able to be exchanged among different applications.
 - Action should be activated quickly.
 - A configuration of user interface should be usable by both professionals and users.
- **Aesthetics:-** With respect to aesthetics, the color combination, character sets, resolution and form of the window need to be considered. They determine a user's first and lasting impressions.
- **Effective Implementation Support:-** To achieve effective implementation of a user-friendly human-computer graphical interface, the user's requirement must be considered. This influences the cost of the implementation.
- **Entry Elements:-** User interfaces use different ways to entries the user.
 - Entries in a menu
 - Entries on a graphical interface
 - Entries through Combo box, Radio button.



9. What is higher programming language? What is toolkits?

➤ In the higher programming languages, the processing of continuous media data is influenced by a group of similar constructed functions. These calls are mostly hardware and driver independent. Hence, their integration in HLLs lends to a wishful abstraction supports a better programming style and increases the productivity. The programs in a high level language (HLL) either directly access multimedia data structures, or communicate directly with, the active processes in the real-time environment. The processing devices are controlled through corresponding device drivers. Programs must be capable of supporting and effectively manipulating multimedia data.



➤ **Toolkits** are used for controlling the audio and video data processing in a programming environment. Toolkit hides the process structures. It represents interfaces at the system software level.

These tool-kits are used to :-

- Abstraction from the actual physical layer (It is also done in a limited way by the libraries).
- Allow a uniform interface for communication with all different devices of continuous media (with eventual input of quality of service parameters).
- Introduce the client-server paradigm (here, the communication can be hidden from the application in an elegant way). (graceful, refined, tasteful)

Tool-kits can also hide process structure. Tool-kits should represent interfaces at the system software level. In this case it is possible to embed them into the programming languages or object oriented environment.

10. Write short notes on :

a) MHEG

➤ MHEG stands for **Multimedia and Hypermedia Experts Group**. It's a system for creating applications for the UK digital terrestrial TV system. MHEG was developed due to the increasing convergence of broadcast and interactive technologies. It specifies an encoding format for multimedia applications that's independent of network protocols and service paradigms.

MHEG provides an interchange format for multimedia and hypermedia information. It also specifies an encoding format for multimedia applications that's independent of network protocols and service paradigms. MHEG provides generic multimedia information structures that are suitable for real-time multimedia applications.

MHEG-5 is an international standard for interactive multimedia applications. It's also known as ISO/IEC 13522–5. MHEG-5 is most commonly used as a language to describe interactive television services. **MHEG applications include:-**

- The text services (red button) found on the BBC channels.
- Other similar interactive systems.

b) System Software

➤ **System software** is hardware oriented software. It manages the hardware devices and creates the environment to use application software. It is the basic software required to make the hardware operate able. It is provided by the hardware developer along with the hardware. Example:- Windows OS, compiler, driver of printer.

Different types of system software used are: operating system, language translator, device driver.

- **Operating system** :- Operating system is a master program that manages the hardware and software resources of the computer and makes the computer ready to use. It manages process, memory, input/output, file, data and security. Example: Windows, Linux, UNIX.
- **Language translator** :- Language translator translates program developed in either assembly or high level language into machine language and vice-versa. Different language translators used are: assembler, compiler and interpreter.
- **Device driver** :- Device driver is system software required to operate a particular hardware. Example: driver of printer, graphics, sound.

-The End-

Multimedia Technology (IT) 6th Sem

(2079) Question Paper Solution.

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Website :- www.arjun00.com.np

Facebook :- www.facebook.com/Arjun00.com.np

1. What are the uses of multimedia? Explain multimedia system and its properties.

➤ **The uses of multimedia are :-**

- Education
- Training
- Entertainment
- Advertisement
- Presentation
- Business Communication
- Web page Design



➤ A **multimedia system** is any system, which supports more than a single kind of media. multimedia system is characterized by computer-controlled, integrated production, manipulation, presentation, storage, and communication of independent information, which is encoded at least through a continuous (time-dependent) and a discrete (time-independent) medium. A multimedia system is any system which supports more than a single kind of media.

➤ The properties of multimedia system are: -

- **Combination of media:** A simple text processing program with incorporated image is often called a multimedia application because two media are processed through one program. But one should talk multimedia only when both continuous and discrete media are utilized. So text processing program with incorporated images is not a multimedia application.
- **Computer support integration:** Computer is idle tools for media combinations. The system should be capable of computer- controlled media processing. The system should be programmable by a system programmer or even a user.
- **Communication systems:** Communication-capable multimedia systems must be approached. A reason for this is that most of today's computers are interconnected; considering multimedia functions from only the local processing viewpoint would be a restriction, if not a step back.
- **Independence:** An important aspect of different media is their level of independence from each other. In general there is a request for independence of different media but multimedia may require several levels of independence. E.g. A computer controlled video recorder stores audio and video information's. There is inherently tight connection between two types of media. Both media are coupled together through common storage medium of tape. On the other hand for the purpose of presentation the combination of DAT (digital audio tape recorder) signals and computer available text satisfies the request for media independence.

2. What is sound/audio system? Explain speech generation and analysis.

➤ Sound is the physical phenomenon produced by the vibration of matter. When a matter vibrates, pressure variations are created in the air surrounding it. Audio is a term used to describe any sound or noise in a range the human ear is capable of hearing.

Speech Generation

➤ Speech output system could transform text into speech automatically without any lengthy pre-processing. Generated speech must be understandable and must sound natural. The requirement of understandable is a fundamental assumption and the natural sound of speech increases user acceptance. An important requirement for speech generation is real-time signal generation.



Types of Speech generation:-

- **Time-dependent sound concatenation:-** Speech generation can also be performed by sound concatenation in a timely fashion. Individual speech unit are composed like building blocks, where the composition can occur at different levels.
- **Frequency dependent sound concatenation:-** Speech generation can also be based on frequency dependent sound concatenation. E.g. through formant synthesizing. Formants are the frequency maxima in the spectrum of the speech. Formants synthesize simulate the vocal track through filter. This characteristics value is filters middle frequency and their bandwidth.

Speech analysis:

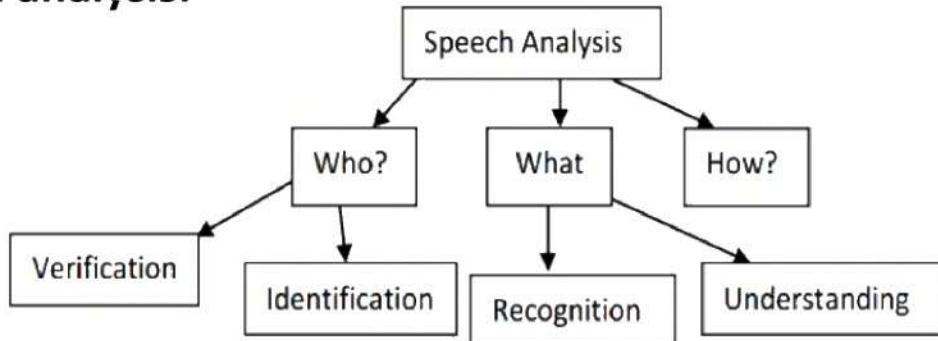
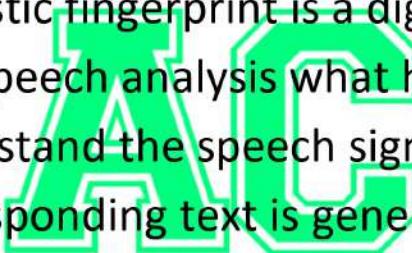


Figure: Research Areas of speech analysis

- Speech analysis can serve to analyze who is speaking i.e. to recognize a speaker for his identification and verification. The computer identifies and verifies the speaker using an acoustic fingerprint. An acoustic fingerprint is a digitally stored speech probe of a person. Speech analysis what has been said i.e. to recognize and understand the speech signal itself. Based on speech sequence, the corresponding text is generated (e.g. speech-controlled typewriter)

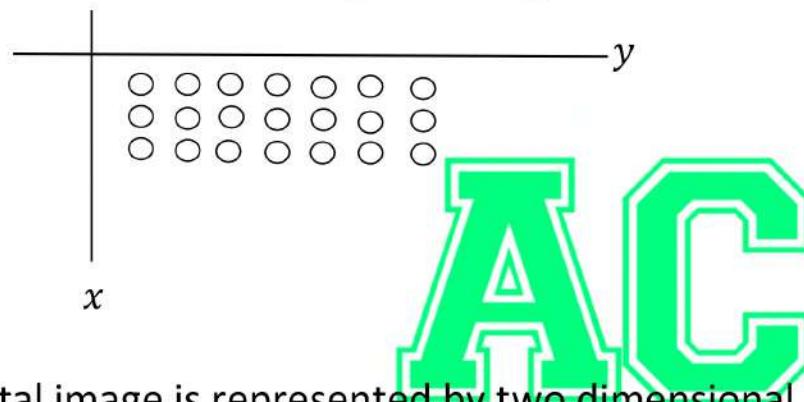


Speech analysis also tries to research speech patterns with respect to how a certain statement was said. E.g. a spoken sentence sounds differently if a person is angry or calm which can be used for lie detector.

3. How can you represent a digital image? Explain image synthesis.

➤ An image may be defined as two dimensional function $f(x, y)$ where, x and y are the spatial co-ordinate and the amplitude of ' f ' at any pair of co-ordinates x, y is called the intensity or gray level of image at that point x, y and amplitude values of f are all finite, discrete quantities we call the image is digital image.

Representation of digital Image:



Digital image is represented by two dimensional matrix e.g. $I[x][y]$ When I is the two dimensional matrix then, $I[x][y]$ is the intensity value at the position corresponding to the row x and column y of the matrix.

Pixel:- A pixel is the smallest unit of information in a digital image.

Image Analysis:- Image analysis is concerned with techniques for extracting description from the image (shape, position, any distance, color) that are necessary for object recognition and classification.

Image synthesis:

- Image synthesis deals with the generation of images of real or imaginary objects. It is an integral part of all computer user interfaces and is indispensable for visualizing 2D, 3D and higher dimensional objects.
- Some of the applications of image synthesis (areas which use image synthesis) are:

i. User Interface:

- Point-and-click facility
- Menu-driven

ii. Office automation and electronic publishing :

- Desktop publishing
- Electronic publishing
- Hypermedia Systems



iii. Simulation and Animation for Scientific Visualization and

Entertainment :

- Simulation of real time systems.
- Visualization of time-varying behavior of systems.
- Abstract representation of complex mathematical expressions
- Models for fluid flow, chemical reaction etc.
- Cartoons.
- Flying logos and more exciting visual for movies.

Image Synthesis can be dynamic. Similarly, interactive graphics systems are used for image synthesis.

4. What do you mean by Computer-Based animation? What are the methods of controlling animation?

- To animate something is literally to bring it to life. An animation covers all changes that have a visual effects, visual effect can be of two major types :-
- **Motion dynamic:** time varying positions
 - **Update dynamic:** time varying shape, colour, texture or even lighting, camera position etc.

The visual effect is the result of exploiting the properties of human vision system. A computer animation is an animation performed by a computer using graphical tools to provide visual effects.



- **Methods of controlling Animation:-** Controlling animation is independent of the language used for describing it. Animation control mechanisms can employ different techniques:-

- **Full Explicit Control:-** It is a simplest type of animation control. Animator provides a description of everything that occurs in the animation, either by specifying simple changes, such as scaling, translation, and rotation, or by providing key frame information and interpolation methods to use between key frames.

This interpolation may be given explicitly or by direct manipulation with a mouse, joystick, data glove or other input device (in an interactive system). E.g. BBOP system

- **Procedural Control:-** It is based on communication between various objects to determine their properties. It is a significant part of several other control mechanisms. In physically-based systems, the position of one object may influence the motion of another (eg: balls cannot pass through walls). In actor- based systems, the individual actors may pass their positions to other actors to affect the other actors' behaviors.
- **Constraint-based Systems:-** Many objects move in a manner determined by other objects with which they are in contact, and this compound motion may not be linear at all. Such motion can be modeled by constraints. Specifying an animated sequence using constraints is often much easier to do than using explicit control. E.g. Sutherland's Sketchpad.
- **Tracking Live Action:-** Trajectories of objects in the course of an animation can be generated by tracking live action. Traditional animation uses rotoscoping. A film is made in which people/animals act out the parts of the characters in the animation. Then animators draw over the film, enhancing the background and replacing the human actors with their animated equivalents.
- **Kinematics and Dynamics:-** Kinematics refers to the position and velocity of points. The final result of an animation is the sum of all the steps. If it does not fit, the animator has to try again. This is known as forward kinematics. Inverse kinematics (IK) is concerned with moving a skeleton from one pose to another. Dynamics takes into account the physical laws that govern the masses and forces acting on the objects.

5. What is the purpose of data compression? Explain LZW compression.

- The purpose of data compression is to reduce the size of data files or streams while maintaining the essential information. It helps optimize storage space, improve data transmission efficiency, and reduce costs. Compression enables faster data transfer, enhances system performance, and can be used for secure transmission. It offers benefits such as storage space optimization, bandwidth optimization, cost reduction, improved performance, and secure data transmission.
- **LZW (Lempel–Ziv–Welch)** compression is a method to reduce the size of Tag Image File Format (TIFF) or Graphics Interchange Format (GIF) files. It is a table-based lookup algorithm to remove duplicate data and compress an original file into a smaller file. LZW compression is also suitable for compressing ~~text and PDF~~ files. The algorithm is loosely based on the LZ78 algorithm that was developed by Abraham Lempel and Jacob Ziv in 1978.

Invented by Abraham Lempel, Jacob Ziv and Terry Welch in 1984, the LZW compression algorithm is a type of lossless compression. Lossless algorithms reduce bits in a file by removing statistical redundancy without causing information loss. This makes LZW -- and other lossless algorithms, like ZIP -- different from lossy compression algorithms that reduce file size by removing less important or unnecessary information and cause information loss.

The LZW algorithm is commonly used to compress GIF and TIFF image files and occasionally for PDF and TXT files. It is part of the Unix operating system's file compression utility. The method is simple to implement, versatile and capable of high throughput in hardware implementations. Consequently, LZW is often used for general-purpose data compression in many PC utilities.

Advantages :

- **High Compression Ratio:** LZW can achieve high compression ratios, particularly for text-based data, which can significantly reduce file sizes and storage requirements.
- **Fast Decompression:** LZW decompression is typically faster than other compression algorithms, making it a good choice for applications where decompression speed is critical.



Disadvantages:

- **Patent Issues:** LZW compression was patented in the 1980s, and for many years its use was subject to licensing fees, which limited its adoption in some applications.
- **Limited Applicability:** LZW compression is particularly effective for text-based data, but may not be as effective for other types of data, such as images or video, which have different compression requirements.

6. What is hypermedia? Explain document architecture ODA.

- **Hypermedia** is a nonlinear medium of information that includes graphics, audio, video, plain text, and hyperlinks. It's an extension of the term hypertext. Hypermedia is different from multimedia, which may include non-interactive linear presentations.

Document Architecture ODA

- The Open Document Architecture (ODA) is a standard document file format created by the ITU-T to replace all proprietary document file formats. ODA defines a compound document format that can contain raw text, raster images and vector graphics. The documents have both logical and layout structures. Logically the text can be partitioned into chapters, footnotes and other sub elements, and the layout fills a function similar to Cascading Style Sheets in the web world.

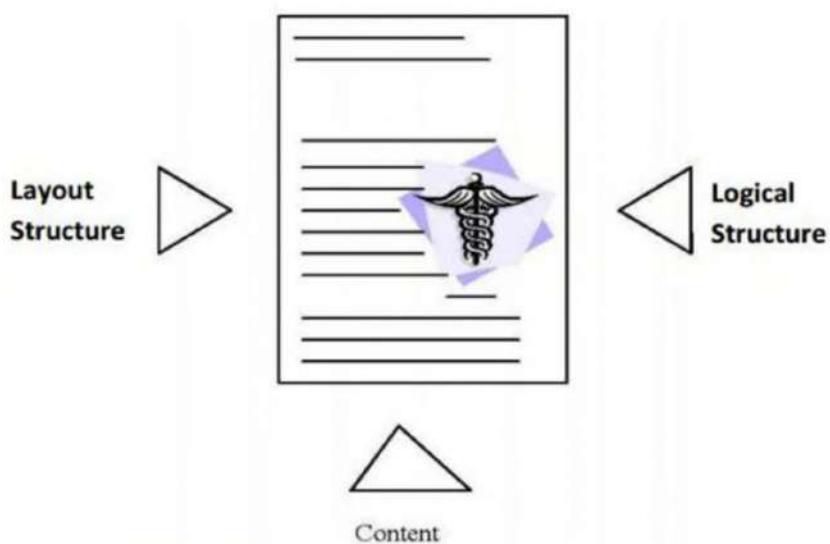


Figure: ODA: Content, layout and logical view

The binary transport format for an ODA-conformant file is called Open Document Interchange Format and is based on abstract syntax notation one (ASN.1). Thus the main property of ODA is the distinction among content, logical structure and layout structure. This is in contrast to SGML where only a logical structure and the contents are defined. ODA also defines semantics. The following figure shows the layout, logical and content aspect of the linked documents. Each of these views represent one aspect, together we get the actual document.

Content:- The content of the document consist of content portions. A content architecture describes for each medium:-

- Specification of the elements
- The possible access functions and
- The data coding



ODA has content architectures for media text, geometrical graphics and raster graphics.

Layout Structure:- The layout structure specifies mainly the representation of a document. It is related to a two dimensional representation.

Logical Structure:- It includes the partitioning of the content.

7. Define user interface. Explain about HTML and SGML.

- **User interface** is the layer of the software or the program with which the end users interact in order to get his things done for e.g. processing of the information. This interaction today occurs with a graphical layer with which the user can interact with several input devices like keyboard, mouse, track balls, data gloves etc.
- **HTML** stands for HyperText Markup Language. It's a markup language that defines the structure and meaning of web content. HTML is used to create web pages and is the most basic building block of the web.

HTML is made up of a series of elements that tell the browser how to display content. For example,

HTML can be used to:-



- Structure web pages
- Embed images and videos
- Improve client-side data storage and offline capabilities
- Interact with native APIs
- Add page breaks, paragraphs, bold lettering, and italics
- With HTML you can create your own Website.

HTML is often assisted by technologies such as Cascading Style Sheets and scripting languages such as JavaScript.

HTML was created by Berners-Lee in late 1991. The first standard HTML specification, "HTML 2.0", was published in 1995.

➤ **Standard Generalized Markup Language (SGML)** is a standard for the uniformity in the content and their representation in the document. The Content of the document is described within the tags. SGML determines the form of tags, but it does not specify their location or meaning. It is basically a set of rules that break a document into parts and identify the different parts of the document. It basically defines the syntax or the structure of the document's content. However SGML does not provide semantics.

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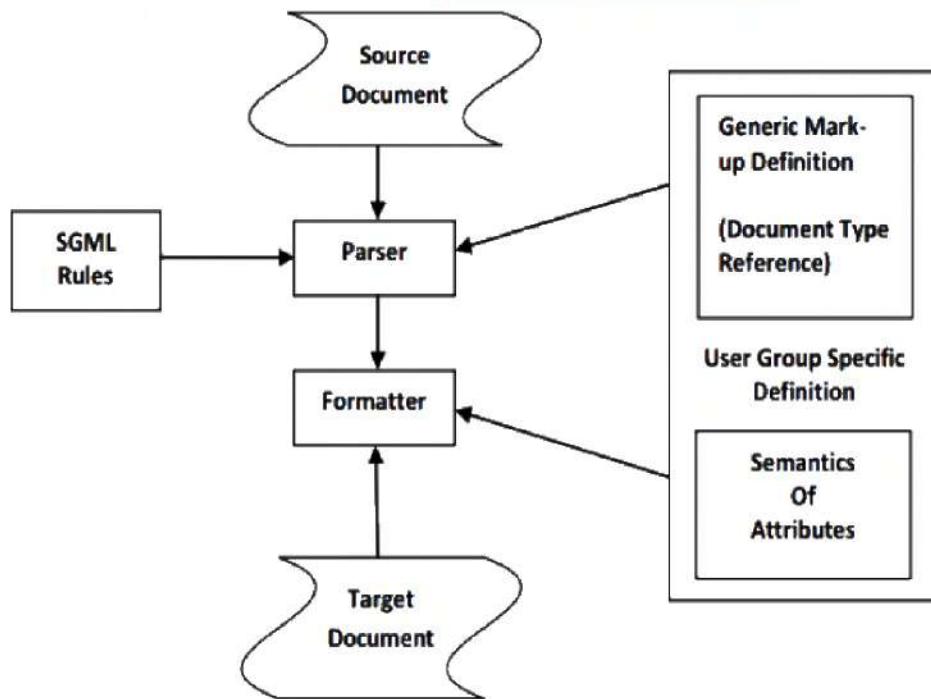
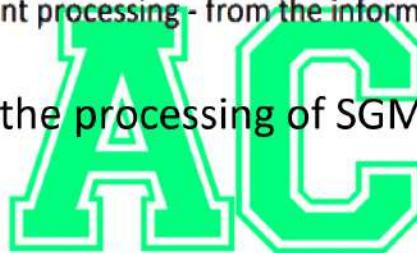


Figure: SGML Document processing - from the information to the presentation

The above figure shows the processing of SGML documents. It is divided into processes.



- **Formatter :-** Formatter knows the meaning of tag and it transforms the document into a formatted document.
- **Parser :-** The Parser uses the tags, occurring in the document, in combination with the corresponding document type.

8. Explain briefly about model for multimedia synchronization.

- Each layer provides synchronization mechanism, which is provided by an appropriate interface. These interfaces can be used to specify or enforce the temporal relationships each interface defines services, i.e. offering the user a mean to define his/her requirements. Each layer can be used by an application directly, or by the next high or layer to implement an interface.

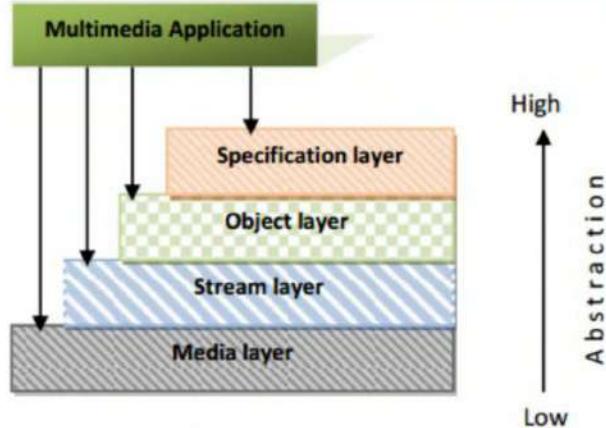


Figure: Four-layer reference model

- **Media layer** :- At the media layer, an application operates on a single continuous media stream, which is treated as a sequence of LDU. The abstraction offered at this layer is a device independent interface with operation like read and write. Media layer implementation can be classified into simple implementation and implementation that provide across two interleaved media stream.
- **Stream layer** :- Stream layer operates on continuous media stream as well as on groups of media streams. In a group, all streams are presented in parallel by using mechanisms for inter stream synchronization. Continuous media is seen in the stream layers as a data flow with implicit time constraint. Individual LDUs are not visible. The streams are executed in real time environment, where all processing is constrained by well-defined time specification. An application using the stream layer is responsible for starting, stopping and grouping the stream for the definition of the required QoS in terms of timing parameters supported by the stream layer. It is also responsible for the synchronization with time independent media object.

- **Object layer:-** Object layer operates on all types of media and hides the differences between discrete and continuous media. The abstraction offered to the application is that of a complete, synchronized presentation. This layer takes a synchronization specification as input and is responsible for the correct schedule of the overall presentation. The task of this layer is to close the gap between the needs for the execution of a synchronized presentation and the stream-oriented services. The functions located at the object layer are to compute and execute complete presentation schedule that include the presentation of the non-continuous media object and the calls to the stream layer.
- **Specification layer:-** The specification layer is an open layer. It doesn't offer an explicit interface. This layer contains application and tools are located that allow to create synchronization specification. Such tools are synchronization editors, multimedia document editors, and authoring systems. It also contains tools for converting specification to an object layer format. It is also responsible for mapping QoS requirements of the user level to the qualities offered at the object layer interface.

9. Write short notes on: (Any Two)

a) Trends in multimedia

➤ **Trends in multimedia are:-**

- **High-Resolution Content:** There is a growing demand for high-resolution multimedia content, including 4K and even 8K resolution videos. As display technologies continue to advance, consumers expect more immersive and visually stunning experiences.
- **Augmented Reality (AR) and Virtual Reality (VR):** AR and VR technologies are being used to create more immersive and interactive multimedia experiences. They are particularly popular in the gaming industry but are also being used in fields such as education, healthcare, and architecture.
- **Artificial Intelligence (AI):** AI is being used to enhance multimedia applications by providing intelligent features such as voice recognition, facial recognition, and object detection. AI can also be used to generate content, such as automated video editing or image generation.
- **360-Degree Video:** This technology allows users to view content from every angle, creating a more immersive and engaging experience. 360-degree videos are particularly popular in the travel and tourism industry.
- **Interactive Storytelling:** Interactive multimedia applications allow users to actively participate in the storytelling process. Users can make decisions that affect the outcome of the story, creating a more personalized experience.
- **Cloud-Based Multimedia:** Cloud computing has made it easier for multimedia applications to be accessed and used from anywhere with an internet connection. This has led to the rise of cloud-based multimedia applications, which offer more flexibility and scalability than traditional on-premises applications.

- **Streaming Services:** The rise of streaming services, such as Netflix, Amazon Prime Video, and Disney+, has revolutionized the way multimedia content is consumed. Streaming platforms continue to gain popularity, offering a wide range of movies, TV shows, and original content on-demand.

b) System Software

➤ **System software** is hardware oriented software. It manages the hardware devices and creates the environment to use application software. It is the basic software required to make the hardware operate able. It is provided by the hardware developer along with the hardware. Example:- Windows OS, compiler, driver of printer.

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- **Language translator** :- Language translator translates program developed in either assembly or high level language into machine language and vice-versa. Different language translators used are: assembler, compiler and interpreter.
- **Device driver** :- Device driver is system software required to operate a particular hardware. Example: driver of printer, graphics, sound.

c) Designing multimedia

➤ Multimedia design is the art of combining different media, such as text, images, audio, and video, to communicate with an audience. It's a niche in the graphics and website design industry. Multimedia designers are graphic design specialists who combine graphics with animation to create content for various media.

They may work in fields such as:

- Advertising
- Video game design
- Web design
- Television



Multimedia designers plan, design, and develop the production of digitally delivered information, promotional content, instructional material, and entertainment. They use static and animated information, text, pictures, video, and sound.

Some steps for designing a multimedia application include:

- Project conceptualization
- Planning and costing
- Design and production

Some principles for designing multimedia educational applications include:

- Contiguity principle
- Optimizing the presentation of information

-The End-

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